

Strategy 2030

Reducing footprints

-

Improving yield, robustness, quality and performance



CROP INNOVATION DENMARK

- from genes to seeds



CROP INNOVATION DENMARK
- from genes to seeds

Sejet 
plant breeding



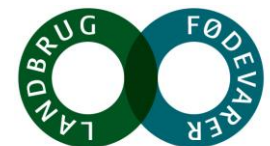
Nordic Seed 



UNIVERSITY OF
COPENHAGEN



AARHUS
UNIVERSITY



Danish Agriculture
& Food Council

Directions for the future

Climate change is the biggest challenge facing the current and future generations, and every part of society must take action and responsibility to make change happen.

The plant breeding sector can contribute by making genetic improvements in crops that reduce the emissions of plant production and in the subsequent stages of food production – while at the same time contribute to an improved food production. Future plant production need to deliver on several agendas.

This requires crops that are effective and robust and that show high performances also under suboptimal growth conditions.



The current decade of plant breeding efforts will be affected by the following trends:

- Climate change mitigation through reduction of carbon emissions (Green Deal target of neutrality in 2050)
- Increasing demand for food, feed and (bio-)energy for a growing world population
- Increasing pressure on available arable land – the need for higher production pr. ha.
- Adaptation of crops to future climate conditions with more extreme weather events and new biotic stresses
- Plant production with less pesticides and decreasing loss of nutrients from fertilizers (Farm to Fork Strategy)
- Bridging the demand for plant-based foods and products
- Increasing demand for biomass for multiple purposes - circularity in the biomass utilization

Vision

Danish plant research environments will carry out business-oriented research at the highest international level. Here – at the intersection of public and private research and innovation – new knowledge and tools are generated that accelerates the breeding progress to meet the climate targets and increases the competitiveness of CID's partners.

Mission

CID will create scientific and commercial added value in its partners research and development activities, and work to position plant breeding at the core of solutions to the challenges of climate change and future food and biomass production.



CID brings together

Research, pre-breeding activities and plant breeding in an innovative frame where the solutions of the future are created



Pre-breeding – exploring genetic diversity

Pre-breeding refers to all activities designed to i. induce variation, ii. develop methods or technologies to aid research or breeding efforts, or iii. identify agronomic traits or genes of interest from plants that cannot be used directly in breeding populations and transferring these into an intermediate material that breeders can readily use in their breeding programs.

Pre-breeding is an important first step in utilizing and expanding the genetic diversity available.

A strong CID partnership

CID has built a strong partnership where co-creation and cooperation on initiatives has created a pre-competitive forum that stimulates world class research and innovation.

In the coming years, CID will continue developing this partnership and contribute to the creation of new innovative solutions, that will accelerate plant breeding progress and address climate change challenges as well as other trends in the bioeconomy including the need for increased biomass production. The partnership will increase the competitiveness of Danish plant breeding companies and research environments.

CID will work to strengthen the partnership and Danish plant breeding through:

- Coordination of joint research projects with an eye for exploiting synergies across partners.
- Commission of the necessary funding and advocating for long term funding to support pre-breeding research at the universities.
- Ensuring access to new breeding methods such as CRISPR/cas and other relevant technologies.
- Public positioning of plant breeding innovations as a green solution to the climate and environmental challenges.
- Identifying and seeking out international cooperations that can contribute with new knowledge to CID and help the partners reach their goals.

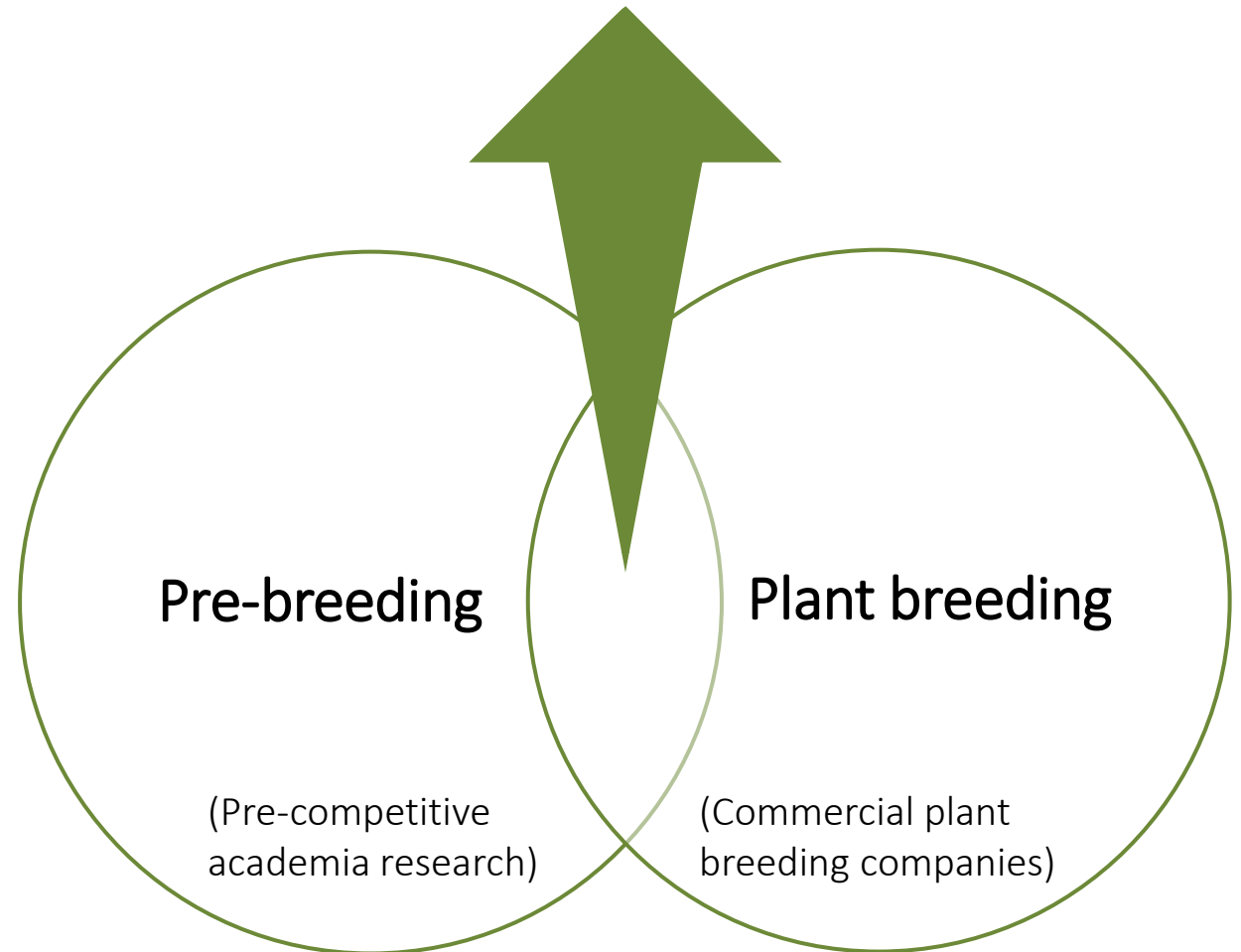




At the intersection of public and private research new science and market opportunities are created

STRATEGIC INNOVATION

that accelerates breeding progress



Plant breeding for a climate neutral future

Plant genetics marks the beginning of the feed and food chain, and plant breeding can deliver fundamental solutions that can increase the sustainability and reduce the climate and environmental footprint in all subsequent stages of food, feed and energy production.

Future plant production will need to deliver on many different agendas and parameters – paramount of these are climate change and the green transition – which will require multi-purpose varieties with a strong genetic potential that show solid yields under all possible conditions.

Danish plant breeding will prepare for a climate neutral future by breeding crops that:

- Show a high and stable performance under changing climatic conditions both regarding yield, quality and total biomass production
- Are more robust against biotic stresses and have a reduced need for insecticides and fungicides
- Have a high resource use efficiency of water, nutrients and CO₂ and are more tolerant to drought
- Are of a high quality for both food, feed and non-food purposes

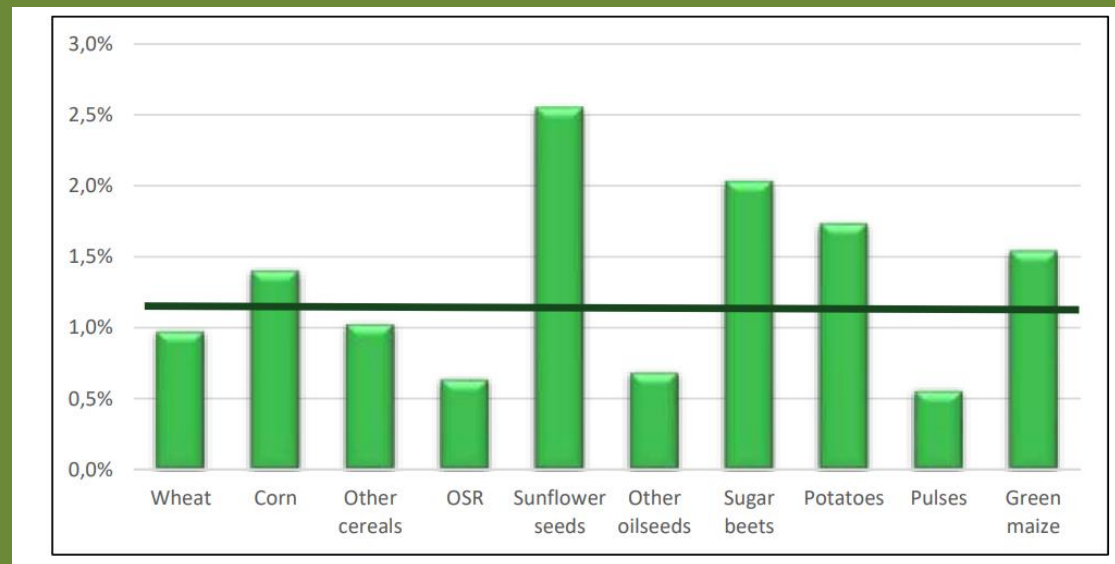


Investing in plant breeding leads to more efficient crops and lower footprint

The continuous efforts made by plant breeders to select and breed new varieties have led to a genetically-based annual yield increase around 1 % across agricultural crops. With the development and combination of new innovative selection methods, plant breeding tools and AI it will be possible not only to uphold this trend but also to accelerate the genetically-based breeding progress way beyond the 1 %.

Increasing yield and output pr. ha while at the same time providing more robust crops is key to deliver on future needs in the green transition of the plant production and food production. Plant breeding is an important climate-tool.

Therefore, CID calls for an increase in future public and private investments in plant breeding research and innovation in order to unfold the full potentials from the plant breeding sector to the green transition.



Annual yield growth rates of arable farming in the EU between 2000 and 2019

Source: HFFA Research 2021. Conclusions supported by CPVO 2022.

In the years to come CID will prioritize research and breeding efforts within the following headlines

A. Acquire more knowledge

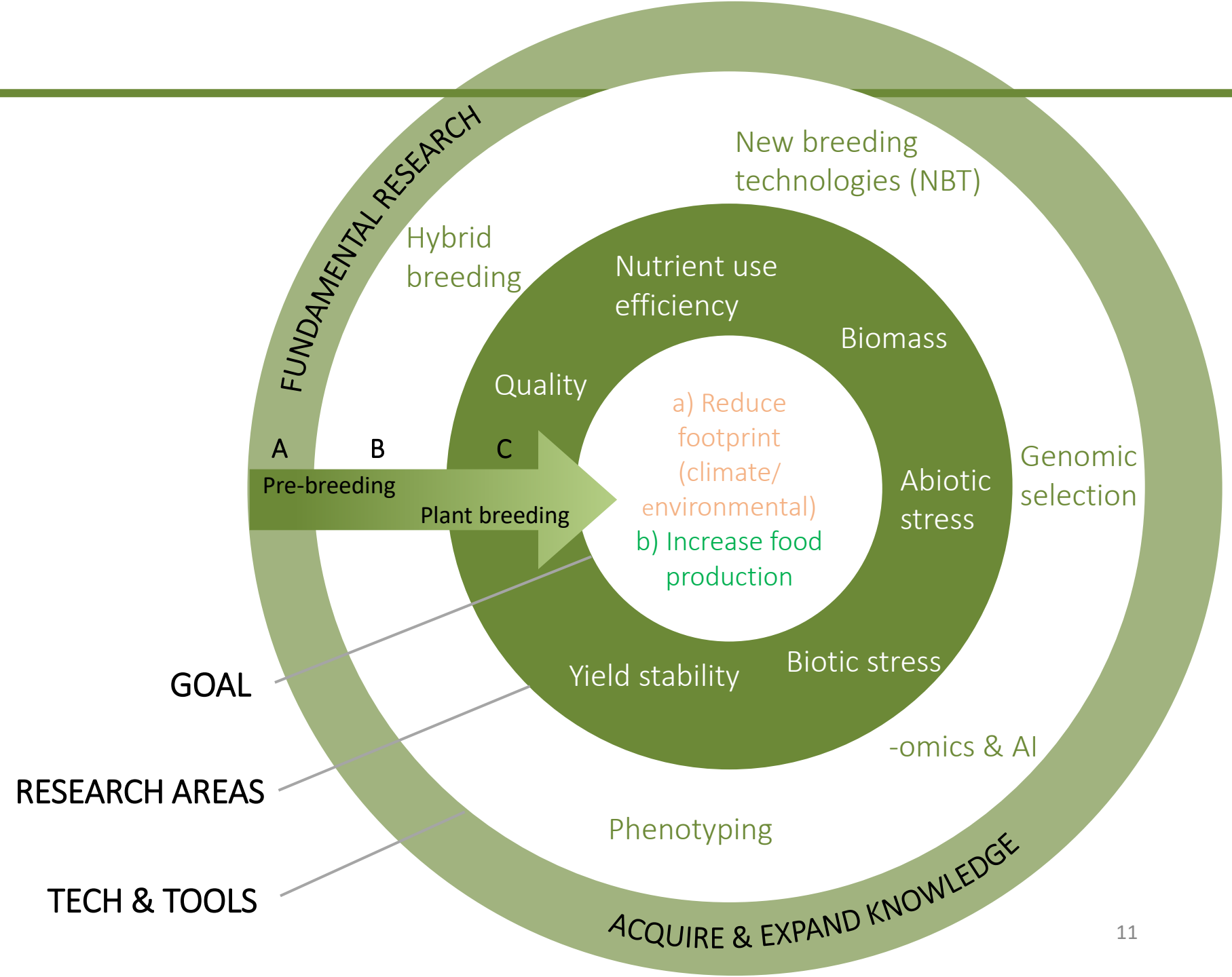
More knowledge need to be acquired to improve the understanding of the biological processes connecting the plant genome and plant phenotype. Also, more research must be put into understanding the interaction between plant genetics and the microbiome (plant biologicals) as well as the interaction with the environment (GxE). With changing climate conditions new pests and diseases will migrate to Northern Europe and so more knowledge must be gathered on these new threats.

B. Development and implementation of new tools and technologies

Technological developments are necessary to breed crops that are more efficient and robust. CID will work on an initiative to exploit innovative ways of combining new and well-established plant breeding tools and continue the work to build and implement valuable remote sensing and AI solutions. CID will exploit New Breeding Technologies that will provide a strong research platform to aid the implementation and use of the CRISPR/cas technology.

C. Prioritized agronomic traits

In the years to come CID's focus will continue to be on traits that improve crop efficiency and productivity with regards to nutrients and water and with a special interest in yield stability, high biomass production and lower emissions. Important traits are drought tolerance, insect and disease resistance, nutrient uptake efficiency and BNI (biological nitrification inhibitors), and specific quality traits such as protein content and removal of antinutritional factors in crops for human and animal consumption.



Focus

OVERALL

- Yield stability in all climate and weather conditions
- Improve disease and insect resistance
- Interactions genetics and management

GRAIN / TUBER / SEEDS

- High yield
- High quality
- Increase protein content
- Increase digestibility and remove antinutritional factors



SHOOT

- Increase biomass production
- Improve digestibility and amino acid composition
- Drought tolerance
- Increase photosynthesis

ROOT

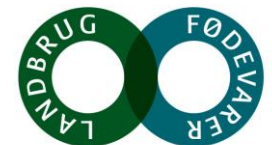
- Deeper and more efficient roots
- Water and nutrient uptake efficiency
- Microbial interactions
- Biological nitrification inhibitors
- C-sequestration
- Mycorrhiza interactions

Who is CID?

CID (Crop Innovation Denmark) is a public-private partnership. Our purpose is to strengthen the cooperation between the partners and set the strategic agenda for Danish plant breeding research.

The partners are DLF, Nordic Seed, Sejet Plant Breeding, Danespo, University of Copenhagen, Aarhus University and The Danish Agriculture and Food Council.

Find out more on the website: <https://cropinnovation.dk/>



**Danish Agriculture
& Food Council**

Board of directors

Asbjørn Børsting, director DAKOFO, *Chairman*

Henrik Brinch Pedersen, AU, *Vice chairman*

Svend Christensen, KU, *Vice chairman*

Ahmed Jahoor, Nordic Seed

Birger Eriksen, Sejet Plant breeding

Derek Bartlem, DLF

Jens Holstborg, Danespo

Kim Bonde Petersen, Nordic Seed

Klaus K. Nielsen, DLF

Lars Næsted, Danespo

Malika Buhr Pedersen, Danish Agriculture & Food Council

Jens Elbæk, SEGES Innovation

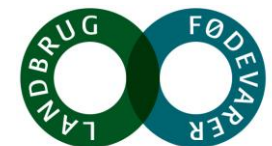
Steen Bitsch, Vestjyllands Andel (Observer)

Secretariat

Claus Saabye Erichsen

E-mail: cse@dakofo.dk

+2488 3932



Danish Agriculture
& Food Council