11th CIRCUMPOLAR AGRICULTURAL CONFERENCE

Programme

The 11th Circumpolar Agricultural Conference; Tórshavn, Faroe Islands.
September 5th - 7th 2023.

Farming in the High North – Contributions to a sustainable local Bioeconomy and secure Food Systems.

Venue: The Nordic House in the Faroe Islands; Tórshavn.

Organiser: Búnaðarstovan – Agricultural Agency of the Faroe Islands; on behalf of the Circumpolar Agricultural Association.

Financial support: The Nordic Committee of Senior Officials for Fisheries, Aquaculture, Agriculture, Food and Forestry (EK-FJLS Executive) at the Nordic Council of Ministers.

Tuesday September 5th

Plenum session.

Moderator: Joanna Djurhuus, Senior Advisor, Ministry of Foreign Affairs, Industry and Trade.

Time schedule:	Name of speaker:	Residence:	Occupation:	Title of presentation:
8:00 – 9:00			Registration	Click on the title below to proceed directly to the presentation
09.00	Tróndur Leivsson	Faroe Islands	President of the Circumpolar Agricultural Association.	Welcome to the 11th Circumpolar Agricultural Conference.
09:20	Høgni Hoydal	Faroe Islands	Deputy Prime Minister and Minister of Foreign affairs, Industry and Trade; The Government of the Faroe Islands.	Opening speech. The 11th Circumpolar Agricultural Conference.
09:40	Kristianna Winther Poulsen	Faroe Islands	Chair. of the Committee on Industry and Trade, Tórshavn City Council.	Welcome to the Municipality of Tórshavn, the Capital of The Faroe Islands.
10:00	Kenneth Høegh	Greenland	Head of Representation, The Representation of Greenland in the United States and Canada.	Can Circumpolar Agricultural Association contribute to the activities organized within the Arctic Council?
10:45			Coffee	
11:00	Åsmund Asdal	Norway	Svalbard Global Seed Vault Coordinator, NordGen	The importance of Biodiversity and genetic resources for a sustainable agriculture in the Circumpolar area.
11:45	Sigurður Eyþórsson	Iceland	Special Advisor, Department of Agriculture, Ministry of Food, Agriculture and Fisheries, Iceland.	Farming in Iceland; the approach towards a sustainable local Bioeconomy and secure Food Systems as laid down in the national Food Supply Goals aimed for 2040.
12:30 – 13:15			Lunch	
13:15	Hilde Halland	Norway	Researcher, NIBIO, Norwegian Institute of Bioeconomy Research.	Arctic agriculture and sustainable local communities.
14:00	Sölve Högman	Åland	Head of section, Department of Trade and Industry, Government of Åland Islands.	Agriculture and foodproduction on Åland Islands.
14:45			Coffee	
15.00	Jaana Sorvali	Finland	Reaserch Scientist, PhD, Natural Resources Institute, Finland.	Finnish farmers' climate change perceptions: Towards a psychological understanding of pro-environmental behavior in agriculture.

15:45	Jodie Anderson	Alaska	Director; University of Alaska, Fairbanks Institute of Agriculture, Natural Resources & Extension.	Community horticultural projects in Alaska.
17:00	Tórshavnar Kommuna - Tórshavn City Council		Tórshavn City Council invites the conference members to at light and informal reception in the Müllers Pakkhús at the old harbour. Refreshments and light snacks.	
19:00	Jóhannes Sveinbjørnsson	Ísland	Dosentur, Landbúnaðarháskóli Íslands.	Fremtidsrettet fårehold på Island; produktionssystemer, fodring, græsning, avlsarbejde og teknisk udstyr. ***Almennur fyrilestur í Norðurlandahúsinum, har ikki er neyðugt við tilmelding.***

Wednesday September 6th

Plenum session.

Moderator: Andrass Holm Arge, Head of Department, Public Land Administration and Tenancy, Búnaðarstovan – Agricultural Agency.

Time schedule:	Name of speaker:	Residence:	Occupation:	Title of presentation:
09:00	Bernt Skarstad	Norway	District Chair of the farmers union "Norsk Bonde og Småbrukerlag" in County of Nordland, North Norway.	Norwegian policy on agriculture; incentives and obstacles regarding instruments to stimulate sustainable utilization of local resources for agro-food production in rural North Norway.
09:45	Jens Ivan í Gerðinum	Faroe Islands	Agricultural Counsellor, Búnaðarstovan – Agricultural Agency, Faroe Islands.	Agricultural Food Production in the Faroe Islands and prospects for future food production.
10:30	Coffee			
10:45	Jørgen Mølmann	Norway	NIBIO Horticulture, Tromsø, Norway	Arctic light conditions and developing heliothermal growth-models based on light and temperature for optimized yields in a warmer climate in Northern Norway.
11:30	Jóhannes Sveinbjørnsson	Iceland	Associate Professor, Agricultural University of Iceland. Co-editor of the 2021 report	Food self-sufficiency and Food security in Iceland – Perspectives on Arctic and Global realities and challenges.

			"Fæðuöryggi á Íslandi (Food Security in Iceland)".	
12:15 – 13:00	Lunch			
13:00	Helen Shook	Canada	University of Saskatchewan, Diagnostician - Gardenline	Northern Horticulture: A new university course
13:45	Sigridur Dalmannsdottir	Norway	Researcher, NIBIO, Norwegian Institute of Biooconomy Research	Future prospects for agriculture in Northern-Norway in light of climate change
14:30	Coffee			
14:45	Sofie Andersson	Sweden	Project Coordinator, Nordic Agri Research, Swedish University of Agricultural Sciences.	The New Nordic Food programmes, their ripple effects since 2005 on the ever growing appreciation for local food and cuisine in the region and the future of New Nordic Food"
15:30	Hrannar Smári Hilmarsson	Iceland	Head of Hvanneyri Agronomy Research Center	Action plan for increased grain production in Iceland
16:15 – 17:00	Venue available for discussions and knowledge exchange/sharing.			
19:00	Conference dinner at the "Panorama"; Hotel Hafnia in downtown city.			

Thursday September 7th

Field excursion.

Guided bus tour around the islands to visit various farmers and related businesses; as well as to get an impression of Faroese living- and farming conditions. Guides from Búnaðarstovan and from the farmers organisations.

Time schedule:	Host:	
8:00	Departure by bus from the parking lot at the Nordic House.	
8:15	MBM; located in Hoyvík	The local dairy company (cooperative, owned by the farmers). Also, a provider of e.g., fodder, fertilizers, Machin equipment etc. Sigert Patursson, chair. of the board, and Tony Veyhe, operational manager, will give a presentation.
9:15	FØRKA; located in Hoyvík	Biogas plant owned by the aquaculture company Bakkafrost. The plant receives manure from the farmers and provides them with liquid fertilizers in return. Fróði Mortensen, operational manager, will give a presentation.
10:30	Varmakeldugarður; located in Norðagøta	Dairy farmer Janus Joensen and wife Bára will give an orientation about their brand-new production facilities.
	Eiðisskarð	View from the bus at the island of Kalsoy: Steep sites for sheep grazing (fitilendi), as well as sites for seabird hunting. View at Slættaratindur, highest peak in the archipelago.

	Eiði-Ljósá	View from the bus towards the village of Vík and the spectacular terrasses made for creating sites for vegetable and grass cultivation.
	Streymnes	View from bus. Potato fields.
11:45	Dúvugarðar; located in Saksun	Sheep farmer Jóhan Jógvansson and wife Sonja Nolsøe will give an orientation about their farm. Sheep keeping and local production, as well as Agrotourism.
13:00	Búnaðarstovan, located in Kollafjørður	Stop at the Agricultural Agency for lunch. Orientation about the institution.
14:30	Ognarhagin, located in Kvívík	Chair. of the board, Oluf Müller, will give a presentation of the management of a mountainous outfield unit for sheep grazing, with more than 50 individual landowners.
16:00	Ocean Rainforest, located in Kaldbak	Kristina Arge, sales manager, and Johan Christiansen, operational manager, will give an orientation of their seaweed production and the exciting prospects for food production as well as supplements in animal fodder.
17:30	Nordic House	End of excursion and farewell.

In addition to the presentations at the conference, Mr. Randy Lewis, Yukon, Canada [one of the founders of the Circumpolar Agricultural Association], who unfortunately was unable to attend the conference in Tórshavn, forwarded the organizers his intended presentation, which can be seen by clicking here.

Address at the 11th Circumpolar Agricultural Conference 2023.

Good morning, everybody, and a very warm welcome to all of you to this 11th Circumpolar Agricultural Conference, held here in the Nordic House in the Faroe Islands.

My name is Tróndur G. Leivsson, and I am the acting President of the Circumpolar Agricultural Association. Despite this temporary honour, my everyday occupation is being the director of Búnaðarstovan – the Agricultural Agency here in the Faroe Islands.

At the 10th Circumpolar Agricultural Conference, held in Rovaniemi in Finland back in March 2019, the board of the Circumpolar Agricultural Association decided at their business meeting that the next conference should be held in the Faroe Islands in 2022.

The preparations for the conference were on schedule when the geopolitical turmoil following the Russian invasion of Ukraine arose, which led to the postponing of the conference.

Although still hampered by this situation, the board of the Circumpolar Agricultural Association decided last winter to trust Búnaðarstovan to continue the preparatory work for the next conference despite the absence of participants from Russia and the Siberian regions.

We all sincerely hope that things will have normalized in a not too far future to allow the activity of the Circumpolar Agricultural Association back on normal track again.

I am indeed grateful for the financial support received by this conference from the Nordic Council of Ministers, and I am also much obliged to all of you who have taken the tour to the midst of the Atlantic Ocean to share your knowledge with us at this event.

The Circumpolar Agricultural Association was founded back in 1992 at a meeting in Whitehorse in Canada, and we are lucky to have two of the founding fathers among us today, namely Hans Kolbein Dahle, former Chief Veterinary Officer of Norway, and Thorsteinn Tómasson, professor emeritus of the Agricultural University of Iceland.

As many of you might know, the Circumpolar Agricultural Association is registered as an NGO, i.e., a non-governmental organization concerned with northern agricultural science, practices, and policies.

The main activity of the Circumpolar Agricultural Association for the past three decades has been the organisation of the triennial Circumpolar Agricultural Conference.

The headline for the 11th Circumpolar Agricultural Conference today is: *"Farming in the High North – Contributions to a sustainable local Bioeconomy and secure Food Systems"*, which we believe is in good accordance with the statutes of the organisation.

Climate change and the consequences that follow are on everyone's lips these days. This is not new knowledge within the agricultural community.

When I, as a young gene-hunter, stood in front of the Mendenhall Glacier on the outskirts of Juneau, Alaska, back in August 1981, the local US Forestry Service officer there showed me how much the glacier had retreated just in his time of duty.

A similar story was demonstrated at a Plantsman-conference here in Tórshavn back in 1996, where a scientist from the University of Tromsø, Norway, who specialized in Remote Data Collection by satellites, could prove to us how the growing season in Northern Scandinavia had been prolonged by 3 weeks compared to the previous climate periods.

Regardless of whom to blame for the climate change and its consequences, this issue is of professional interest to those of us who are occupied in the agro-food production sector in the High North.

Most likely, huge areas of both land and sea will be revealed as ice and snow melt in the years to come, thus providing us with large areas for future food production.

This is of particular interest to us, not least with respect to the global call for increased food production to meet the future global demands of healthy diets.

In the paper "*How to Feed the World in 2050"*, issued in 2009 by the Food and Agriculture Organization of the United Nations, which we normally refer to as the FAO, they stated that net food production for consumption must increase by 70 % by 2050. Annual cereal production must increase by nearly one third and the meat production must more than double.

The FAO paper *"Building a common vision for sustainable food and agriculture - PRINCIPLES AND APPROACHES"* from 2014 outlines very clearly the challenges and demands of the global society with respect to feeding the world's population. They even speak of an unprecedented confluence of pressures with respect to poverty, inadequate diets, land scarcity and degradation, soil depletion, water scarcity, loss of living resources and biodiversity, climate change and <u>stagnation in agricultural research</u>.

In the FAO paper *"The future of food and agriculture – Alternative pathways to 2050",* issued in 2018, they conclude that the "overarching question regarding the future of food and agriculture is whether global food and agricultural systems will be able to sustainably and satisfactorily feed humanity by 2050.

And they continue by saying that this depends on the following concerns:

- ✓ How consumer preferences related to food will evolve in the future.
- ✓ how much food will be lost or wasted along the food chains.
- ✓ the extent of pressure on agriculture from non-food demands.

- ✓ the capacity of systems to produce more while limiting GHG emissions and conserving land, water, and biodiversity.
- ✓ and last but not least, how agricultural prices will move to match supply and demand in a sustainable way.

To my mind, we here in the High North can make a significant contribution to mitigate many of the concerns expressed by the FAO.

Plant production on our available areas, be it on rangeland, meadows, vegetable or cereal fields, etc. is among the most efficient collection systems of both solar energy and CO_2.

Gracing animals, as well as husbandry animals feeding on locally grown and renewable resources, are thus functional components in a *"Short rotation coppice system on utilising catchment of solar energy and CO_2."*

Television programmes about survival in the wilderness are quite popular these days. You might have noticed from these programmes that access to animal protein and animal fat seems to be a prerequisite for long-term survival in the conditions of the wilderness in the High North.

The brand-new Nordic Nutrition Recommendations (NNR), released in June this year, which also are considered a world-leading mentor on nutritional issues, recommend a shift in food consumption towards an increased proportion of plant-based food.

Even in the High North, this might be possible to a certain extent.

The potential within plant breeding to foster suitable agro-plant material for growth and utilisation in high latitudes has without doubt much to yield us.

Technologies of various kinds - constructions, materials, equipment and machinery, infrastructure and digitisation, knowledge and services - are all bits and pieces of a puzzle which together can increase the farming activities in the High north.

The potential of greenhouses of various kinds, and of aquaponic solutions, in combination with e.g. wind and solar energy, are all components with the potential to contribute to a much wider agro-business in our region, where the plant-based commodities may evolve.

We shall of course be eagerly engaged in developing our local food production for the benefit of our own societies and thus in improving the livelihood in the High North.

The geopolitical turmoil, the pandemic, and the various calamities in recent years have all clearly demonstrated the vulnerability of our modern societies, and a certain degree of self-sufficiency in food production has become a priority goal again on the political agenda in many countries.

To increase the natural production capacity in our region, and to utilise our resources in a sustainable way, and thus contributing to feeding both ourselves and the world, we need the highest standards of knowledge, best practices, and good societal frameworks.

Therefore, we must pay attention to the worries of FAO regarding stagnation in agricultural research.

Today we also show respect for those of our fellows and colleagues who have been hit by either wildfire, drought, flooding, warfare, landslides, or other calamities, and we hope, they will experience normal conditions soon.

An important reason for us in the Faroe Islands to host this 11th Circumpolar Agricultural Conference has been the prospect of such a conference to hopefully inspire some people in the local community to take further interest and action in agro-food production in the future.

Similarly, we do hope that this conference will give our guests from abroad an opportunity to become acquainted with our islands and with the natural conditions we have for agricultural activity and food production.

Not least, we sincerely hope that this conference will act as a forum for knowledge sharing, both now and in the future, to the mutual benefit of the people in the High North.

We certainly look forward to two productive days here in The Nordic House, as well as to an interesting excursion on Thursday in cooperation with the local farmers organisations.

It is now my pleasure to hand over the microphone to our moderator today, Ms. Jóanna Djurhuus, Senior Advisor at the Ministry of Foreign Affairs, Industry and Trade, who will guide us with her firm hand through the day.

Thank you for your attention.

Good morning, ladies, and gentlemen, and welcome to the 11th Circumpolar Agricultural Conference, organized by the Agricultural Agency of the Faroe Islands on behalf of the Circumpolar Agricultural Association.

The topic of this event is *Farming in the High North – Contributions to a sustainable local Bioeconomy and secure Food Systems.*

The speakers today will share with us their views and ideas for how we can utilize our local food resources in a sustainable manner and how we can make sure local food can play an ever-greater role in food security in our region in the future.

We are located far from the great metropoles and densely populated regions of Europe, North America and beyond. But in the words of the English poet, John Donne: *No man is an island*. We are also a part of the global community and the issues, challenges and responsibilities of the global community are also our own.

In a world that is growing smaller and smaller, we are only a click away from the problems faced by communities all around the globe. Lack of proper nutrition and limited access to abundant and sustainable food resources is one of the key challenges in many parts of the world today, and one which we must all help to address, no matter where we are.

Self-sufficiency and sustainable use of local foods have long defined the peoples of the Arctic and have shaped our lives and cultures. In the most remote parts of our region, where the population density is low, it is difficult and expensive to transport goods, and the reliance on local food produce is therefore high. At the same time, the conservation and management of our food resources must be sustainable and resilient to the impacts of climate change.

The challenges of food security in our region are multifaceted and the solutions vary. We must work together towards maintaining and achieving food security not just for the northern region but for the entire population of the world.

This can partly be done by promoting sustainable agriculture as well as other sustainable food systems. We must focus on the best possible sustainable use of natural resources and we must promote awareness of the importance of local produce and local production. And, not least, we must safeguard our rights and access to the sustainable use of local resources.

But more importantly we need to change our way of thinking. We have become accustomed to unlimited access to food and maybe this has made us somewhat indifferent to the challenges of others. And it has also made us somewhat indifferent to the food we have immediate access to. Our local produce. And in our circumpolar region, we need to focus on the advantages of local produce. We can soon become too vulnerable if we base most of our consumption on imported produce.

The current government will therefore present a new agricultural policy that largely focuses on the sustainable use of agricultural land, especially the sustainable production of local agricultural products.

Our primary source of food has for centuries been the ocean. It still is. We aim to make the most of our valuable marine resources, and our seafood exports feed more than a million people every year. This is an important contribution to world food security and nutrition. At the same time, we need to keep a strong focus on resource conservation and protection of the marine environment to ensure that future generations have the same opportunity to make the best possible use of our renewable natural resources for the common good of the entire world.

In addition, we also have a global duty to ensure that the food production is organized and promoted in such a way that consumers choose to support local production and thereby reduce the environmental footprint we all leave in the world.

We are aware of the challenges we face in coming years– as a region and as a part of the global community. The world's population is growing and the demand for food is increasing.

The increased demand for food will inevitably influence the world's economy. And the demand for economic growth on one hand and the demand for sustainable use of natural resources on the other hand requires us to change our mindset and to focus on finding a suitable balance between these two.

We know that we can't continue to promote unlimited economic growth without addressing the matter of sustainability – environmental sustainability, social sustainability, and economic sustainability. Therefore, we must find the balance between environmental protection, social equity, and economic viability. It is crucial to keep this in mind when we work towards ensuring both local and global food security.

Food security is a commendable goal, but how do we achieve this? I don't have the definitive answer, but I know that we can work together to make a difference.

It takes time to change people's attitudes. I'm sure it's only a matter of time before the attitude changes take hold, but it's time that we may not have. It is extremely important that we keep this goal in mind and consciously work towards it. That is why conferences like this are so important - only with constant focus will we achieve the changes we want.

So, let us do that by continuously keeping our focus on the issue, both locally and globally, and let us all agree to be a part of the solution for future generations.

Thank you.

Landbúnaðarráðstevna 2023 í Norðurlandahúsinum
11th Circumpolar Agricultural Conference
Týsmorgunin 5. september 2023 kl. 9

Dear guests!

Dear participants, researchers, organizers.

On behalf of Torshavn City Council and Municipality, it is an honor for me to welcome such a distinguished group of researchers and professionals in our capital Tórshavn.

Some of you have travelled quite a distance to participate in this conference and to give your presentations.

I am sure that the most impressive programme for the days to come will make the long journey worthwhile.

High quality knowledge sharing is of great importance to our society – as is the subject of this conference. Contributions to a sustainabe local Bioeconomy and secure Food Systems. A crucial part of human existence, and research and increased knowledge in this area is of greatest interest.

On Thursday, you will be visiting farmers and related businesses, and hopefully the excursion will be fruitful and interesting, and a good opportunity to see more of our beautiful islands.

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From the first step you take on our islands, the stage is set for an extraordinary experience to which the first known settlers, Irish monks in the 6th century, probably would agree. But their peacful existence among sheep and birds was to be disturbed some centuries later.

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Our ancestors were Norwegian vikings who defied the ocean and sailed out in quest of land and freedom. They took the long and perilous journey heading towards the unknown north-west and reached the Faroes in the early ninth century.

On their journey our ancestors passed by the British isles, since we know from research in genetics that our foremothers were mainly Celtic while our forefathers were Norwegian.

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The Vikings established their parliament on the Tinganes peninsula in Tórshavn in the beginning of the 9th century. The farms were spread around the islands, while Tórshavn, approximately in the center, was the place where the chieftains and farmers gathered to discuss political and administrative matters.

Hence the name Tinganes – or peninsula of Parliament, and I hope that you will get the opportunity to see the beautiful old and well conserved buildings that today house our government.

Thus Tórshavn was made capital of Faroe Islands and has remained so ever since.

Tórshavn – the *Harbour* or the *Haven* of Thor – takes its name after the Norse God Thor, one of the most popular figures in Norse mythology. Thor is the god of thunder, lightning, storms, and fertility, and with a combination of cleverness and physical strength, he wields his legendary hammer that he uses to control the weather and to protect humankind.

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As you can see, our municipal logo is Thor's hand holding his hammer. So far we have been fairly well protected, and let us hope that he will grant us fairly good weather in the following days.

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For almost a thousand years after the first settlements, Faroese society was static and poor without any noteworthy development - with agriculture as the main activity. The old common saying ‘Ull er Føroya gull’ – Wool is the gold of the Faroe Islands - illustrates the importance of sheep – and for centuries, wool garment became our main goods for exports, while every bit of the sheep was used for food. Occasional whale hunting and limited coastal fishery were also precious sources of nourishment.

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The potato proved to be a gamechanger as regards the general health conditions. Only in the late 19th century, it became possible to grow potatoes for the general crowd due to a new legislation on lands in 1894.

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From the middle of the nineteenth century, the transition from an agricultural society to a fishing society started. For the last century or so, fishery and recently also salmon farming have been our main sources of income, an industrial development which in general has resulted in less focus on the importance of agriculture.

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As regards agriculture, our municipality has the country’s largest concentration of farmers. More than half of the entire milk production takes place in our municipality.

I asked a farmer about his working conditions here in the capital. He pointed out one problem: that the municipality constantly demands the territory on which he works, for various sorts of municipal activity, especially for development of building land.

It is important that we find the complicated balance between the preservation of agricultural territory and the construction of homes for our ever growing population.

We most certainly need to economize with our space which is limited, bearing in mind the size of our country. So in our future urban development we need to leave as much arable land as possible for agriculture, and we need to construct higher buildings and limit the space between the houses and buildings.

We generally need to focus more on the agricultural activities in our municipality, and in the Faroe Islands as a whole. But I am more than happy to observe that an increasing number of people, especially the younger generations, insist on the importance of sustainability and self-sufficiency in our agricultural production.

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One can say that in Tórshavn, the old and the new rub shoulders, especially in the city centre, where it is still easy to find yourself standing on stones tred by Viking chieftans a 1000 years ago.

The town has grown steadily since the turn of the 20th century into the undisputed administrative, economic and cultural center of the Faroes.

Tórshavn municipality is very much aware of the value that Nordic and international conferences have for the city, and we presently focus on developing our capital as an international conference city. And that is why, of course, we welcome all international conferences to be held here.

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The capital includes the city of Torshavn and a total of 16 settlements that are spread over 4 islands: Streymoy, Nólsoy, Hestoy and Koltur.

Today, more than 23,000 people live in the municipality.

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The capital is diverse and is modern and traditional at the same time. We have the city life in the center - and if we move a little outside the center we have sheep, cows and nature. We have islands and we have settlements. So, all in all, we have a lot to offer conference attendees and tourists in general.

As you have probably seen in the programme, our municipality hosts an informal reception at 5 o'clock today. Hope to see you there.

And huge congratulations to the organizers of the conference. The impressive programme with participants from so many countries and even continents tells me that this must have been quite an effort.

Once again, I would like to thank you for the invitation and extend a warm welcome to you all. Thank you for choosing Tórshavn as the host city for this conference.

And I hope you will help spread the word about our beautiful islands.

I wish you a good and fruitful conference in Tórshavn!

Thank you and enjoy your stay with us.

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Can Circumpolar Agricultural Association contribute to the activities organized within the Arctic Council ?

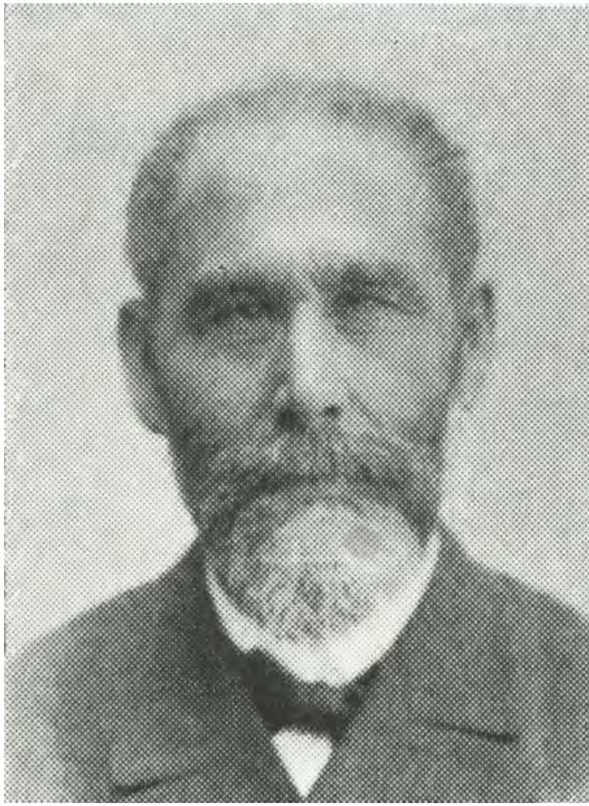
Kenneth Høegh,
Representation of Greenland, Washington DC

Early Faroese-Greenlandic agricultural cooperation

The reverend Jens Chemnitz (1853-1929)

A pioneer in Arctic Agricultural Cooperation

- Jens Chemnitz („Palasinnguakkuluk“) was born in Ikigaat (Østprøven/Herjolfsnæs) on 24/11 1853, near Nanortalik in S-Greenland
- The father was a ethnic German trader, Jens Carl Wilhelm Chemnitz from Schleswig, and the mother Maria Elisabeth Egede, a Greenlander and descendent of the Norwegian farming pioneer in Greenland, Anders Olsen & his wife Tuperna.
- Jens Chemnitz went to the Faroe Islands in 1905, on leave from the church, at the age of 52, to be trained into sheep farming,
- In 1906 he returned to Greenland, with a small flock of Faroese sheep, the first Nordic Short tailed sheep since the Norse
- Later in 1915 the Danish colonial administration imported Icelandic sheep.
- These two imports forms the foundation of the present day Greenlandic sheep.
- In 1924 the first modern farm based only on sheep farming was founded by the Greenlander Otto Frederiksen, with many others to follow.



“Important Aspects of future Agriculture and Food production in the Arctic Region. Can Circumpolar Agricultural Association contribute to the activities organized within the Arctic Council?”

The Arctic Council – at a glance

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What is the Arctic Council?

- The Arctic Council is the leading intergovernmental Arctic forum promoting cooperation, coordination and interaction among:
  - ***the Arctic States***,
  - ***Arctic Indigenous peoples and Arctic communities,***
  - ***… as well as a number of other actors in the Arctic***

  The Council deals with common Arctic issues, in particular on:
  - ***issues of sustainable development*** and
  - ***environmental protection in the Arctic***.
- The Arctic Council was formally ***established in 1996.***

- The establishment of the Arctic Council was preceded by the Arctic Environmental Protection Strategy (June 1991), a declaration on the protection of the Arctic environment.

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The Arctic Council - continued

- The Arctic Council is not a treaty based organization, but a forum for Arctic Cooperation, based on the Ottawa Declaration (1996), and the declarations agreed since then.
- All Arctic Council decisions and statements require consensus of the eight Arctic States.

Arctic Council – the eight Arctic states

- The Ottawa Declaration (1996) defines eight states as Members of the Arctic Council.
- The eight States have territories within the Arctic and thus carry the role of stewards of the region.
- Their national jurisdictions and international law govern the lands surrounding the Arctic Ocean and its waters.
- The Northern regions of the Arctic States are home to more than four million people, whose health and well-being is on the top of the Arctic Council's agenda.
- The Arctic Council is supported by a secretariat in Tromsø
- The chairmanship is biyearly, and is handed over to the next chair during the Ministerial Meeting every second year.
- The present chair is Norway, from May 11 this year.

- United States, (due to Alaska)
- Canada
- Kingdom of Denmark, incl. Greenland and Faroe Islands
- Iceland
- Norway
- Sweden
- Finland
- Russian Federation

What doesn't the Arctic Council do?

- The Arctic Council is a forum; and ***has no programming budget on its own***.
- All projects or initiatives are sponsored by one or more Arctic States.
- Some projects also receive support from other entities.
- The Arctic Council is first and foremost a ***Council*** – and does not and cannot implement or enforce its guidelines, assessments or recommendations. That responsibility belongs to individual Arctic States or international bodies.
- The Arctic Council's mandate, as articulated in the Ottawa Declaration, ***explicitly excludes military security***.

Six Permanent Participants

- The category of Permanent Participants is a unique feature of the Arctic Council.
- Six organizations representing ***Arctic Indigenous Peoples*** have status as Permanent Participants (PP's).
- This category was created to provide a ***means for active participation of the Arctic Indigenous Peoples*** within the Council.
- The Permanent Participants have full consultation rights in connection with the Council's negotiations and thereby on the final decisions, and make valuable contributions to its activities in all areas.
- Their participation in the Council's projects and initiatives is facilitated by the Indigenous People's Secretariat in Tromsø.

Six Permanent Participants

1. **AIA : Aleut International Association**
2. **AAC: Arctic Athabaskan Council**
3. **GCI: Gwich'in Council International**
4. **ICC: Inuit Circumpolar Council**
5. **RAIPON: Russian Association of Indigenous Peoples of the North**
6. **Saami Council (Samerådet)**

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The Arctic Council Secretariat (ACS)

- The Arctic Council Secretariat is an administrative office that works under the direction of the ***Senior Arctic Officials*** and the ***Arctic Council Chairmanship***.
- The Secretariat is situated in Tromsø.
- The ACS is mainly funded by the host country (40-50%), being Norway, with rest of the funding from the remaining member states.

The 6 Working Groups of the Arctic Council

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Each Working Group has a:

- Mandate,
- Chair,
- Management Board or Steering Committee, and a
- Secretariat which provides support

- **Working Group Management Boards are typically comprised of:**
  - representatives of national governmental agencies of the Arctic Council Member States, connected to the mandates of the Working Groups
  - representatives of the Permanent Participants
  - Observer States and Observer Organizations are likely to attend Working Group meetings and participate in specific projects.

The six Working Groups (1)

ACAP : Arctic Containiments Action Program

- Prevention and reduction of pollution and environmental risks in the Arctic.
- ACAP carries out demonstration projects to raise awareness and show possibilities to cut pollution in the Arctic and clean up.
- Focus on PCB, Mercury, Micro-Plastic, Pesticides, Black Carbon etc.

AMAP : Arctic Monitoring & Assessment Program

- Documenting trends and effects of pollutants, sources and pathways of pollutants
- Documenting trends in key climate indicators and their environmental implications
- Examining the impact of pollution and climate change on Arctic ecosystems and people, including health of Arctic Indigenous peoples and other residents
- Reporting on the state of the Arctic Environment with respect to climate and pollution issues
- Giving advice to Ministers on priority actions needed to improve Arctic conditions

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The six Working Groups (2)

CAFF : Conservation of Arctic Flora & Fauna

- CAFF's mandate is to address the conservation of Arctic biodiversity, collect data, and to communicate its findings to the governments and residents of the Arctic.
- CAFF’s projects provide data for informed decision making to resolve challenges arising from trying to conserve the natural environment and permit regional growth.
- To successfully conserve the natural environment and allow for economic development, comprehensive baseline data is require, including the status and trends of Arctic biodiversity, habitats and ecosystem health.
- CAFF develops frameworks and tools necessary to create a baseline of current knowledge.

The six Working Groups (3)

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EPPR : Emergency Prevention, Prepearness and Response

- Developing guidance and risk assessment methodologies
- Exchanging information and best practices regarding prevention, preparedness and response to accidents and threats from unintentional releases of pollutants and radionuclides, and to natural disasters
- Coordinating response exercises and training
- Maintaining the operational guidelines for two of the legally binding agreements negotiated under the auspices of the Arctic Council, agreements on Search and Rescue (SAR) and Cooperation on Marine Oil Pollution Preparedness and Response (MOSPA).

PAME : Protection of the Arctic Marine Environment

PAME works with marine policy in response to environmental change from both land and sea-based activities, with projects within the following themes:

- Arctic Shipping
- Marine Protected Areas
- Resource Exploration and Development
- Ecosystem Approach to Management
- Arctic Marine Pollution

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The six Working Groups (4)

SDWG : Sustainable Development Working Group

- **Economic assessments:** Strengthen analysis and joint monitoring of economic trends and activities in the Arctic, including enhancing sustainable and diverse economic development, investments and policies.
- **Science and research for sustainable development:** *Facilitate good use of the Arctic region's research institutions and extensive intellectual resources to benefit sustainable development, including through academic exchanges and joint Arctic research.*
- **Sustainable business involvement and development:** *Explore economic development, including in new and emerging sectors, and evaluate its potential benefits, including job creation and promotion of local culture and products.*
- **Educational opportunities**
- **Heritage and culture of Arctic communities**
- **Human health**
- **Infrastructure**
- **Reduction/elimination of inequalities**
- **Sustainable energy**
- **Transportation links**
- **Water and sanitation services**

Sustainable Development Working Group

Arctic Economic Council - *AEC*

- The AEC history is closely connected – yet independent from – the Arctic Council.
- Formed in 2014 by an initiative by the Canadian Chairmanship (2013-15),
- Create business opportunities, trade, and investment in a fair, inclusive and environmentally sound manner
- Develop commercial ties between the Arctic and the global economy
- Thirty five member companies, from the eight Arctic states
- Financed by the member companies
- Activities organized in ad-hoc working groups
- Works closely together with the AC-WG's, also on food production.
- Recent report ***"State of the Arctic Food",*** with many agricultural references
- Chairmanships follows the chairs in the Council, i.e. presently a Norwegian chairmanship
- A secretariat is placed in Tromsø.

AEC
ARCTIC ECONOMIC COUNCIL

Observers to the Arctic Council

- Observer status in the Arctic Council is open to ***non-Arctic states***, along with
  - inter-governmental,
  - inter-parliamentary, and
  - global, regional and non-governmental organizations.
  - Arctic Council Observers primarily contribute through their engagement at the level of ***Working Groups***.

Observers to the Arctic Council

- Decisions at all levels in the Arctic Council are ***the exclusive right and responsibility of the eight Arctic States***, with the involvement of the Permanent Participants.
- ***Observers shall be invited*** to the meetings of the Arctic Council once observer status has been granted.
- While the primary role of observers is to ***observe the work*** of the Arctic Council, observers should continue to make relevant contributions through their engagement in the Arctic Council primarily, at the level of the ***Working Groups***.

Observers
Non-Arctic States

Non-Arctic States (13)

- France Barrow Ministerial meeting, 2000
- Germany Iqaluit Ministerial meeting, 1998
- Italian Republic Kiruna Ministerial meeting, 2013
- Japan Kiruna Ministerial meeting, 2013
- The Netherlands Iqaluit Ministerial meeting, 1998
- People's Republic of China Kiruna Ministerial meeting, 2013
- Poland Iqaluit Ministerial meeting, 1998
- Republic of India Kiruna Ministerial meeting, 2013
- Republic of Korea Kiruna Ministerial meeting, 2013
- Republic of Singapore Kiruna Ministerial meeting, 2013
- Spain Salekhard Ministerial meeting, 2006
- Switzerland Fairbanks Ministerial meeting, 2017
- United Kingdom Iqaluit Ministerial meeting, 1998

Observers: Intergovernmental and interparliamentary organizations (13)

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- International Council for the Exploration of the Sea (ICES) Fairbanks Minist. meeting, 2017
- International Federation of Red Cross & Red Crescent Societies (IFRC) Barrow Ministerial meeting, 2000
- International Maritime Organization (IMO) Rovaniemi Ministerial meeting, 2019
- International Union for the Conservation of Nature (IUCN) Barrow Ministerial meeting, 2000
- Nordic Council of Ministers (NCM) Barrow Ministerial meeting, 2000
- Nordic Environment Finance Corporation (NEFCO) Reykjavik Ministerial meeting, 2004
- North Atlantic Marine Mammal Commission (NAMMCO) Barrow Ministerial meeting, 2000
- OSPAR Commission Fairbanks Ministerial, 2017
- Standing Committee of the Parliamentarians of the Arctic Region (SCPAR) Iqaluit Ministerial meeting, 1998
- United Nations Development Programme (UNDP) Inari Ministerial meeting 2002
- United Nations Environment Programme (UNEP) Iqaluit Ministerial meeting, 1998
- World Meteorological Organization (WMO) Fairbanks Ministerial meeting, 2017
- West Nordic Council (WNC) Fairbanks Ministerial meeting, 2017

Observers:
Non-governmental organizations (12)

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- Advisory Committee on Protection of the Sea (ACOPS) Barrow Ministerial meeting, 2000
- Arctic Institute of North America (AINA) Reykjavik Ministerial meeting, 2004
- Association of World Reindeer Herders (AWRH) Barrow Ministerial meeting, 2000
- Circumpolar Conservation Union (CCU) Barrow Ministerial meeting, 2000
- International Arctic Science Committee (IASC) Iqaluit Ministerial meeting, 1998
- International Arctic Social Sciences Association (IASSA) Barrow Ministerial meeting, 2000
- International Union for Circumpolar Health (IUCH) Iqaluit Ministerial meeting, 1998
- International Work Group for Indigenous Affairs (IWGIA) Inari Minist. meeting, 2002
- Northern Forum (NF) Iqaluit Ministerial meeting, 1998
- Oceana Fairbanks Ministerial meeting, 2017
- University of the Arctic (UArctic) Inari Ministerial meeting, 2002
- World Wide Fund for Nature, Arctic Programme (WWF) Iqaluit Ministerial meeting, 1998

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Observers

- ***Observers may propose projects*** through an Arctic State or a Permanent Participant.
- Financial contributions from observers to any given project may not exceed the financing from Arctic States, unless otherwise decided by the SAOs.
- In meetings of the Council's subsidiary bodies to which observers have been invited to participate, observers may, at the discretion of the Chair:
  - ***make statements*** after Arctic states and Permanent Participants,
  - ***present written statements***,
  - ***submit relevant documents*** and
  - ***provide views*** on the issues under discussion.
- Observers may also submit written statements at Ministerial meetings.
- All in all, ***observer status provides influence in the Arctic cooperation.***

Who can become an observer?

As set out in the Declaration on the Establishment of the Arctic Council and governed by the Arctic Council Rules of Procedure, observer status in the Arctic Council is open to:

- non-Arctic States;
- inter-governmental and inter-parliamentary organizations, global and regional; and
- non-governmental organizations

But whether an organizations or any bodies can contribute to the work of the Council is determined by the Council.

Suitability of an applicant for observer status

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In the determination by the Council of the general suitability of an applicant for observer status the Council will take into account the extent to which observers:

- Accept and support the objectives of the Arctic Council, as defined in the Ottawa declaration.
- Recognize Arctic States' sovereignty, sovereign rights and jurisdiction in the Arctic.
- Recognize that an extensive legal framework applies to the Arctic Ocean including, notably, the Law of the Sea, and that this framework provides a solid foundation for responsible management of this ocean.

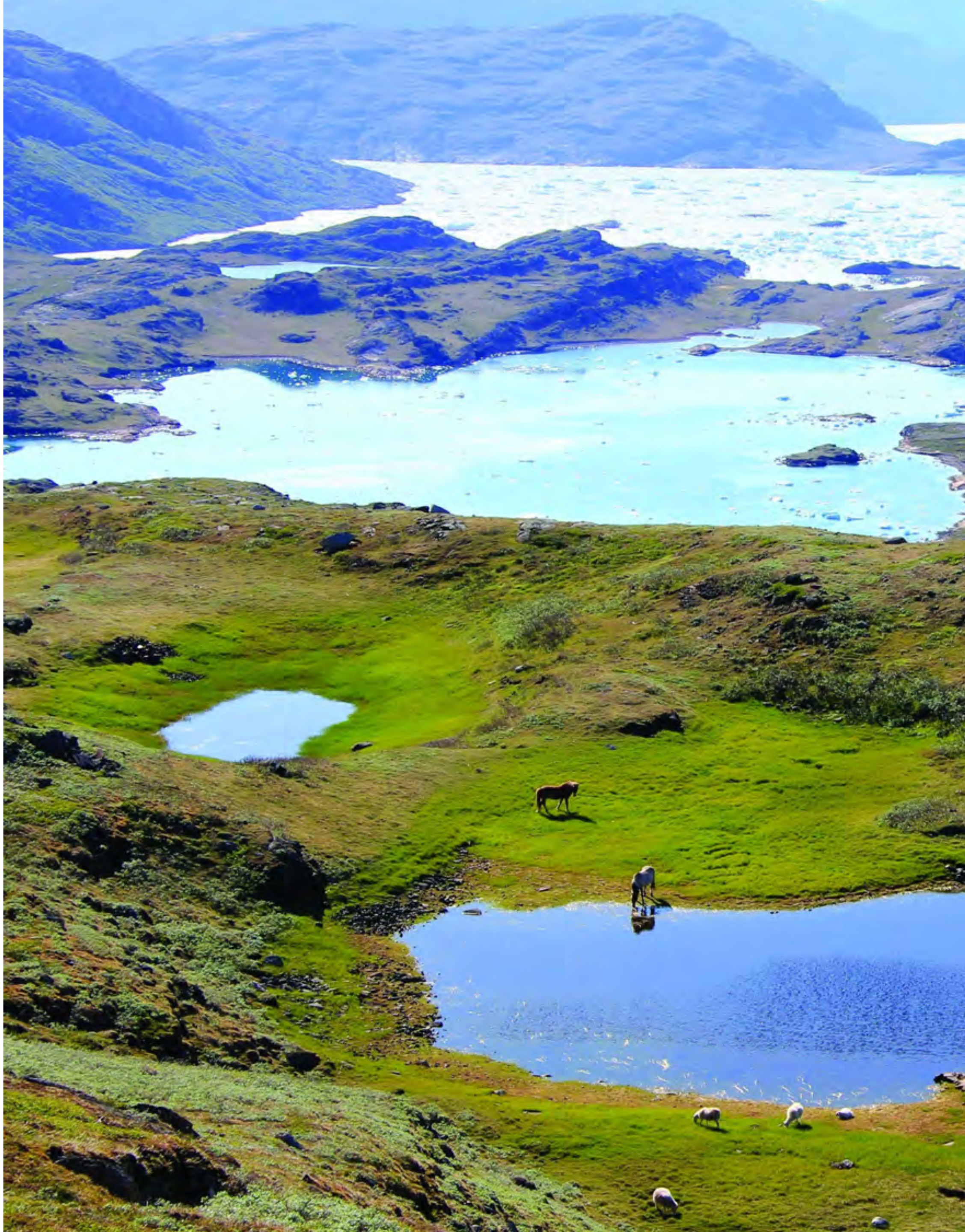
Suitability of an applicant, continued

- Respect the values, interests, culture and traditions of Arctic Indigenous Peoples and other Arctic inhabitants.
- Have demonstrated a ***political willingness***, as well as ***financial ability*** to contribute to the work of the Permanent Participants and other Arctic Indigenous peoples.
- Have demonstrated their ***Arctic interests and expertise*** relevant to the work of the Arctic Council.
- Have demonstrated a ***concrete interest and ability*** to support the work of the Arctic Council, including through partnerships with member states and Permanent Participants bringing Arctic concerns to global decision making bodies.

Conclusion - recommendations

- Food Security and Agriculture is seems as a priority among the Arctic States, so there is a relevance for CAA in the Arctic family.
- The WG's are conducting projects directly related to the activities of CAA
- CAA in the work of the Arctic Council will create opportunities for participation and influence, especially within the WG's

- Especially the WG's are the venues for the observers.
- The observers recieve much information in the WG's
- And the observers can influence the work of the WG's.
- The observers must submit yearly reports on the work.



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Conclusion and process

Conclusion:

- ***An Observer Status in the Arctic Council is probably the right solution*** for CAA, especially when influencing the work of the WG's.

- ***Observer status will provide influence and strengthen the work of CAA***

Process:

- ***Reach out*** to the ***Arctic Council Secretariat***.

- ***Seek friends and advise*** in the Arctic family, both among States and PP's

- Seek contact with the ***WG's***, especially the ***SDWG*** could be relevant,

- Seek contact with the ***Arctic Economic Council,*** being a relevant partner

- but the process can be lengthily.. and ***Patience and Perseverance*** is needed in the application process.

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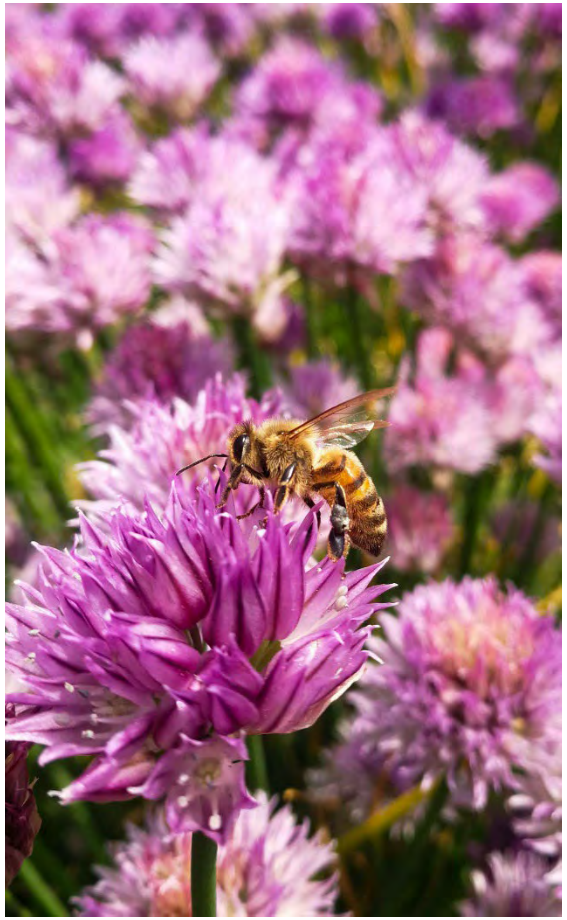
Practicalities:
How to become an observer?

- **to apply for observer status:**

1. Read, in full, the following two documents:
   The Arctic Council Rules of Procedure, with attention to items 36, 37 and 38, as well as to Annex 2, which contains sections on "Accreditation and Review of Observers" and "Criteria for Admitting Observers".
   The Arctic Council Observer Manual for Subsidiary Bodies, with attention to items 4.3, 6 and 7.1.
2. Email the Arctic Council Secretariat requesting the ***Observer Application form.***

Qujanaq – Thank you

The importance of Biodiversity and Genetic Resources for a Sustainable Agriculture in the Circumpolar area



NordGen

NordGen is a Nordic institute for the conservation and sustainable use of genetic resources or plants, farm animals and forest trees

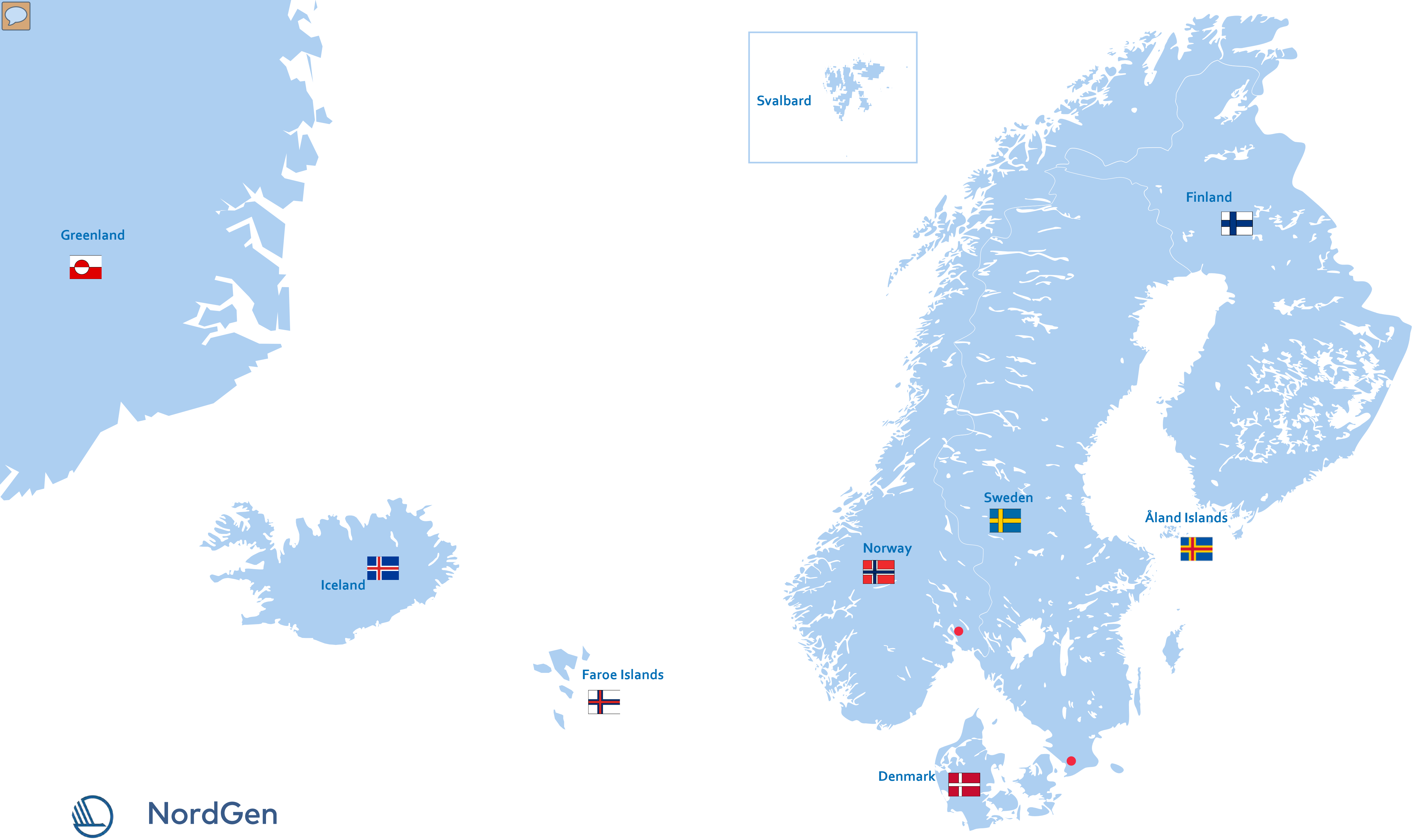
NordGen´s basic goal is to secure genetic diversity for agriculture, horticulture and forestry in the Nordic countries and facilitate the use of these resources.

NordGen

Our Mission

"To safeguard the Nordic genetic resources and facilitate their sustainable use. To provide knowledge and genetic material for biobased solutions in the Nordic region's changing climate"

NordGen


Svalbard
Greenland
Finland
Sweden
Åland Islands
Norway
Iceland
Faroe Islands
Denmark

NordGen

What are Genetic Resources?

NordGen

Genetic Diversity

The greater the genetic diversity within a species, the greater that species' chances of long-term survival

NordGen

A few global facts:

- There are approximately 30,000 edible plants in the world. Todays' food supplies depend on 150 of these only
- 60% of our calorie needs come from 4 crops. (maize, wheat, rice, soybean)
- 80% of the corn varieties that existed in Mexico in the 1930s have disappeared.
- 17% of the animal breeds we raise for food are endangered. Between 2000 and 2014, 100 breeds disappeared.

NordGen

It is all about biodiversitet and sustainability for our globe

— Biodiversity, or the variety of all living things on our planet, has been declining at an alarming rate in recent years, mainly due to human activities, such as land use changes, pollution and climate change

— An update from Svalbard

- From Arctic desert to a mild, wet climate where glaciers, sea ice and permafrost etc. plays a smaller role
- Average temperature increase 4^{0}C over the past 50 years
- Already significant problems for fauna and infrastructure

NordGen

Biodiversity is also business

World Economic Forum has estimated that companies that are moderate to very dependent of the resources of nature has a value of 44.000 B$ or half of the worlds GDP.

As of today, yearly investments into biodiversity is estimated to 6,6-13, B$

The need to restore biodiversity is estimated to 722-967 B$ a year


4 | BÆREDYGTIG

WEF: Natur-krise bringer halvdelen af verdens bnp i fare

Kurven for vores udnyttelse af naturressourcerne skal ifølge World Economic Forum vendes inden 2030, hvis vi skal gøre os forhåbninger om at drive virksomhed i fremtiden, bevare vores modstandsdygtighed og kunne vågne op til en kop kaffe

Af Julie Ring-Hansen Holt

afhængige af naturen og økosystemer

NordGen

Climate change impacts

According to the UN climate panel, climate change will lead to:

- poorer access to food and water
- poorer physical and mental health
- economic inequality
- conflicts, humanitarian disasters and refugees
- loss of natural diversity and extinction of species
- damage to nature, infrastructure and buildings

All in all, we have a very short time to ensure a viable and sustainable future for all.

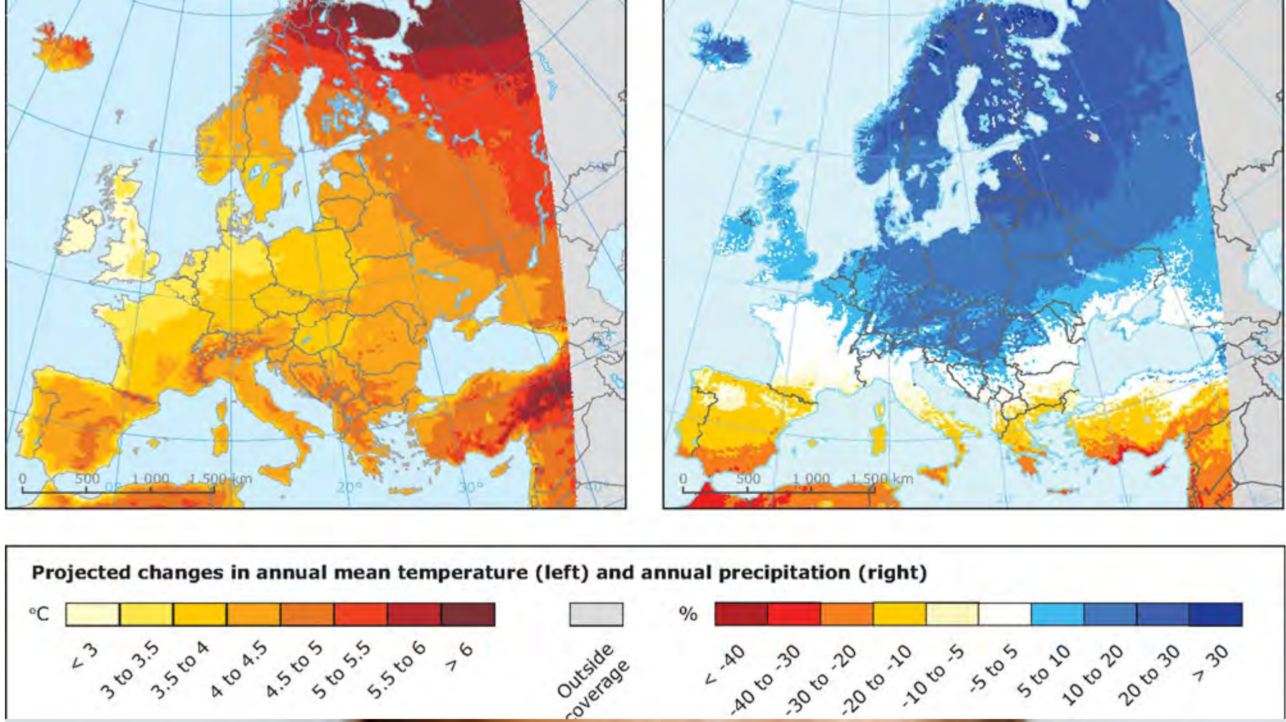
Climate change is a threat to human well-being and to nature, on which we depend for survival.

Impacts on agriculture

— Climate change demands robust farm animals, forests and crops that can handle new pests, diseases and extreme weather events

— The biological and genetic diversity is disappearing at an increasing rate

— New demands from the consumers
  - Vegetarians and vegans
  - Locally grown
  - Nutritional and dietary demands



NordGen

How to ensure resilience in the food production under climate change?

Strong need for new resilient plant varieties that are adapted to the new climate conditions - varieties which can produce high quality food for a growing human population

- Challenges:
  - Development of new varieties takes a long time (8-25 years)
  - Development of new varieties is expensive and requires substantial advance investments (small Nordic market)
  - The future climate is not fully known and cannot be completely imitated today – the plant breeding goal is therefore unclear
  - Limited variation in today´s cultivated varieties – need to use genetic resources from gene banks and *in situ* conservation

Workshop: "Nordic Agriculture and Climate Change: Mitigation and Adaptation" (Oslo 18 January 2019)

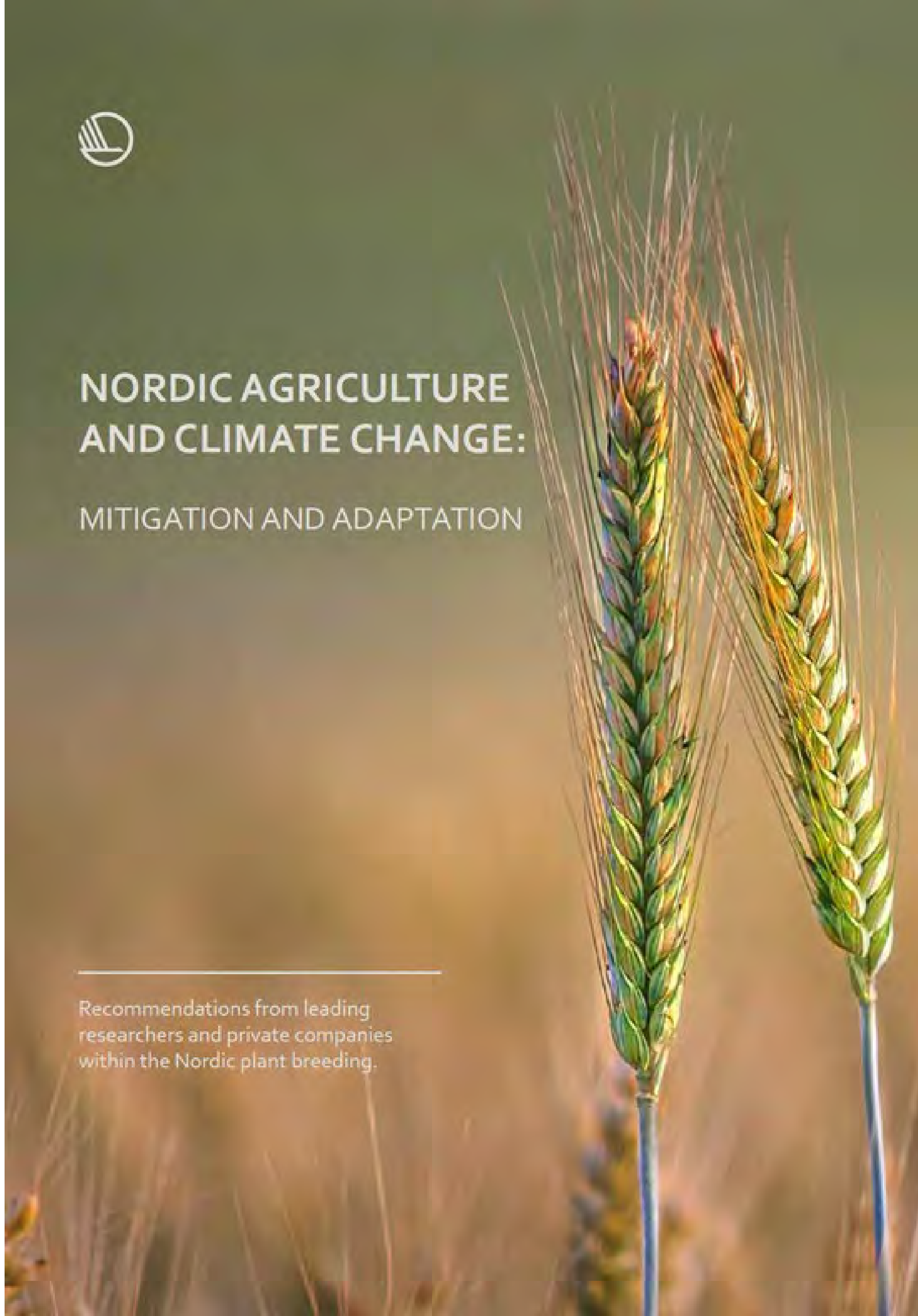
Aim: How can research facilitate climate change adaptation and mitigation in agriculture?

Focus: plant breeding, food/feed production and Nordic added value.

Participants: high-level decisionmakers and key stakeholders from Nordic plant breeding companies, farmer organisations, universities and other research organizations.

NordGen

NordForsk



Knowledge gaps: Climate change adaptation

- **Drought and flooding**
  - Lack of knowledge and experience in the Nordic region
  - Plant physiology, genetics, variation in genetic resources
- **Pests and diseases**
  - Influx of pests and diseases is expected
  - Modelling of distribution patterns, pathology, variation in genetic resources
- **Winterhardiness**
  - A different type of winterhardiness is needed under climate change!

Knowledge gaps: Climate change mitigation

- Cover crops
- Perennial crops
- Root systems
- No-till agriculture
- CO2 capture in plants

NordGen

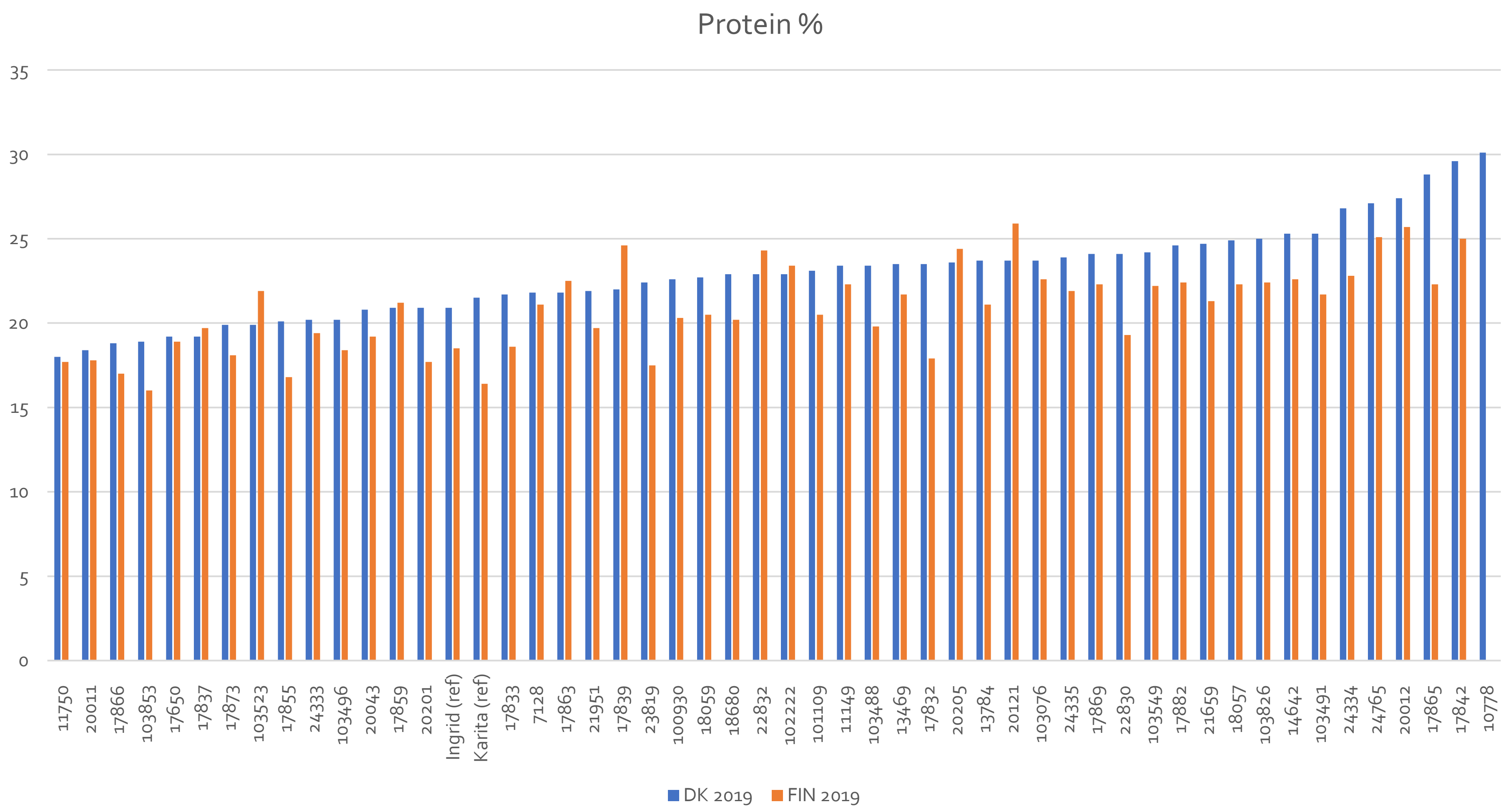
Plant genetic resources provide solutions for climate change adaption and mitigation

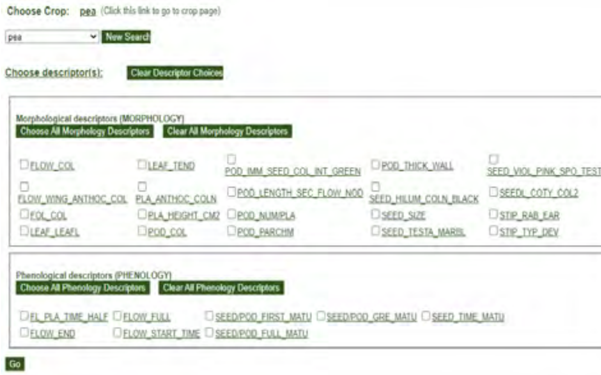
Arctic pea

- Project on an alternative protein source in the Arctic region
- Cooperation with breeders and scientists
- Field trials in northern Norway, northern Sweden, Finland and Denmark
- Peas can grow and mature in the arctic when the right genetic resource is choosen

NordGen

Arctic pea





NordGen

Einkorn and emmer

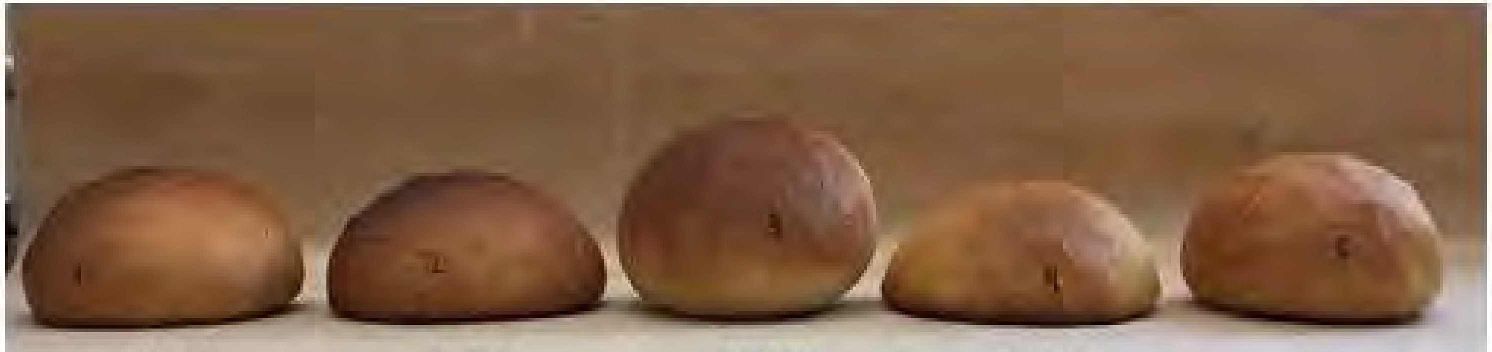
Agronomical- and quality properties

- Earliness
- Straw strength
- Plant height
- Disease resistance
- Thousand grain weight
- Milling properties
- Gluten content

NordGen

Baking parameters

(A)



	NGB 4499	NGB 9694	NGB 10910	NGB 4498	vetemjöl
Brödvolym (ml/100g mjöl)	694	741	1043	619	667
	emmer	emmer	einkorn	einkorn	breadwheat

Sometimes old varieties can outperfom the newest cultivars.

NordGen

Crop Wild Relatives (CWR) are wild species that are closely related to cultivated crops




NordGen

Nordic Crop Wild Relatives

- Important for new traits like:
  - Resistance to pests and diseases.
  - Environmental stress, cold, waterlogging, drought, salt, etc.
  - Adaptation to seasonal differences in day-length in the Nordic region.

- The Nordic flora is rich in CWRs
  - Wild turnip (a wild relative of the oil crop turnip rape and pak-choi).
  - Sea beet (relative of sugar beets and fodder beets).
  - Wild lettuce (relative of common lettuce).
  - Wild timothy (relative of the forage grass timothy)

NordGen

Animal breeds have potentials for the circumpolar agriculture

— Many of the landraces of farm animals are in danger of going extinct in the circumpolar area - use them before they are lost

— These animals are well adapted to the environment, less labour demanding, provides special products and have a role in eco-system preservation

— They could bring more resilience into the farm animal and environmental sector

NordGen

Forests

- Genetic diversity is required for forests to adapt to future climate change. Long term strategies are important.

- Climate change requires maintenance of both species' diversity, and genetically diversity within species

- Genetic diversity is also the basis for selection to adopt to new invasive biotic risks/pests

- Tree species variation – what do we know about future requirement for the industry

Lise Lykke Steffensen
Executive Director NordGen
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+46 738 171 215

Nordic Genetic Resource Centre
www.nordgen.org

@nordgen
@nordgen
@nordgen
NordGen

NordGen

Farming in Iceland; the approach towards a sustainable local Bioeconomy and secure Food Systems as laid down in the national Food Supply Goals aimed for 2040.

Sigurdur Eythorsson,
Ministry of Food, Agriculture and Fisheries

11th
CIRCUMPOLAR
AGRICULTURAL
CONFERENCE

- About me
- Iceland and its agriculture
- Food and agricultural policies
- Towards 2040

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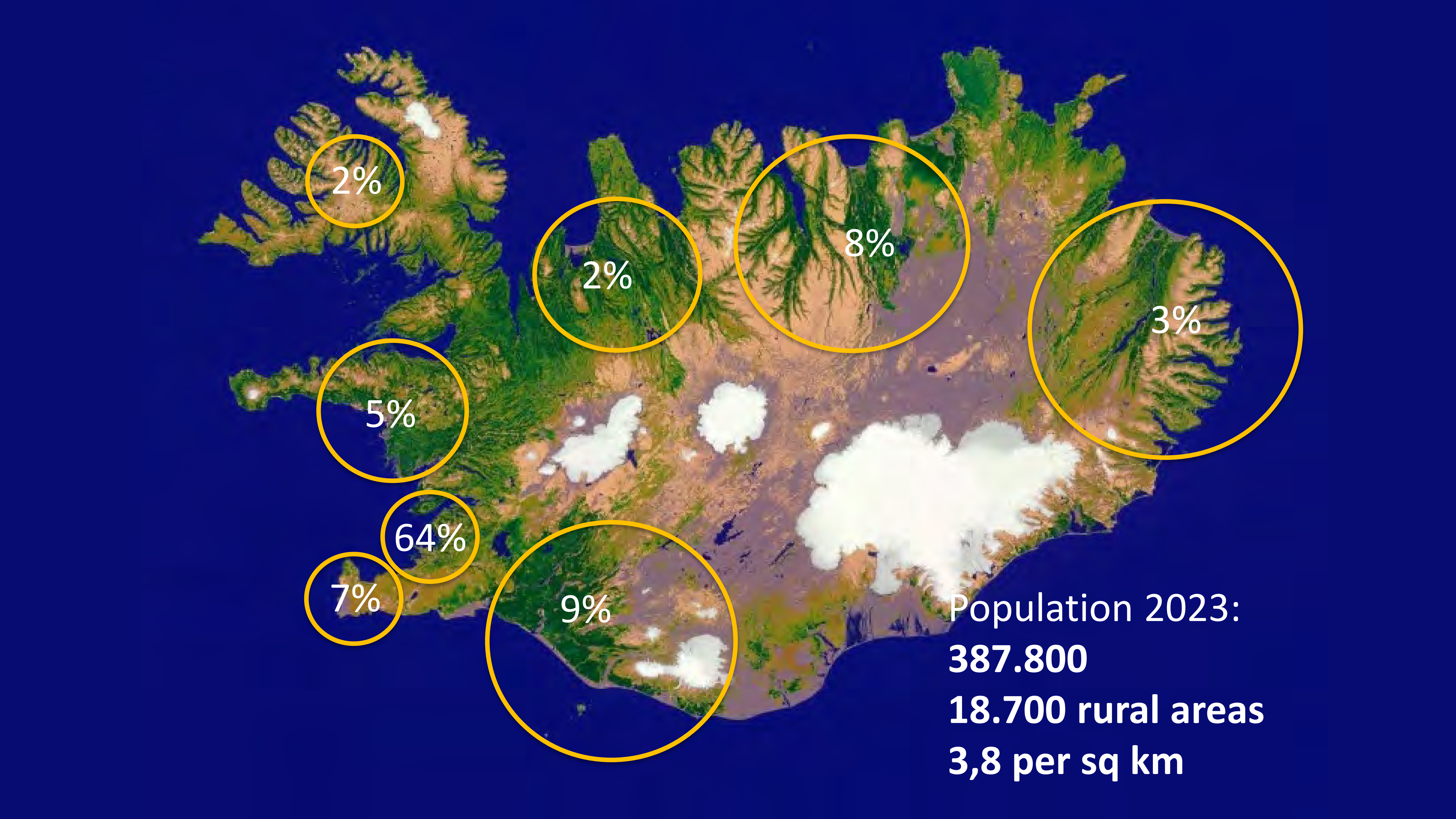

2%
2%
8%
3%
5%
64%
7%
9%
Population 2023:
387.800
18.700 rural areas
3,8 per sq km

Area: 103 000 km^2

Climate:

July °C: 5 / 10,5 / 17

F: (41 / 50 / 63)

Jan °C: -9,5 / 1,5 / 9,5

F: (16 / 34 / 48)

Bilder: E. Blöndal


Photo: Mats Wibe Lund

Rich in natural resources

- Abundance of fresh water
- Large areas of potential agricultural land
- Access to geothermal and hydropower energy

Healthy animals

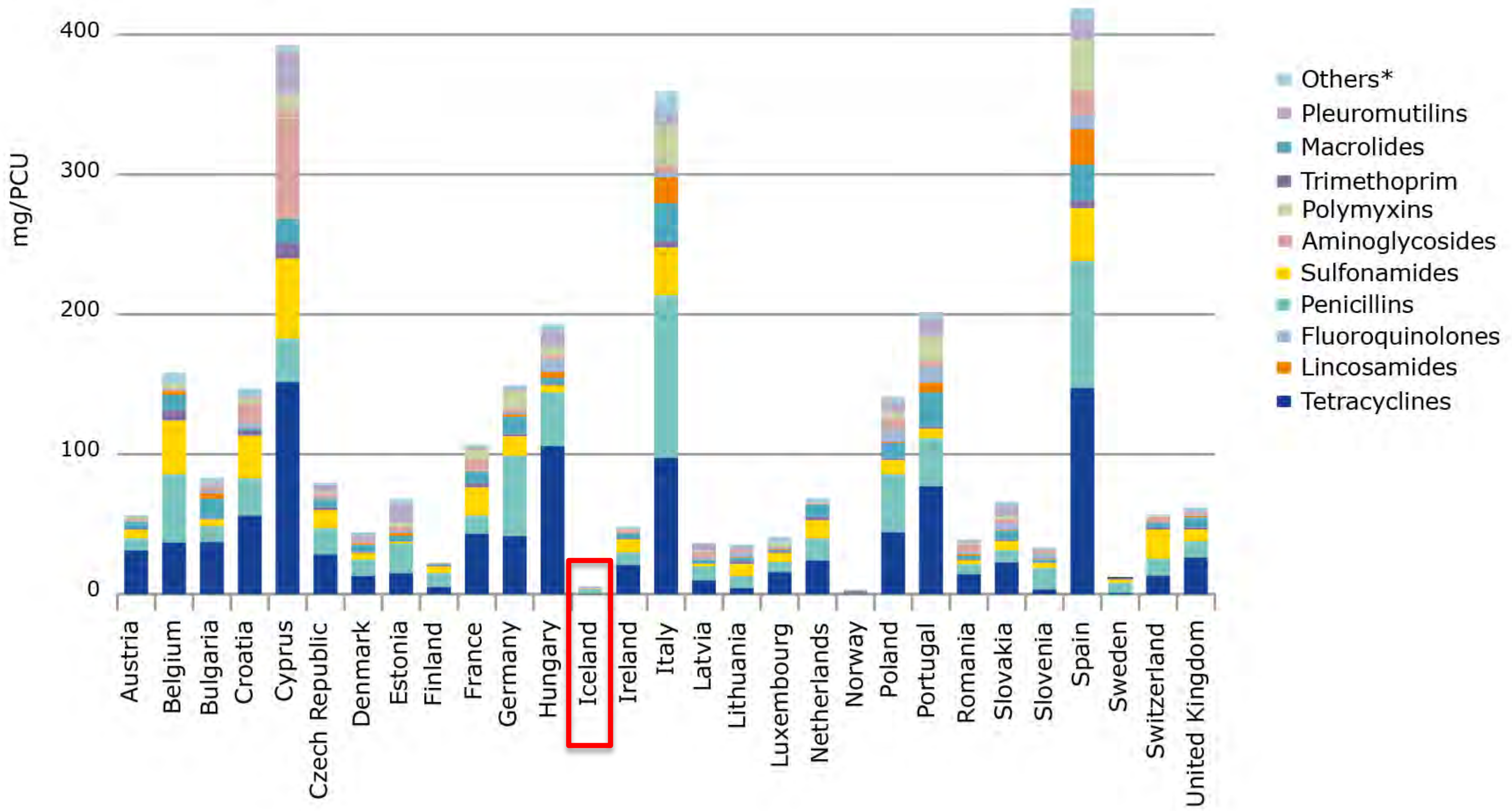
- Icelandic animals are free of many severe diseases which are found in neighbor countries

- Experience underlines that they can be severely affected by imported diseases

Healthy animals are a cornerstone for producing healthy food

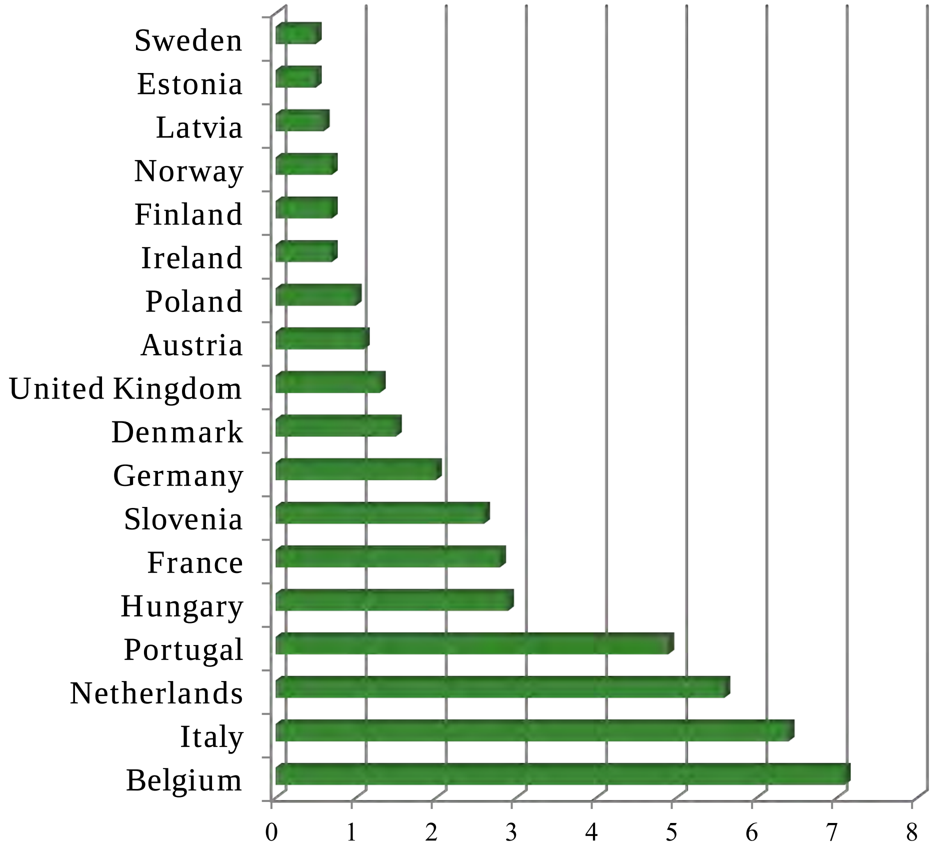
Screening results	Iceland	Germany	UK	Spain
Total diseases screened for:	121	121	121	121
Clinical	1	21	27	33
Never occurred	105	43	42	26
No information available	0	7	1	15

Limited use of antibiotics



Limited use of pesticides

- Iceland, Greenland, Northern Scandinavia, Faroe Islands are close to zero.

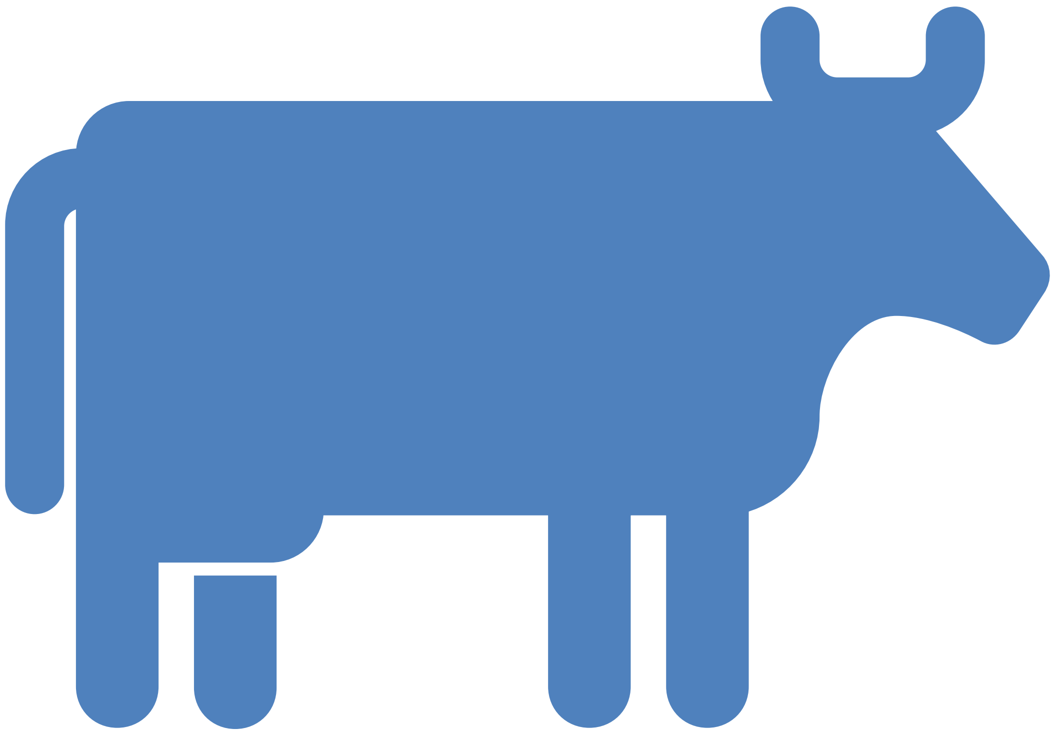


Pesticides in agriculture kg / ha

Sectors

- Sheep
- Cattle
- Horticulture
- Horses
- Pig and poultry

- Tourism
- Forestry




Íslenskir kúalitir
The Iceland Breed of Cattle
BÆNDASAMTÖK ÍSLANDS
THE FARMERS ASSOCIATION OF ICELAND


Íslenskt sauðfé
The Iceland Breed of Sheep
BÆNDASAMTÖK ÍSLANDS
THE FARMERS ASSOCIATION OF ICELAND


Íslenska geitin
The Iceland Breed of Goats
BÆNDASAMTÖK ÍSLANDS
THE FARMERS ASSOCIATION OF ICELAND

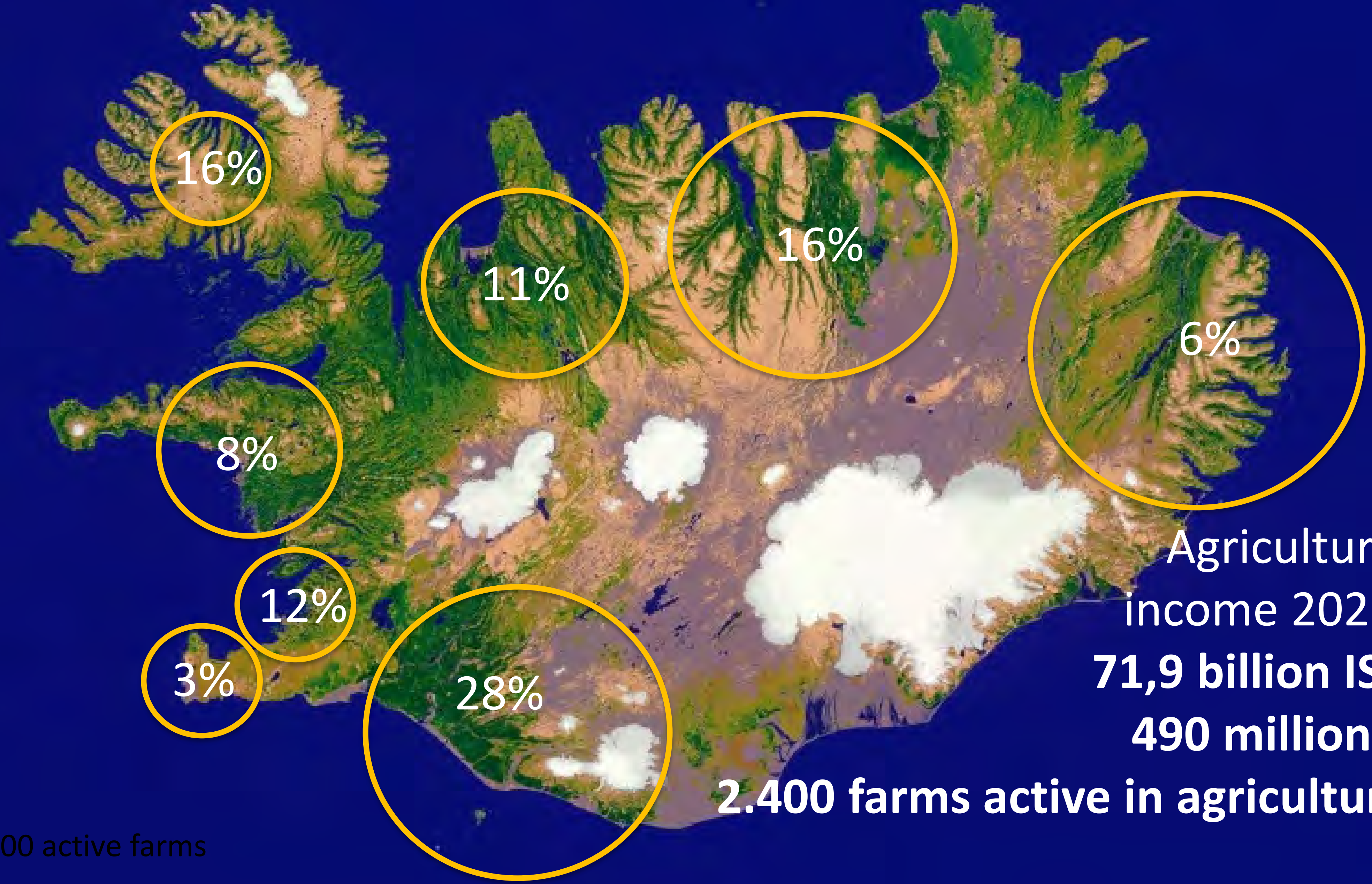

Íslensk hross
The Iceland Breed of Horses
BÆNDASAMTÖK ÍSLANDS
THE FARMERS ASSOCIATION OF ICELAND

Diversity

- Farm tourism
- Forestry and carbon
- Angling
- Small hydroelectric power stations
- Land reclamation projects
- Farm food direct
- Organic production

Production

- Horticultural produce: 13.300 tons (43%)
  - Geothermal greenhouses and outside
- Milk: 152.400 tons (>98%)
- Meat: 30.940 tons (80% excl. lamb)
- Live horses for export
- 2,1 million cubic metres of hay
- Grains: 9.400 tons



Agricultural
income 2021:
71,9 billion ISK
490 million €
2.400 farms active in agriculture

2.400 active farms

Photo: G. M. Jónasson


Photo: G. M. Jónasson

2

Huglægt mat, ágiskanir og skortur á rannsóknum

12

Íslensk repjuolía til matargerðar er komin á markað

34

Bærinn okkar Meðalfell

Bændablaðið

18. tölublað 2012 ● Fimmtudagur 20. september ● Blað nr. 379 ● 18. árg. ● Upplag 25.000

Fé rekið niður frá Rönd neðan Gæsafjalla í átt að Hraunsrétt.

Mynd / Gísli Haraldsson

Vikulangt neyðarástand að baki á Norðurlandi

– Bændur reyna að ná áttum og meta afleiðingarnar af óveðrinu

–Sjá nánari umfjöllun af harðindunum á Norðurlandi á bls. 4, 8, 20, 21 og 23

Kartöfluuppskeran verður rétt undir meðallagi

MAST biður bændur að bíða með að slátra lífgimbrum:

Liðkað verður fyrir endurnýjun bænda á fjárstofni sínum

Landbúnaðarkerfi ESB:

Finnar greiða 35 milljónum evra meira í CAP en þeir fá þaðan

–Sjá nánar bls. 32

Bilde: Brynjar Gauti


Nonna og Brynjuhús
Hostel - Skálagisting
Þykkvabæjarklaustur 2


Þykkvabæjarkl.
Nonna og Brynjuhús
Hostel - Skálagisting
Þykkvabæjarklaustur 2

Government support

- Icelandic agricultural policy is based on two pillars

- Revised system from 2027
- Negotiations
- Parliament

Direct payments or grants

Market price support (tariffs)

Volatile future

- Pandemic
- War in Europe
- Climate change
- Strain on food systems, markets and farmers incomes
- Food security

Food and agricultural policies

- Adopted by Parliament 3 months ago
- Towards 2040
- Extensive consultations
- Action plans being drafted
- 5 years

Vision – Food policy

- Leader on quality
- Sustainable and socially responsible use of resources
- Circular economy
- Carbon neutrality
- One health
- Emergency supplies for food security
- Research and education to promote sustainability, diversity and value creation

Goals – Food policy

- Better data on current eocsystems and their use.
- Efficient infrastructure and governance to support value creation
- Innovation to support emission reduction and circular economy principles
- Food safety paramount for both domestically and imported food
- Better info on origins and production methods on consumer level
- Mapping the sector need for education.

Vision – Agricultural policy

- Leader on quality
- Criteria for sustainable and socially responsible use of resources including arable and grazing land
- Animal welfare
- Carbon neutrality and adaptability
- Biodiversity
- Protection of agricultural land as a resource
- Easier generational transition
- Viable income.
- Producers can access education to help them respond to changes

Goals – Agricultural policy

- Land use decisions must evaluate food security consequences and protect biodiversity
- Emergency stocks of food and essential inputs
- Emphasis on increasing production diversity
- Support must incentivize carbon neutrality and promote opportunities for carbon farming.
- Much better data on agricultural land
- Less waste and better use of raw materials on all levels including for energy or fertilizer production
- A solid base for production

The future

- Action plans and financing them
- Revised support system
- International developments

- Unique story
- Do not forget to tell it!

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Arctic Agriculture and sustainable local communities

Hilde Halland, Marianne Vileid Uleberg, Frøydis Gillund, The CAC Conference 2023

Photo: NIBIO

What is a farm?

"A farm is an area of land that is devoted primarily to agricultural processes with the primary objective of producing food and other crops; it is the basic facility in food production."

Photo: Erling Fløystad, Lars Sandved Dalen, Oscar Puschman, Jutta Kapfer Bøhn, NIBIO

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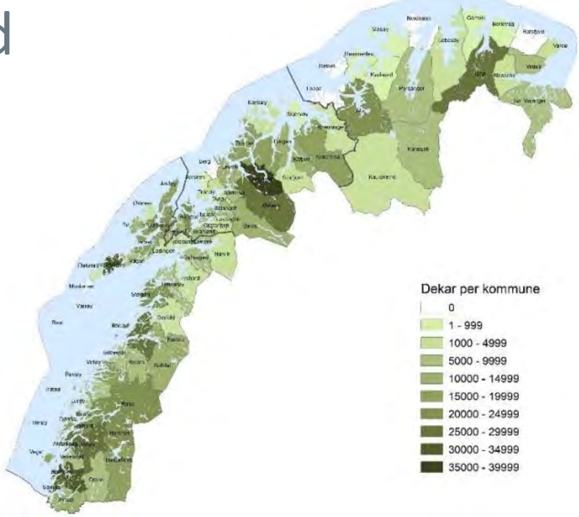
Arctic Norway agriculture

Short and cool growing season and long winter season.
0.8% of total land area is cultivated



Mainly dairy and meat producers
5% produce horticultural products
Multi-functional farms.

Challenges:

- A decline in the population in many rural municipalities
- The number of farmers has more than halved the last two decades - from 6000 farmers to todays 3000 farmers.
- Centralization

Photo: stoltarktiskbonde.no, Anne Linn Hykkerud, Jo Jorem Aarseth, NIBIO

Importance for, and dependence on,

Arctic Agriculture and sustainable local communities

Outline:

- Relevance: Agricultural sustainability – Food systems – Food security
- Four project-examples:
  - Sustainable value: the perspective of horticultural producers in Arctic Norway
  - Learning for sustainability in horticultural production in Arctic Norway
  - Sustainability in Arctic local food production
  - CoastShift
- Sustainable local communities

->Seeking circumpolar collaborations

Agricultural sustainability

A development that "meets the needs of the present without compromising the ability of future generations to meet their own needs"
(WCED, 1987, p.16)

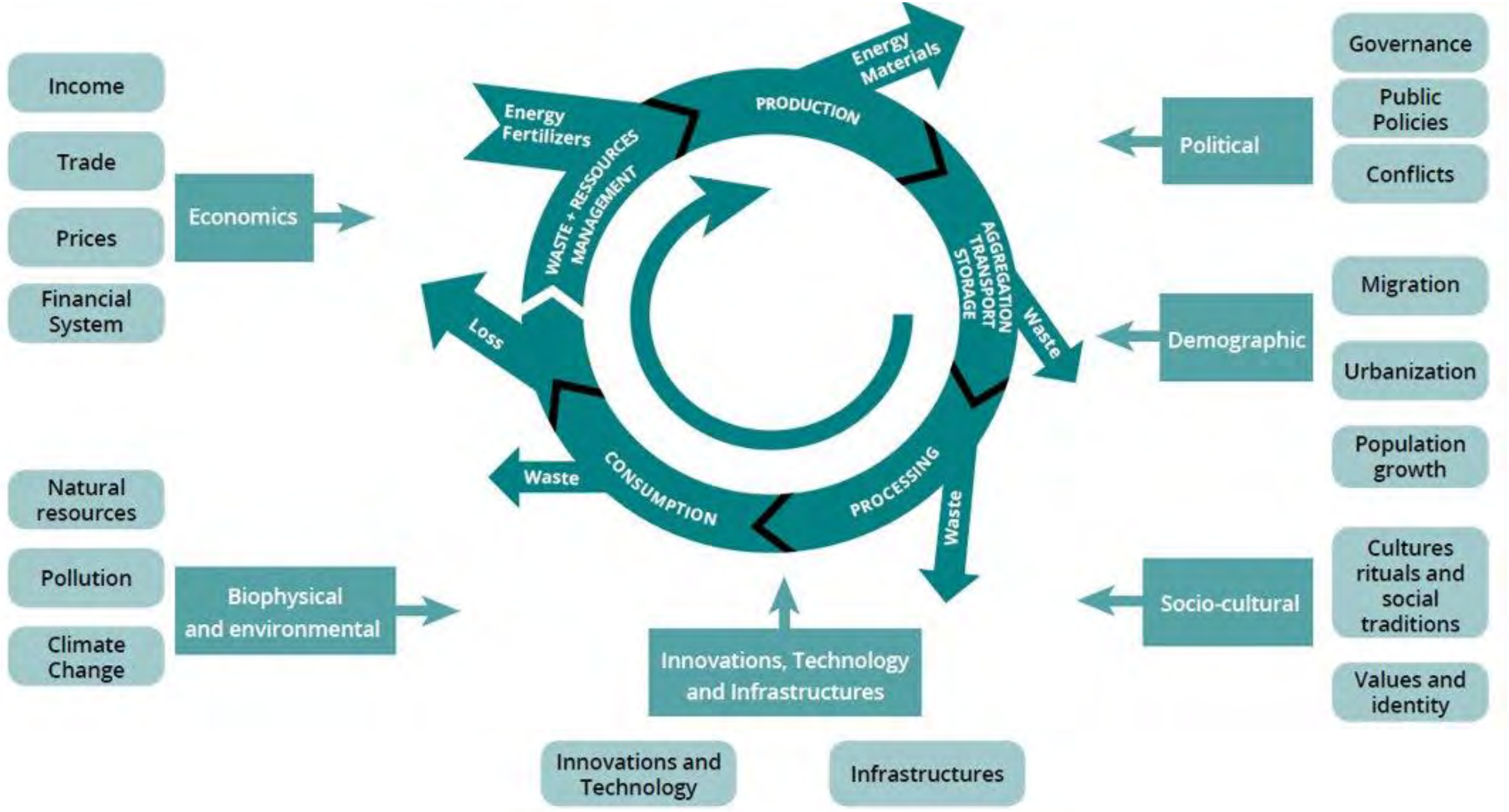
Holistic – environmental, economical, social

An ethical concept

->Making conscious decisions

WCED (World Commission on Environment and Development). (1987). Our Common Future. Oxford: Oxford University Press.

Food systems



Dury, S., Bendjebbar, P., Hainzelin, E., Giordano, T. & Bricas, N. (Eds.) (2019). Food Systems at Risk: new trends and challenges. Roma: Cirad, European Commission & FAO.

Food security

Without food security
– there is no sustainability

Agriculture in the whole of Norway

Threats and risks

Food emergency preparedness –
"Preparedness is about well functioning local communities"

– I situasjoner som den vi nå står oppi, blir det veldig tydelig for alle, at beredskap handler om lokalsamfunn som fungerer, sa Jon Halvorsen, daglig leder for Hovedredningssentralen og medlem av Totalberedskapskommisjonen.

Photo: Lars Sandved Dalen, NIBIO

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Sustainability in Arctic Norway agriculture
Four project examples

1. Sustainable value: the perspective of horticultural producers in Arctic Norway, 2019
2. Learning for sustainability in horticultural production in Arctic Norway, 2020-2021
3. Sustainability in Arctic local food production, 2022-2023
4. CoastShift, 2022-2025

->how and why the conclusions from these projects has shifted
our research interest towards Sustainable local communities

1. Sustainable value: the perspective of horticultural producers in Arctic Norway, 2019

High level of public documentation requirements.

The farmers feel that they contribute to their local communities.

For the farmers to have a good network of producers is a critical factor for improved and increased horticultural production.

One of the biggest challenges is their dependency of rented land.

Transportation mileage is high, due to the geography, few farmers and little infrastructure.


OPEN ACCESS

International Food and Agribusiness Management Review
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Received: 13 December 2019 / Accepted: 17 October 2020

Sustainable value: the perspective of horticultural producers in Arctic Norway

RESEARCH ARTICLE

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Abstract

Aiming for sustainable development of food value chains several assessment methods are developed, however it seems challenging to go from assessment to actual change. A solution proposed is increased stakeholder involvement also in the assessment phase. The perspective on sustainability varies depending on several variables, among which the geographical context where the producers are located. The perspective of the latter is of paramount importance as these are the actors on who, ultimately, possible changes towards sustainability depend. In this article, we applied a qualitative approach to investigate the farmers' perspective on sustainability, in the horticultural production in Arctic Norway. We found that many of the premises for sustainable food production are present. The main challenges are lack of long-term planning, dependency of rented land as well as fluctuating yield and income. Producer's network is essential for development as well as introduction of technical improvements. The study shows the importance of contextualisation of sustainability, as well as pointing at concerns about trade-offs between sustainability dimensions and themes in the proposed model. The research contributes to method development by demonstrating how a qualitative approach is a fruitful method to unravel the complexities of sustainability in food production.

Keywords: sustainable food production, SAFA, farmers' perspective, horticulture, arctic food
JEL code: Q01

Corresponding author: hilde.halland@nibio.no

Halland, H., Bertella G., and Kvalvik I. (2021). Sustainable value: the perspective of horticultural producers in Arctic Norway. International Food and Agribusiness Management Review: 24 (1), 51–70.

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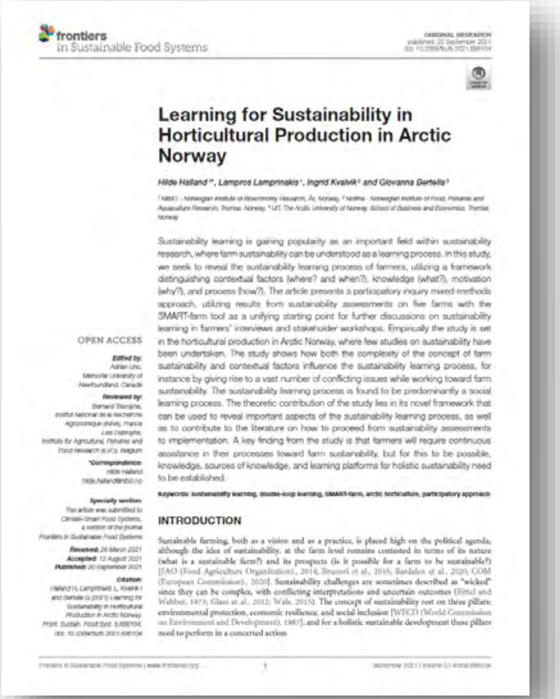
2. Learning for sustainability in horticultural production in Arctic Norway, 2020-2021


frontiers in Sustainable Food Systems

Learning for Sustainability in Horticultural Production in Arctic Norway

Hilde Halland, Lampros Lamprinakis, Ingrid Kvalvik and Giovanna Bertella

OPEN ACCESS

Sustainability learning is gaining popularity as an important field within sustainability research, where farm sustainability can be understood as a learning process. In this study, we seek to reveal the sustainability learning process of farmers, utilizing a framework distinguishing contextual factors (where? and when?), knowledge (what?), motivation (why?), and process (how?). The article presents a participatory inquiry mixed-methods approach, utilizing results from sustainability assessments on five farms with the SMART-farm tool as a unifying starting point for further discussions on sustainability learning in farmers' interviews and stakeholder workshops. Empirically the study is set in the horticultural production in Arctic Norway, where few studies on sustainability have been undertaken. The study shows how both the complexity of the concept of farm sustainability and contextual factors influence the sustainability learning process, for instance by giving rise to a vast number of conflicting issues while working toward farm sustainability. The sustainability learning process is found to be predominantly a social learning process. The theoretic contribution of the study lies in its novel framework that can be used to reveal important aspects of the sustainability learning process, as well as to contribute to the literature on how to proceed from sustainability assessments to implementation. A key finding from the study is that farmers will require continuous assistance in their processes toward farm sustainability, but for this to be possible, knowledge, sources of knowledge, and learning platforms for holistic sustainability need to be established.

Keywords: sustainability learning, double-loop learning, SMART-farm, arctic horticulture, participatory approach

INTRODUCTION

Sustainable farming, both as a vision and as a practice, is placed high on the political agenda, although the idea of sustainability, at the farm level remains contested in terms of its nature (what is a sustainable farm?) and its prospects (is it possible for a farm to be sustainable?)

Collaboration is a key feature - Optimally combining knowledge from various sources, informal and formal.

Context matters: the interplay between climatic, topographic, demographic, policy and market conditions - must be understood locally.

Needs a focus beyond the farm scale: farmers linked with society.

Centralization of operations of large market actors impedes farm sustainability.

Motivations for more sustainable farming have grown alongside policy regulations.

Halland, H., Lamprinakis, L., Kvalvik, I., and Bertella, G. (2021). Learning for sustainability in horticultural production in Arctic Norway. Frontiers in Sustainable Food Systems, 5(320). doi:10.3389/fsufs.2021.686104

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3. Sustainability in Arctic local food production, 2022-2023

->To a large degree other factors besides their farm and processing activities affects the possibilities for sustainability

Political aspects:

- Access to land (soil-conservation)
- Economic support
- To see the farm as a resource

Value-chain aspects:

- Centralization of dairy-operators
- Access to markets

Local society:

- Network
- Support and customers
- Services

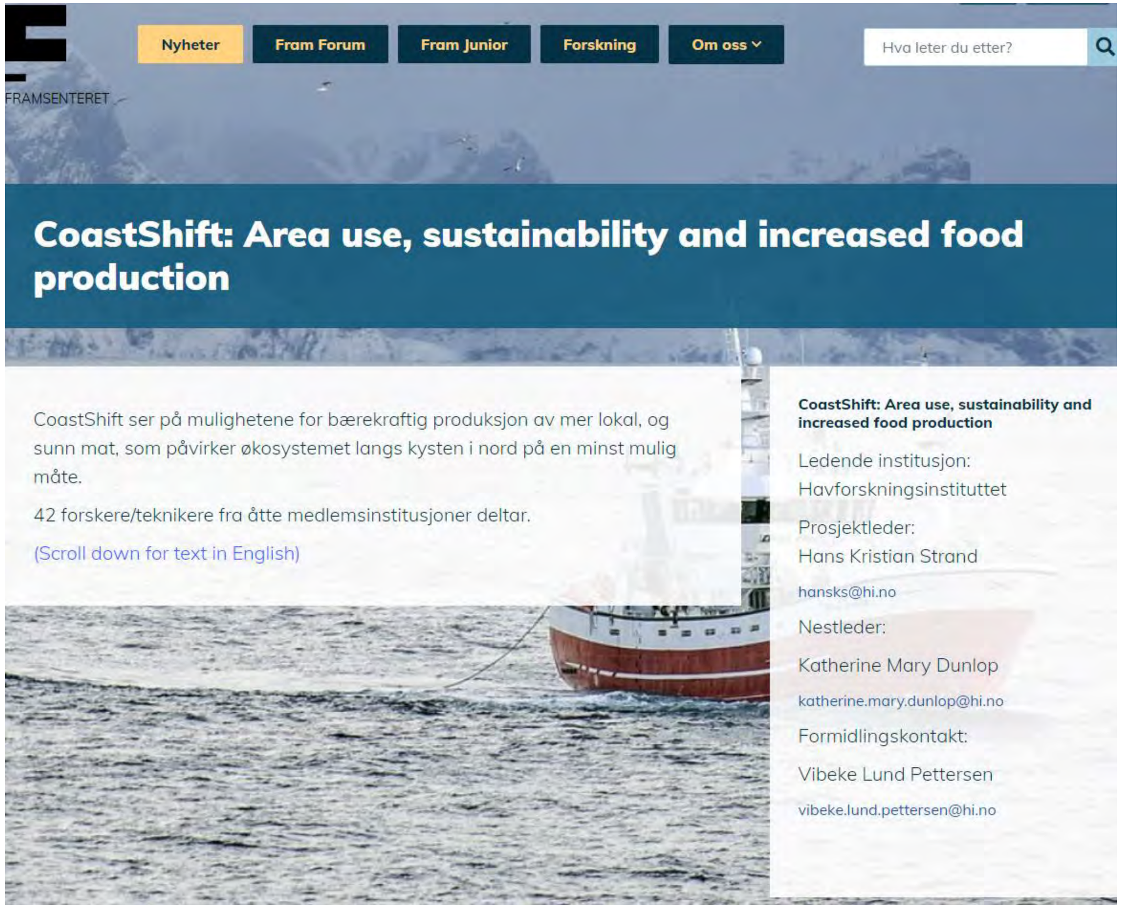
Photo: Innovation Norway

4. CoastShift, 2022-2025

Land management for a sustainable use of agricultural land

Case-studies in three Arctic Norway municipalities

Local political and administrative management



https://framsenteret.no/forskning/coastshift/

What is the significance of Arctic agriculture for sustainable local communities,

and its reciprocity,

How are viable local communities a prerequisite for sustainable food production?

- Social structures
- Infrastructure and services
- Access to Land

Sustainable local communities - Social structures

Network and cooperation

Co-production

Competence and knowledge-sharing

Formal and unformal social meeting arenas

Photo: Erling Fløystad, NIBIO

Sustainable local communities
- “Infrastructure”

<u>Community infrastructure:</u>

- Roads
- Kindergarten and School
- Shops
- Cultural and sports arenas
- Public management
- …

<u>Infrastructure for production:</u>

- Machines and farm buildings
- Distribution
- Suppliers
- Market actors
- Support & Extension service
- ….

Photo: Lars Sandved Dalen, NIBIO

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Sustainable local communities
–Access to agricultural land

Dependence on rented land (historical property structures)

Public and private management
-soil conservation
-land management – (grazing land)

Conflicts or collaborations - "other social considerations"

Photo: Lars Sandved Dalen, NIBIO

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Seeking circumpolar collaborations

What is the significance of arctic agriculture for sustainable local communities, and its reciprocity, how are viable local communities a prerequisite for sustainable food production?

- Transdisciplinary research
  - knowledge and participation from several disciplines
  as well as from a variety of societal actors.

As this is a new focus area for agricultural research in northern Norway, we want to open for a discussion about how such research can benefit from a broader circumpolar cooperation.

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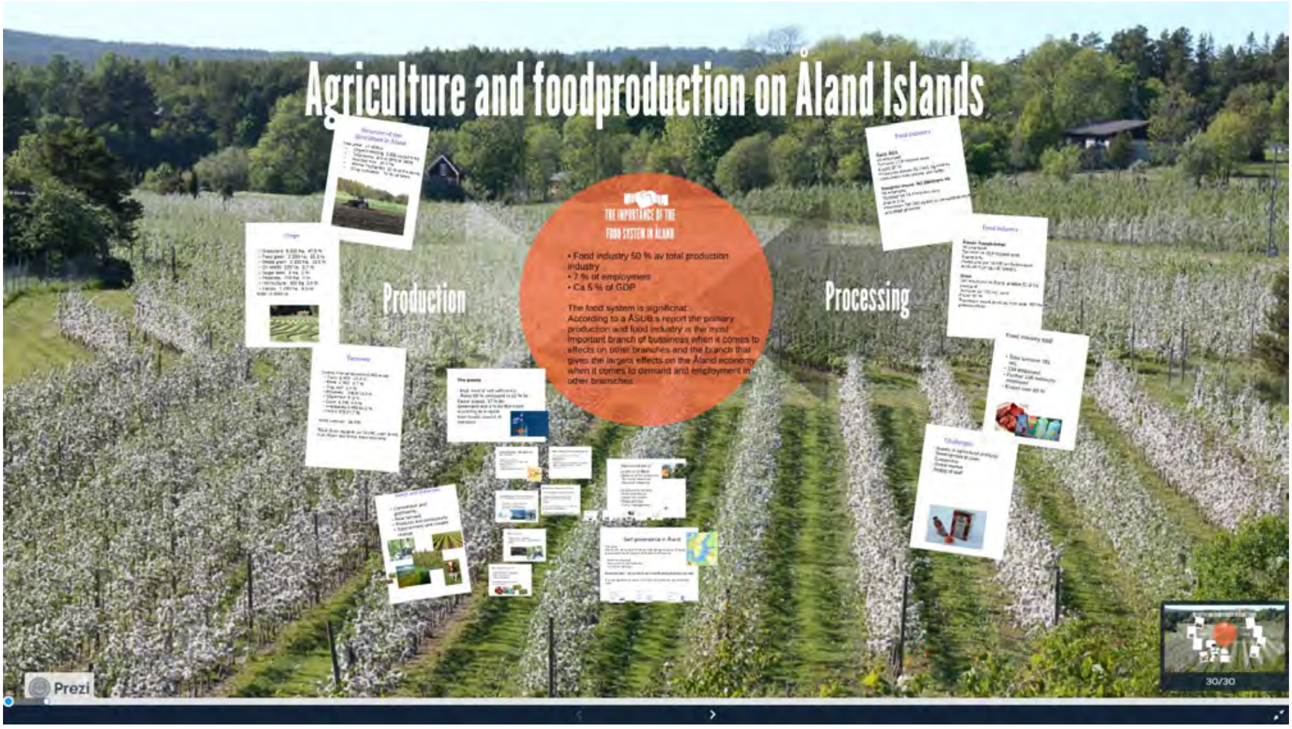

Agriculture and foodproduction on Åland Islands
Production
THE IMPORTANCE OF THE FOOD SYSTEM IN ÅLAND
• Food industry 50 % av total production industry
• 7 % of employment
• Ca 5 % of GDP
The food system is significnat:
According to a ÅSUB:s report the primary production and food industry is the most important branch of bussiness when it comes to effects on other branches and the branch that gives the largets effects on the Åland economy when it comes to demand and employment in other branches.
Processing
Prezi
30/30


Self governence in Åland
The base:
Åland shall be a part of Finland, with self governence. Finland guaranteed that the people of Ålands shall keep its;
- Swedish language
- local customs and traditions
- its cultural heritage
Demilitarisation, neutralisation and international guarantees are kept.
First self goverence law is from 1921 wich was put into force from 1922
Baltic Sea
Organisation of the self governance
Parliament of Åland
- ordinary parliament
- legislative
- decision of the budget
Government of Åland
- Political steering
Self governance in Åland
Self governance
Prezi

Organisation of the self governance

Parlament of Åland
- ordinary parlament
- legislative
- decision of the budget

Government of Åland
- Political steering
- Civil service

Self governance in Åland

Parlament of Åland have legaslative powers in:
- Education and culture
- Health and social service
- Environment
- Trade
- Communication
- Municipalities
- Police
- Postal services, radio and tv

Self governance

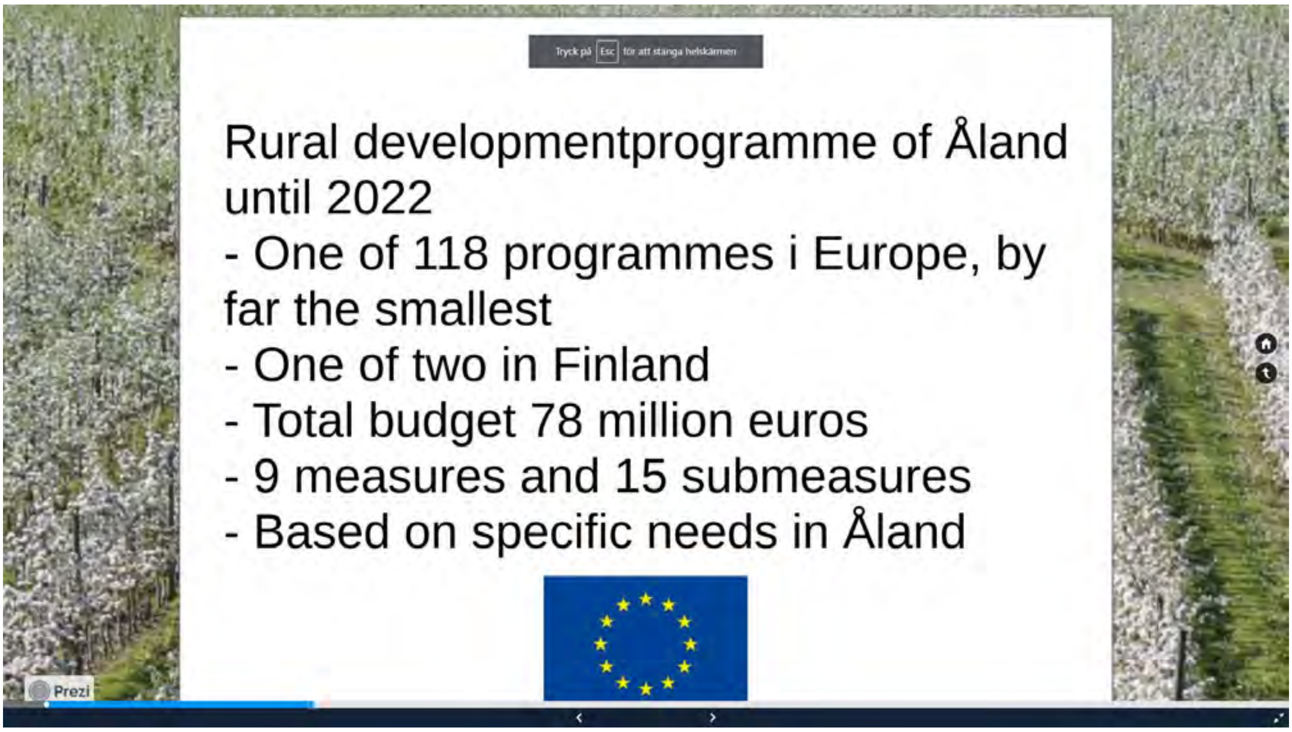
The parlament of Finland is legaslative responsible – also on Åland – to:

- Foreign policies
- State taxes
- Larger parts of the civil and criminal laws
- Courts
- Customs and border control, crisis management

Agricultural policy

Jurisdiction of Åland:
- Steering of the production
- Structural measures
- Regional measures

Jurisdiction of Finland:
- Price of products
- Import and export
- Taxes and fees
- Crisis management


Tryck på Esc för att stänga helskärmen
Rural developmentprogramme of Åland until 2022
- One of 118 programmes i Europe, by far the smallest
- One of two in Finland
- Total budget 78 million euros
- 9 measures and 15 submeasures
- Based on specific needs in Åland
Prezi


Tryck på Esc för att stänga helskärmen
From 2023 Åland is a part of the CAP-strategy plan of Finlands
- Measures developed for the specific needs in Åland
- Measures are almost the same as before
- Åland more integrated with mainland
NEW CAP
#NewCAP
New Common Agricultural Policy
Prezi

Measures

- Areal measures
- Investment measures
- Project measure
- Measures pointed at food industry
- Leader

Other fields of legaslative powers and administration:

- Adivsory
- Organic production
- Fudders
- Fertilizers
- Seeds
- Plant health

Advisory and development

- Financing of the advisory system
- Performance agreement
- Financing of specific development projects

Mainland Finland resonbilities

- Pillar one CAP-measures, Income support
- National production aids
- Market measures


Tryck på Esc för att stänga helskärmen
and foodproduction on
Production
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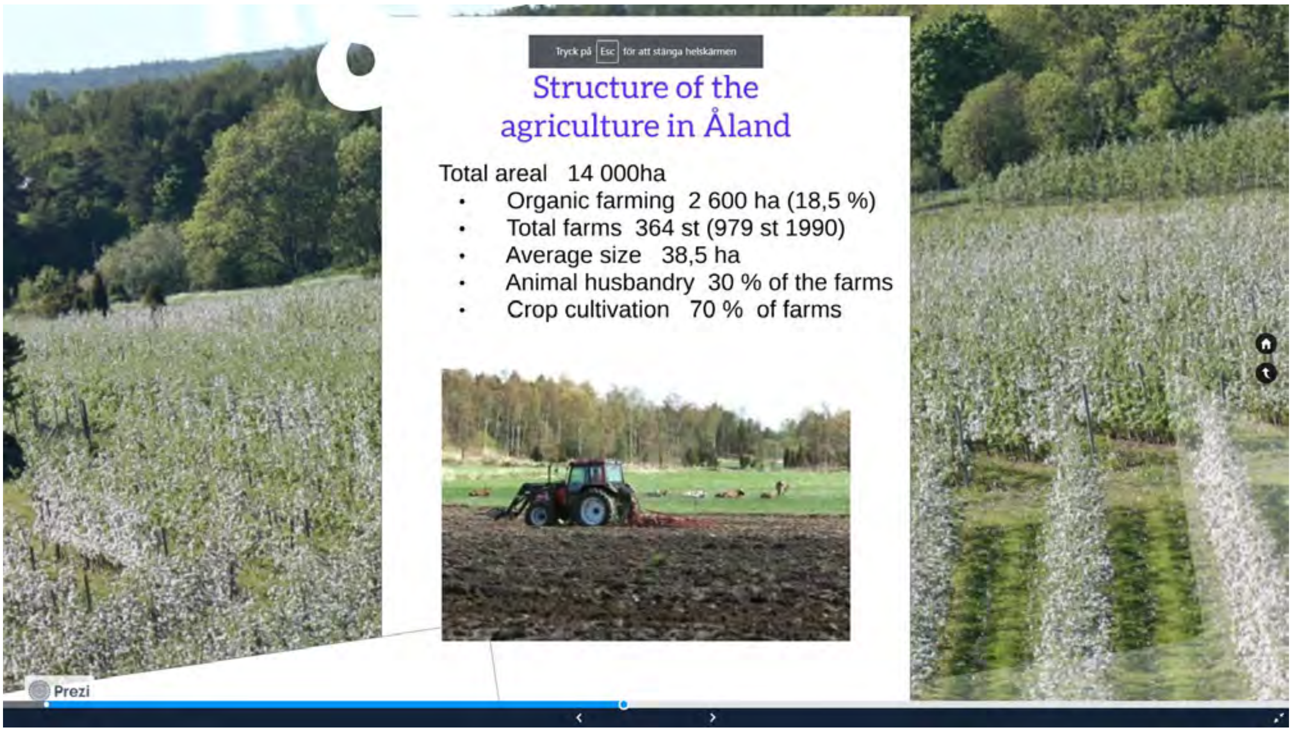
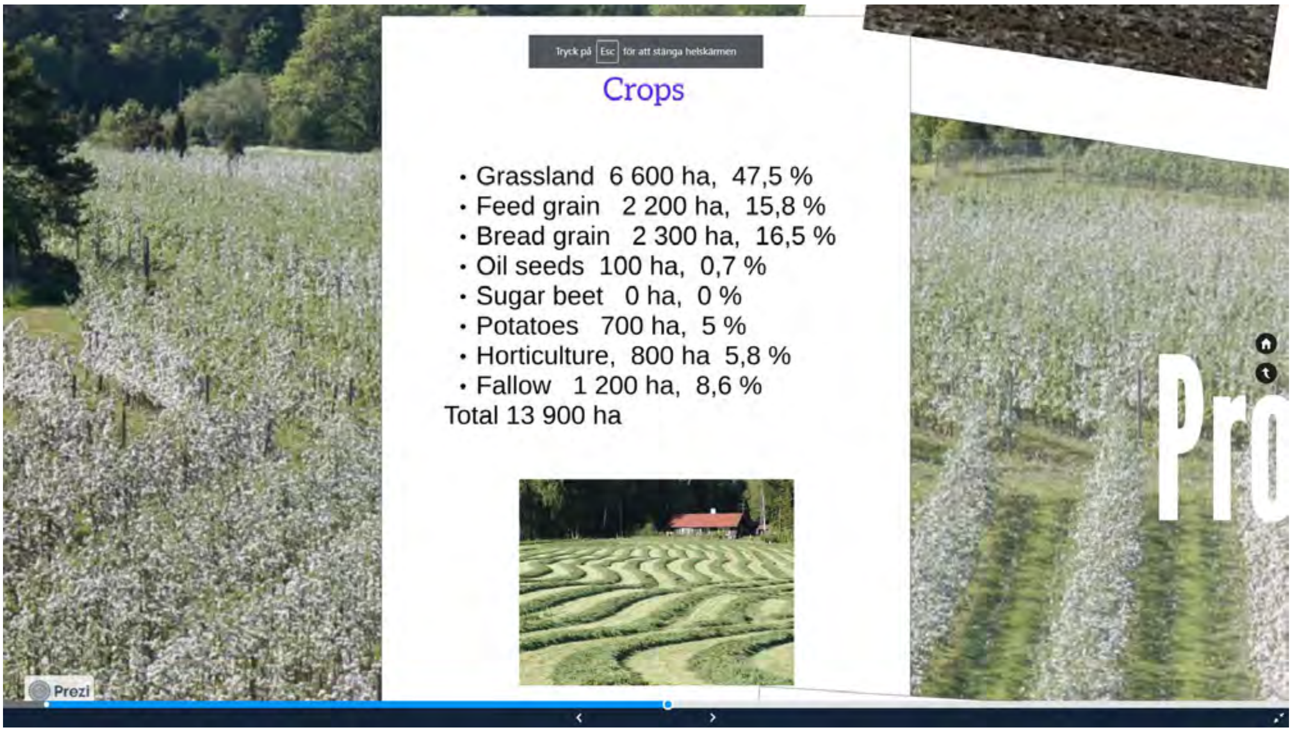
Prezi


Tryck på Esc för att stänga helskärmen
Structure of the agriculture in Åland
Total areal 14 000ha
• Organic farming 2 600 ha (18,5 %)
• Total farms 364 st (979 st 1990)
• Average size 38,5 ha
• Animal husbandry 30 % of the farms
• Crop cultivation 70 % of farms
Prezi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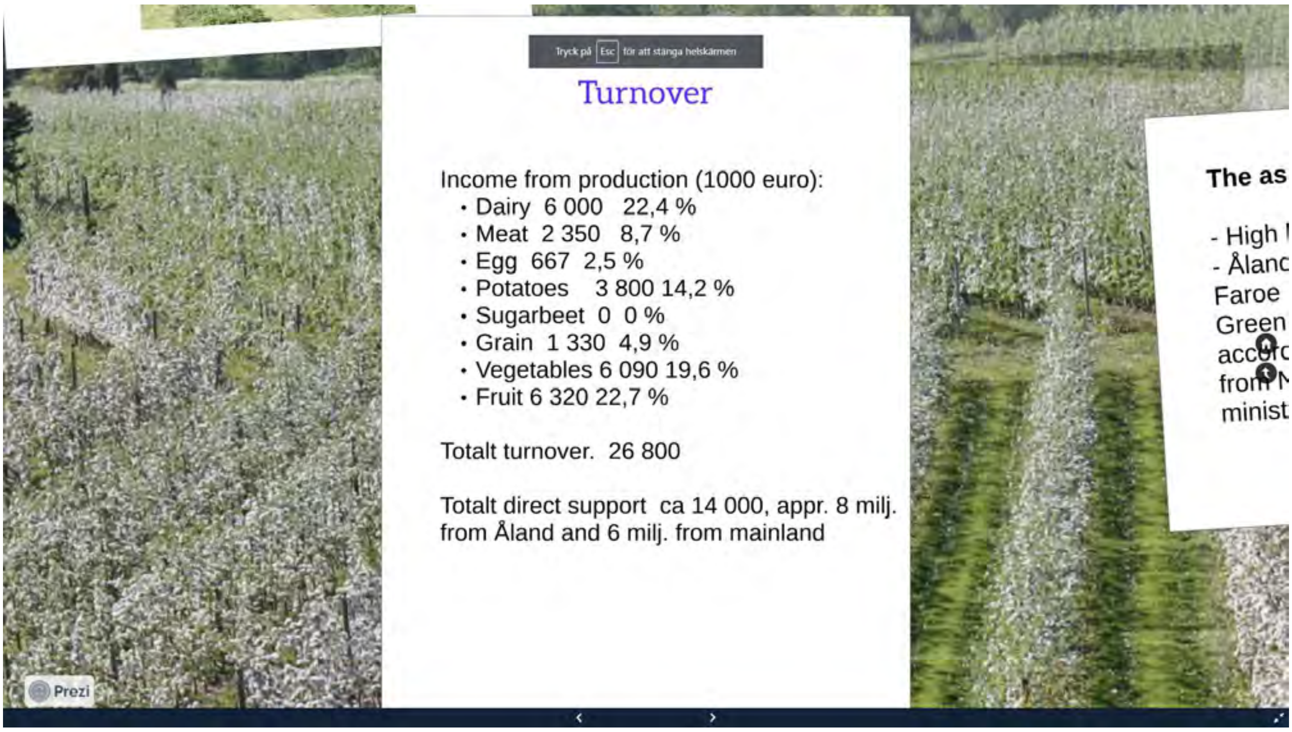
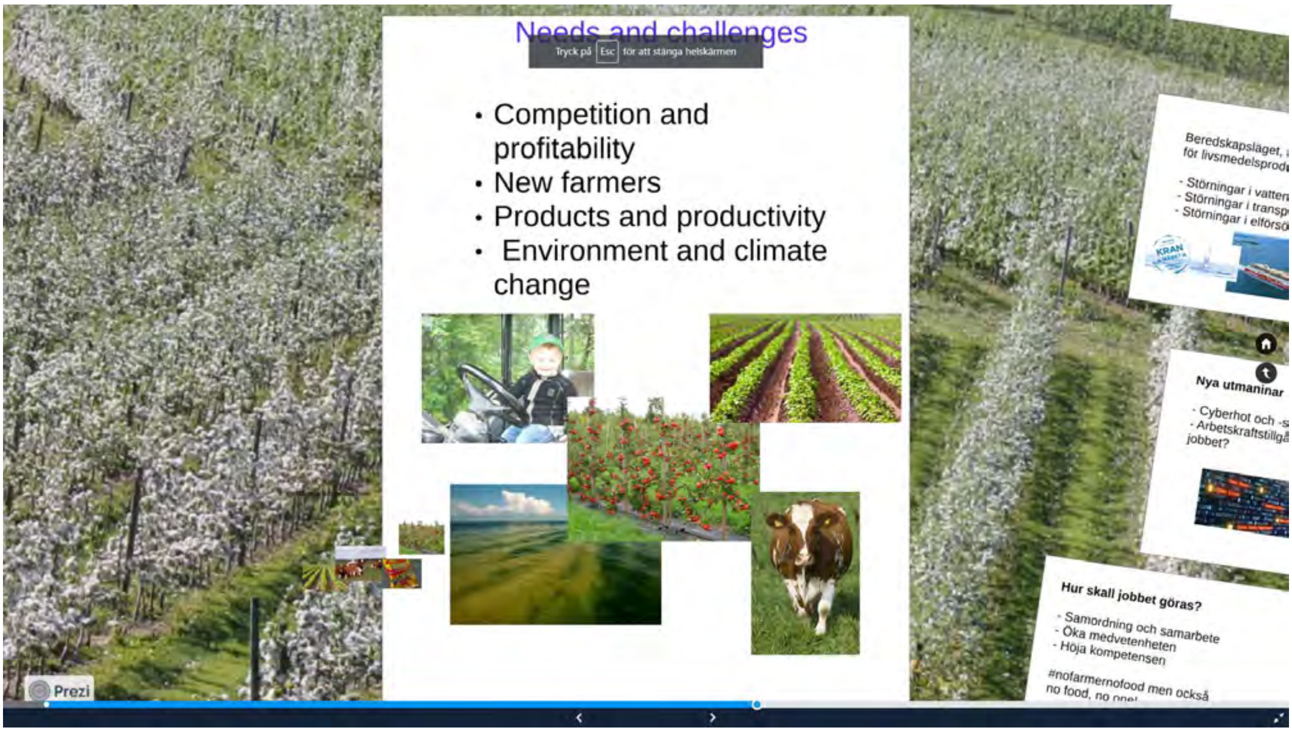
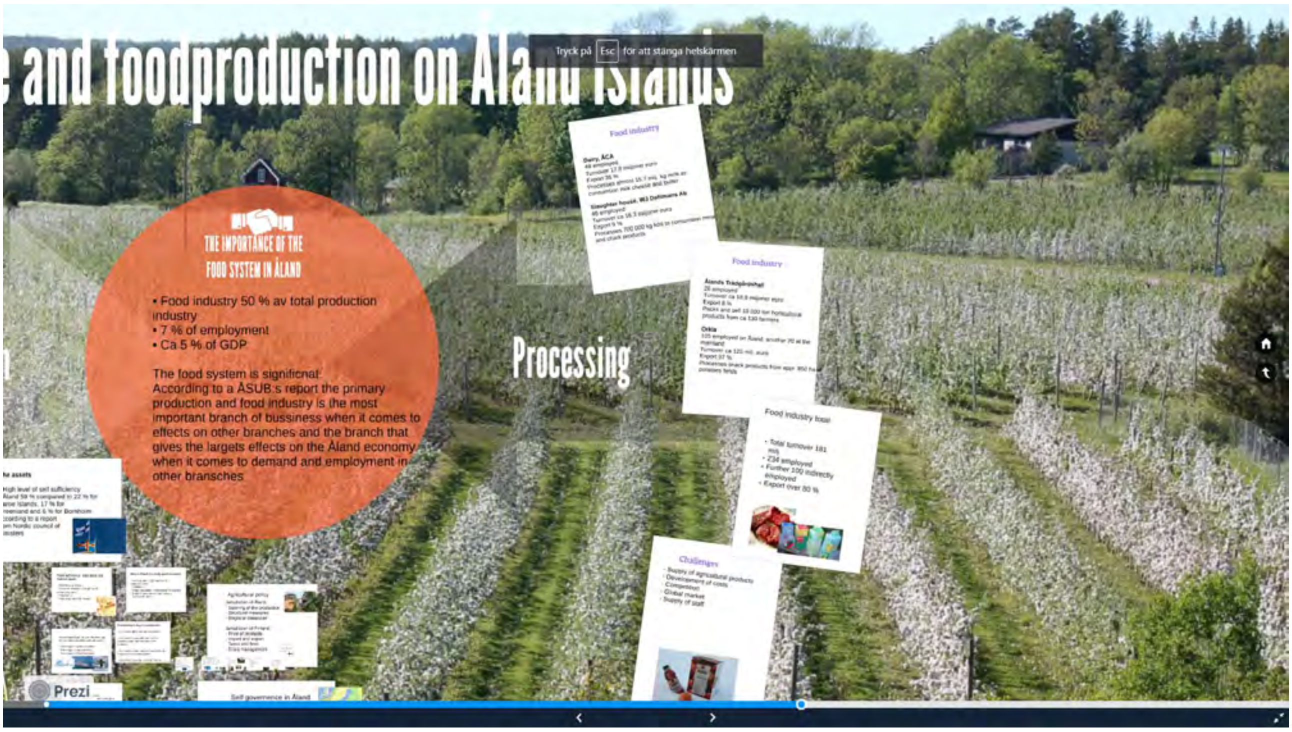
Crops
• Grassland 6 600 ha, 47,5 %
• Feed grain 2 200 ha, 15,8 %
• Bread grain 2 300 ha, 16,5 %
• Oil seeds 100 ha, 0,7 %
• Sugar beet 0 ha, 0 %
• Potatoes 700 ha, 5 %
• Horticulture, 800 ha 5,8 %
• Fallow 1 200 ha, 8,6 %
Total 13 900 ha
Prezi


Tryck på Esc för att stänga helskärmen
Turnover
Income from production (1000 euro):
• Dairy 6 000 22,4 %
• Meat 2 350 8,7 %
• Egg 667 2,5 %
• Potatoes 3 800 14,2 %
• Sugarbeet 0 0 %
• Grain 1 330 4,9 %
• Vegetables 6 090 19,6 %
• Fruit 6 320 22,7 %
Totalt turnover. 26 800
Totalt direct support ca 14 000, appr. 8 milj. from Åland and 6 milj. from mainland
Prezi


Needs and challenges
Tryck på Esc för att stänga helskärmen
• Competition and profitability
• New farmers
• Products and productivity
• Environment and climate change
Nya utmaninar
Hur skall jobbet göras?
- Samordning och samarbete
- Öka medvetenheten
- Höja kompetensen
#nofarmernofood men också
Prezi


and foodproduction on Åland Islands
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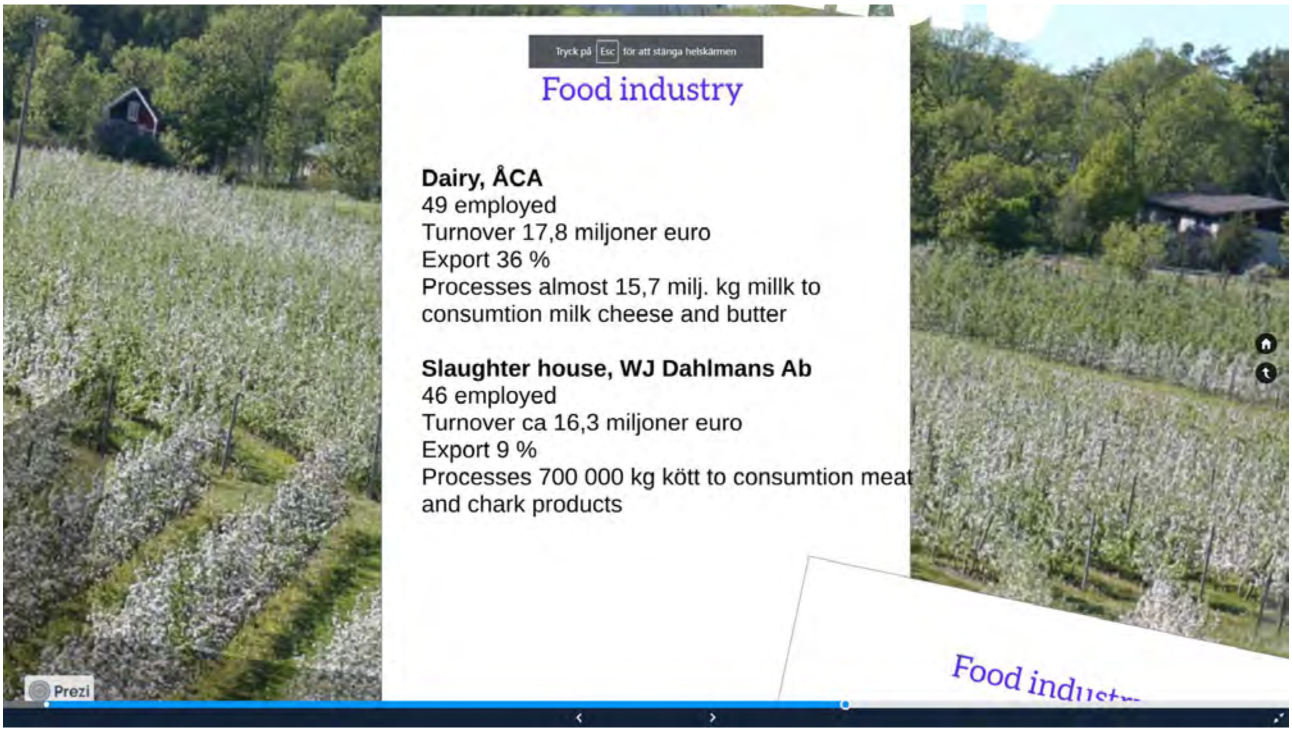
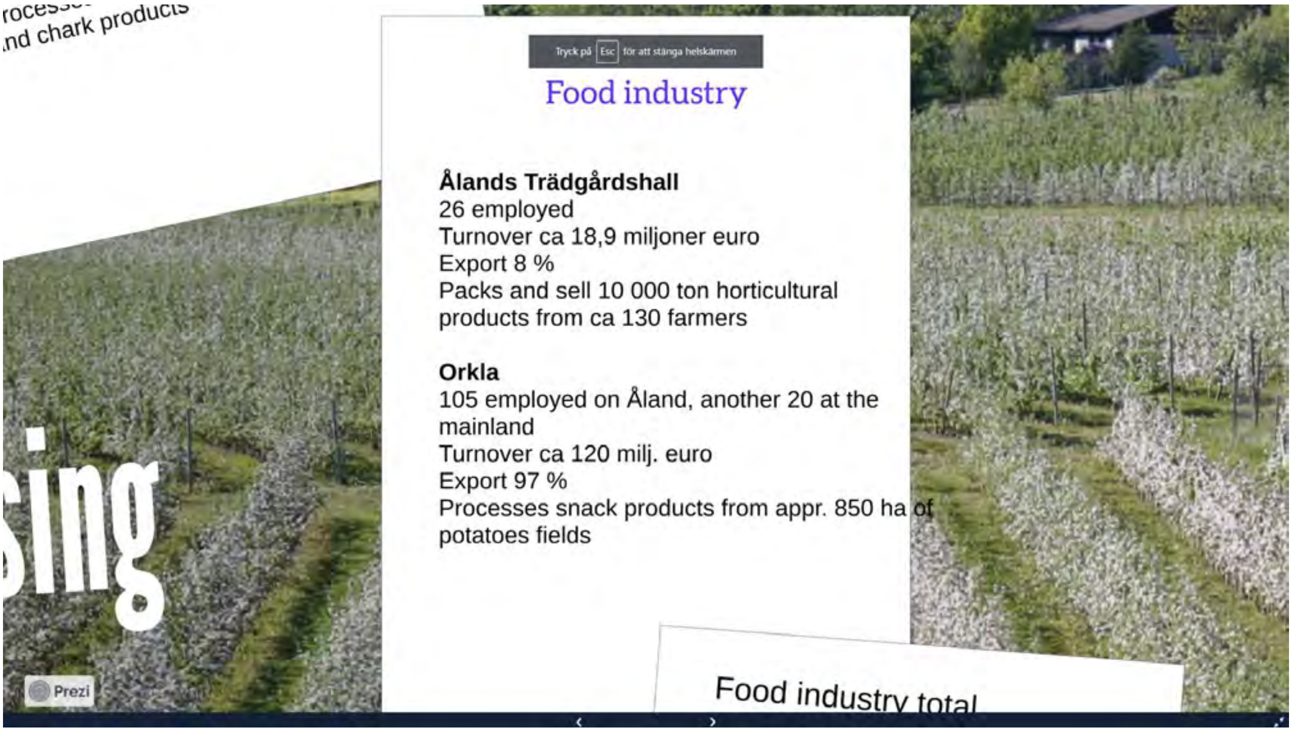
Processing
Food industry
Food industry total
Challenges
Prezi

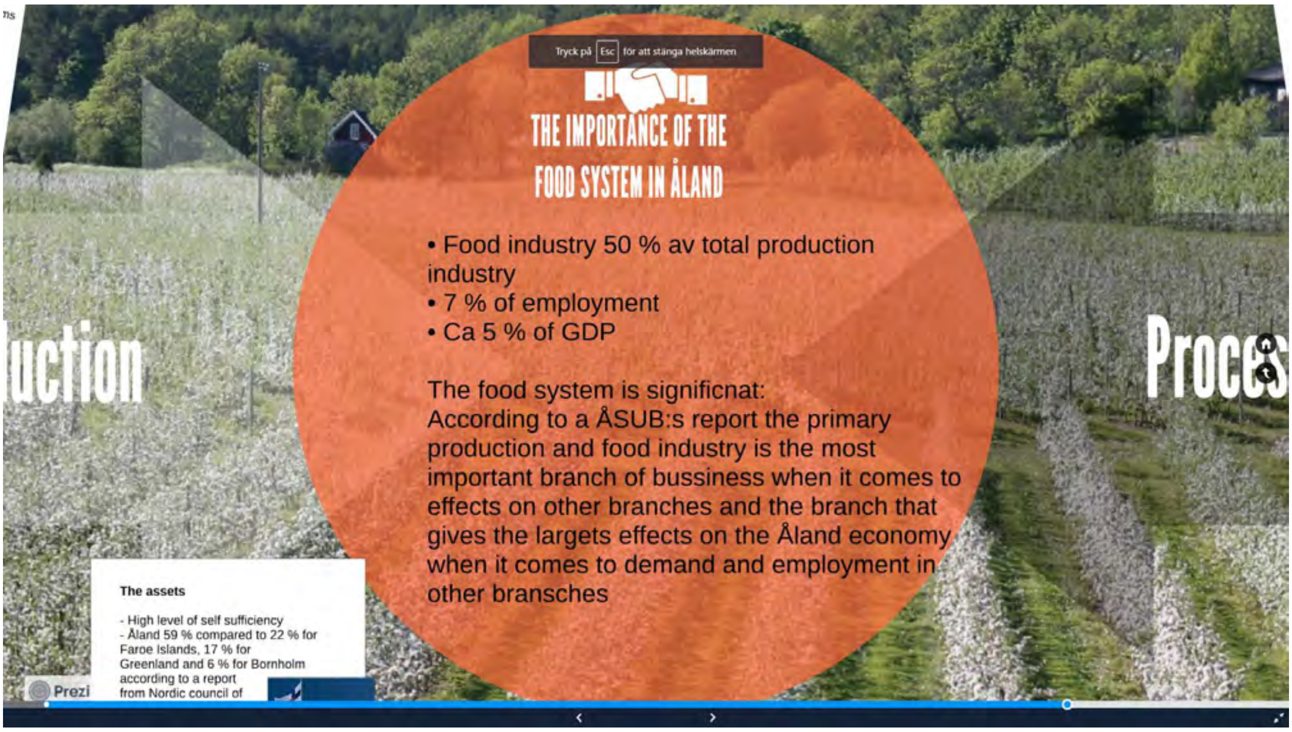

Tryck på Esc för att stänga helskärmen
Food industry
Dairy, ÅCA
49 employed
Turnover 17,8 miljoner euro
Export 36 %
Processes almost 15,7 milj. kg millk to consumtion milk cheese and butter
Slaughter house, WJ Dahlmans Ab
46 employed
Turnover ca 16,3 miljoner euro
Export 9 %
Processes 700 000 kg kött to consumtion meat and chark products
Prezi


Tryck på Esc för att stänga helskärmen
Food industry
Ålands Trädgårdshall
26 employed
Turnover ca 18,9 miljoner euro
Export 8 %
Packs and sell 10 000 ton horticultural products from ca 130 farmers
Orkla
105 employed on Åland, another 20 at the mainland
Turnover ca 120 milj. euro
Export 97 %
Processes snack products from appr. 850 ha of potatoes fields
Food industry total
Prezi


Food industry total
• Total turnover 181 milj.
• 234 employed
• Further 100 indirectly employed
• Export over 80 %


Tryck på Esc för att stänga helskärmen
Challenges
- Supply of agricultural products
- Development of costs
- Competition
- Global market
- Supply of staff


Tryck på Esc för att stänga helskärmen
THE IMPORTANCE OF THE
FOOD SYSTEM IN ÅLAND
ood industry 50 % av total produc
Prezi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uction
Proces
The assets
- High level of self sufficiency
- Åland 59 % compared to 22 % for Faroe Islands, 17 % for Greenland and 6 % for Bornholm according to a report from Nordic council of
Prezi

The assets

- High level of self sufficiency
- Åland 59 % compared to 22 % for Faroe Islands, 17 % for Greenland and 6 % for Bornholm according to a report from Nordic council of ministers

Food sufficiency - have gone into fashion again

- Resiliens is a key
- Extreme weather, drought and extensive rains
- Pandemic
- Now also security issues

Why is Åland in a fairly good situation

- Fairly good circumstances for foodproduction
- Traditions
- Food production is important for society
- Small independent food industry
- Self governance

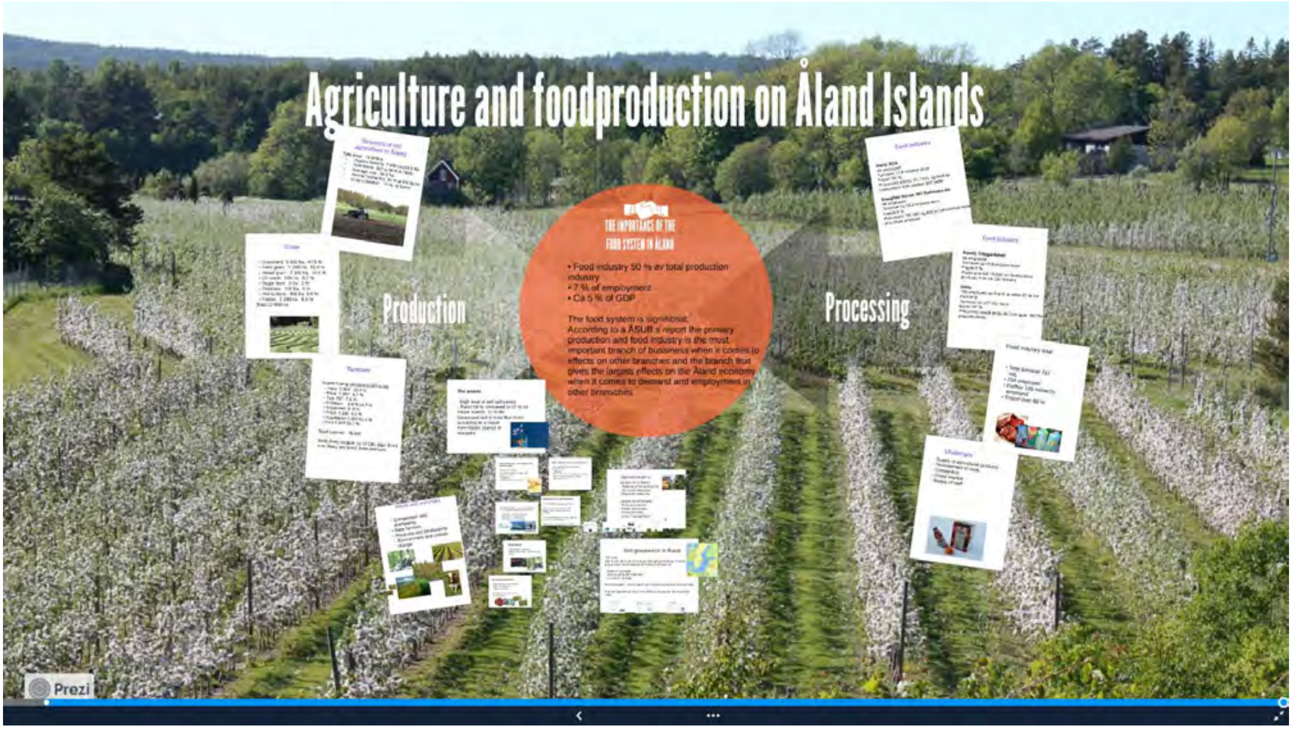
Profitability is key for production

- If it is profitable you get production

- You need to pay attention to the specific needs and adress them - strategy

- You need to take care of them who do the job and be sustainable!

- No farmer no food, no food noone!



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Prezi

Luke
NATURAL RESOURCES
INSTITUTE FINLAND

Finnish farmers' climate change perceptions: Towards a psychological understanding of pro-environmental behavior in agriculture

Circumpolar Agricultural Conference
the Faroe Islands – 5.9.2023
Jaana Sorvali

Aim of the research

Study the climate change perceptions of Finnish farmers and the psychological factors that influence farmers' pro-environmental, in this case climate-friendly, behavior.

The two main research questions for this thesis are:

1) **What are Finnish farmers' values and perceptions of climate change?**

2) **Which psychological elements predict farmers' pro-environmental behavior?**

Climate Risk Management 27 (2020) 100205

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journal homepage: www.elsevier.com/locate/crm

Winds of change for farmers: Matches and mismatches between experiences, views and the intention to act

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ARTICLE INFO

Keywords:
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Climate change
Crop management
Crop production
Farmer
Survey

ABSTRACT

Agriculture is facing multifaceted changes. Farmers are eventually the ones who will implement changes or not depending on their knowledge, experience, views and other motives. To gain some insight into farmers' decision making and to identify possible hotspots that require knowledge sharing, encouragement and subsidies, a farmer survey was arranged. 38,091 invitations were sent covering 80% of Finnish farmers and 4401 answers were received without significant distortions of representativeness due to age, geographical area, farm type, farm size or education. The survey contained four groups of questions with structured statements on awareness of future changes, personal experience of changes, views towards different measures and intentions to act. Farmers have observed many weather-related changes. They often see a need to take measures to manage crops, soil conditions and farming system. The measures considered to be important were often implemented or they were in the farmers' near future plans. However, some mismatches occurred between scientific evidence and the farmers' understanding and observations of changes, as well as concerning measures needed in the future. Hence, more efficient means are needed to share knowledge concerning future changes and coping measures. Moreover, policy incentives are important for investments because the economic situation is challenging for farmers and the measures primarily aim to decline the environmental footprint of agriculture.

1. Introduction

Agriculture has always been in a state of flux. The original aim of producing food more efficiently compared to the preceding hunter-gathering economy has gradually been supplemented by increasingly multifaceted targets. Ideally, farmers would produce more food in less land area for an increasing human population and support higher standards of living in an environmentally, economically and socially sustainable way (Foley et al., 2011). This necessitates adaption to climate change, but also coping with fluctuations in markets and prices, agricultural and environmental policies, changes in consumption habits etc. (Soussana et al., 2012). Simultaneous action to reduce the environmental footprint of agriculture is needed, i.e. climate change mitigation, maintenance of biodiversity, and reductions of nutrient and pesticide loads in the environment (Rockström et al., 2009). Farmers need to cope with short-term shocks, while safeguarding their long-term sustainability, productivity and competitiveness.

Due to the multifaceted, but also justifiable aspirations that are set for agriculture alongside food production and security farmers' decision making has become increasingly challenging, and even further strained by the difficult economic situation (Scherer et al.,

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Farmer views on climate change—a longitudinal study of threats, opportunities and action

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Abstract
Any new policy measure aiming to mitigate climate change and support adaptation in agriculture is implemented at the farm scale. This makes a farmer the key actor. This study aimed to understand farmers' climate change views and reveal how farmers see their role, responsibilities and possibilities to mitigate and adapt to climate change. Furthermore, this study aimed to assess how various background variables and values associate with farmers' views in order to have novel and comprehensive on farmers' perspectives on climate change. Short-term changes in views were studied with a longitudinal framework. In total, 4401 farmers in Finland answered a standardized e-mail survey in spring 2018. A total of 2000 of them responded again in spring 2020. The respondents differed in gender, age, education, farming system, farm type, farm organization, farm size, revenue and region. The farmers were not a uniform group of citizens, and their views on climate change varied widely. For a Nordic, boreal zone country like Finland, climate change will bring not only challenges but also opportunities that may even strengthen the agricultural production. Such a "two-sided coin" causes confusion for farmers as indicated by this study. Climate change–induced risks often dominate the public dialogue with farmers. This study emphasizes the need for better balance between risks and opportunities not only in the dialogue with farmers but also with policy makers and all public discussion. Acknowledging farmers' views in planning the future climate policies for agricultural sector is elemental to ensure success in farm-scale implementation.

Keywords Climate change · Farmer · Agriculture · View · Longitudinal survey · Finland

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I

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II

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RESEARCH ARTICLE

WILEY

Value priorities of the Finnish farmers—Time to stop thinking of farmers as inherently conservative and traditional

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Abstract

Farming communities are becoming more heterogeneous and multifunctional due to various structural and environmental changes. However, it is not known if farmers' values have also become more heterogeneous. We wanted to explore potential heterogeneity in farmers' value priorities in detail across different farmer groups in Finland using the refined Schwartz theory of 19 basic human values. A representative sample of 4,401 Finnish farmers responded to a survey in 2018. The data were analysed with multidimensional scaling, confirmatory factor analysis and one-way analysis of variance. The results show that farmers' values were heterogeneous, and differences were associated with socio-demographic characteristics. Our findings confirmed the motivational continuum structure of values, with the exception of societal-value. Security-societal was the most important value for the Finnish farmers. The theory of 19 values proved useful in uncovering value priorities in detail. The security-societal value is more a part of national identity rather than a personal motivational value in the Finnish farming community. The heterogeneity of farmers' values should be considered in more targeted policy planning.

KEYWORDS
agriculture, farmers, Finland, Schwartz, survey, values


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Climate change opportunities reduce farmers' risk perception: Extension of the value-belief-norm theory in the context of Finnish agriculture

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Natural Resources Institute Finland (Luke), Helsinki, Finland

Global agriculture faces severe challenges due to climate change. For boreal agriculture, climate change might also bring opportunities as the growing season lengthens, if the risks of climate change are managed properly. Agricultural production is a source of greenhouse gases, while agricultural land has also a great possibility to mitigate climate change as a carbon sink. Farmers are the central group for implementing these actions. Their views and beliefs contribute to their corresponding pro-environmental agricultural behavior. This research is based on the theory of value-belief-norm (VBN) as a predictive model of pro-environmental agricultural behavior. We extend the theory by studying how opportunities caused by climate change affect pro-environmental behavior in agriculture and present differences between farmer groups and experiment with the longitudinal possibilities of the theoretical model. Based on the structured survey responses from 4,401 farmers in Finland in 2018 and 2000 responses in 2020, we found that all the elements of VBN theory did help to predict intention for climate change mitigation, among which felt possibility to perform mitigation practices was the strongest predictor while risk perception was rather an unimportant one. Furthermore, opportunities caused directly or indirectly by climate change have an effect on Finnish farmer's implementation of mitigation practices. Therefore, future efforts in agricultural research and policy in Finland should concentrate to bring forth concrete farm-level mitigation practices with proven environmental benefits and the direct and indirect opportunities should be given more attention.

KEYWORDS
climate change, opportunity, farmer, agriculture, value-belief-norm theory, survey, Finland

III

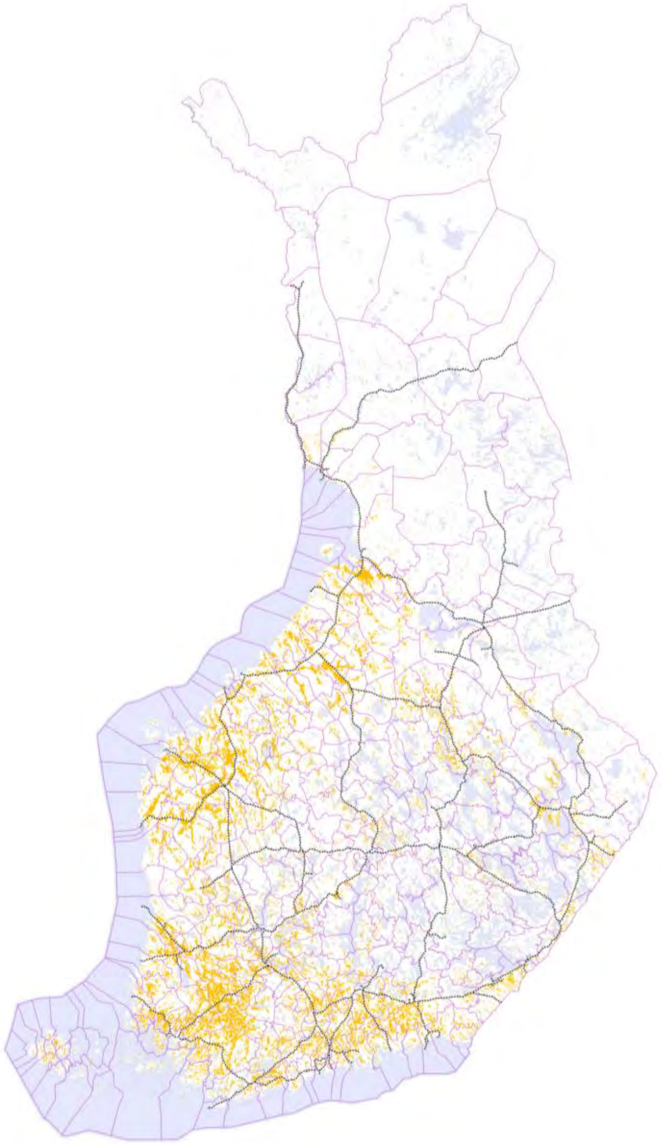
Sorvali, Jaana, Kaseva, Janne, Vainio, Annukka, Verkasalo, Markku, and Peltonen-Sainio, Pirjo. (2022). Value priorities of the Finnish farmers – Time to stop thinking of farmers as inherently conservative and traditional. Journal of Community and Applied Social Psychology, 32:2, 212-240. https://doi.org/10.1002/casp.2561

IV

Sorvali, Jaana; Liu, Xing and Janne Kaseva (2022). Climate change opportunities reduce farmers' risk perception: extension of the Value-Belief-Norm theory in the context of Finnish agriculture. Frontiers in Psychology, 13. https://doi.org/10.-3389/-fpsyg.2022.939201

Agriculture in Finland

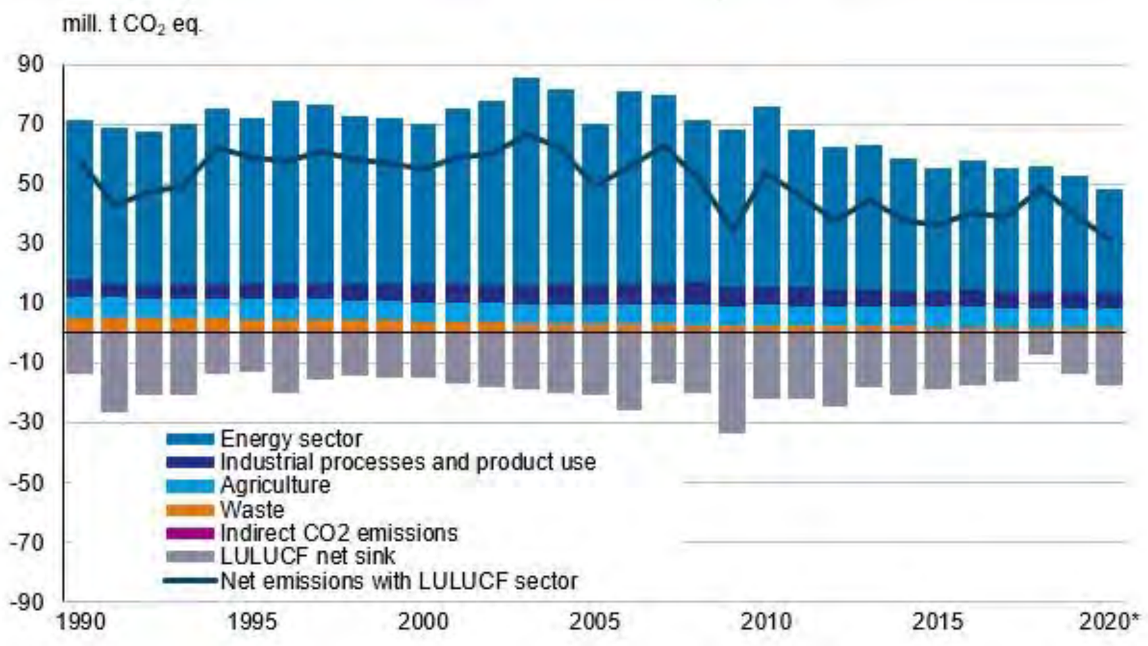
- 98 000 farms (1995) – under 50 000 farms (2020)
- Average farm size 51 hectares (EU 15 ha; USA 180 ha)
- Average farmer age 53 years
- 86 % family-run farms
- Almost 70 % plant production
- Little less than 30 % livestock (dairy)
- Around 14 % organic farms
- Common Agricultural Policy (CAP) of the EU



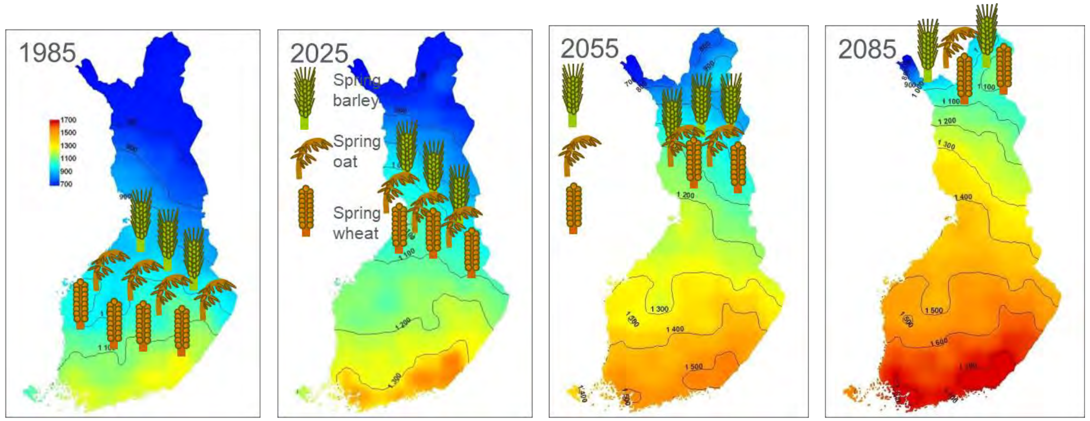
Agricultural land in Finland.
Areas under cultivation are marked in yellow (Näsi, 2018).

Climate change and agriculture

- Challenges
  - ✓ weather extremes; disease/pest outbreaks
- Opportunities
  - ✓ longer growing season, new crops, northward shift of cultivation
- Adaptation necessary
- Mitigation obligation under the Paris Agreement
  - ✓ emission levels stayed quite stable for 30 years
- Poor economic profitability
- Heated and emotional public discussion
- Peatlands (10 % land - 60 % emissions)
- Agricultural lands as carbon storage ("carbon farming")



Finland's greenhouse gas emissions and removals by sector and the sum of all sectors, where the net sink of the LULUCF (land use, land-use change, and forestry) sector is deducted from the combined emissions of other sectors. *Based on preliminary data (OSF, 2020).



Peltonen-Sainio, P., Jauhiainen, L., Hakala, K., Ojanen, H., 2009. Climate change and prolongation of growing season: changes in regional potential for field crop production in Finland. *Agricultural and Food Science 18: 171–190.* 19 climatic models, Finnish Meteorological Institute (± 15 years).

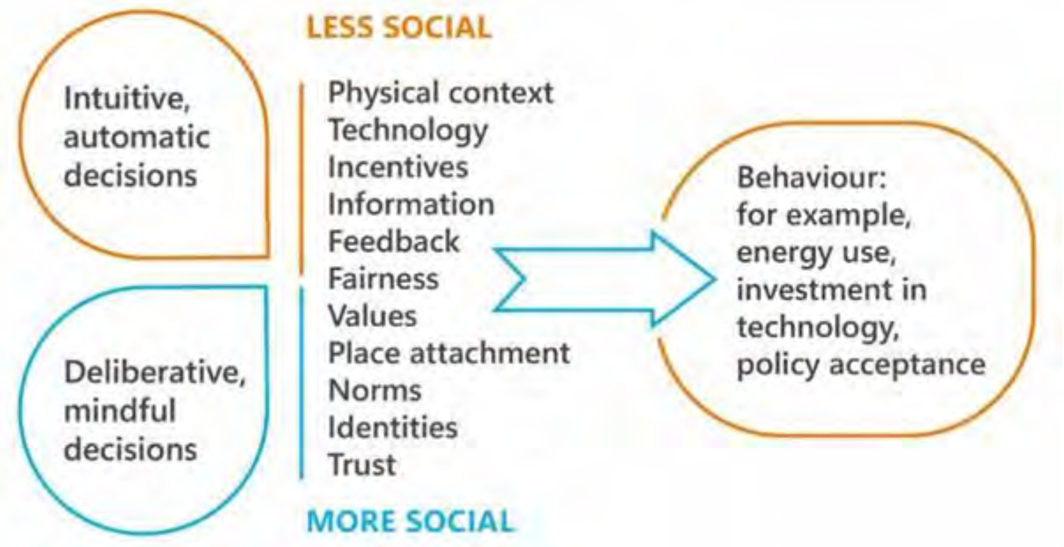
Environmental psychology

Studies the interplay between individuals and the built and natural environment (Steg et al., 2019).

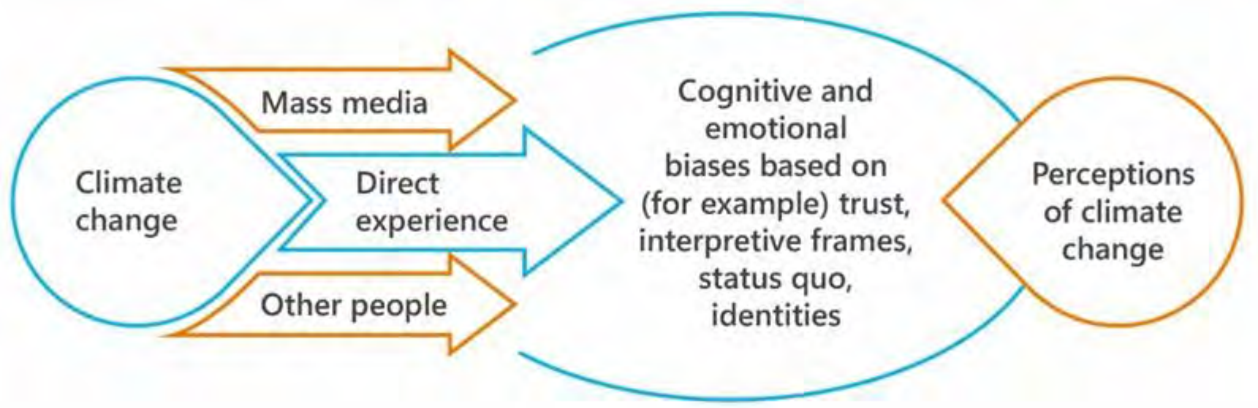
The focus of the discipline is to find ways to change people's behavior towards more environmentally friendly practices and simultaneously preserve well-being and quality of life. Environmental psychology can:

1) describe and explain the human causes of climate change by understanding how and why humans consume or behave otherwise in a way that increases emissions;
2) describe and explain the human consequences of climate change by understanding how it will affect humans (e.g. quality of life, mental health);
3) describe, explain, and inform responses to climate change (such interventions and campaigns); and
4) understand people's thoughts and feelings about climate change that in turn influence their motivations and pro-environmental behavior (Swim et al., 2011).

Environmental psychology and climate change

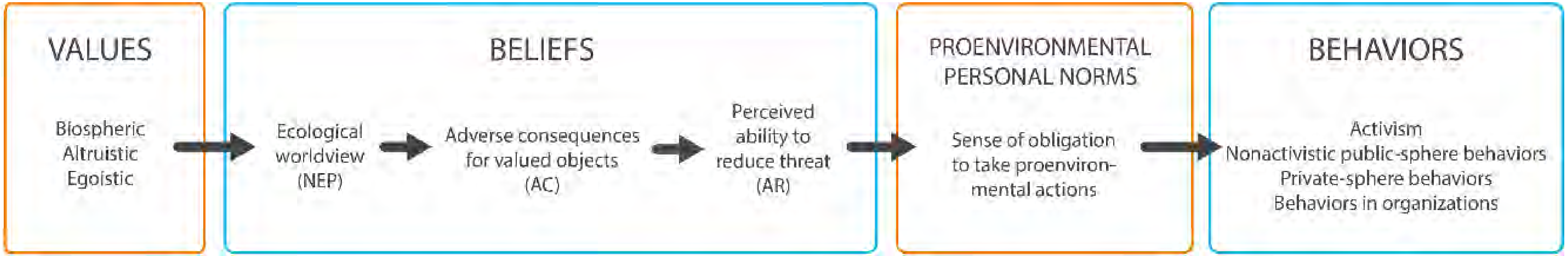


Factors influencing behavior relevant to climate change.
Modified from Clayton et al. (2015).



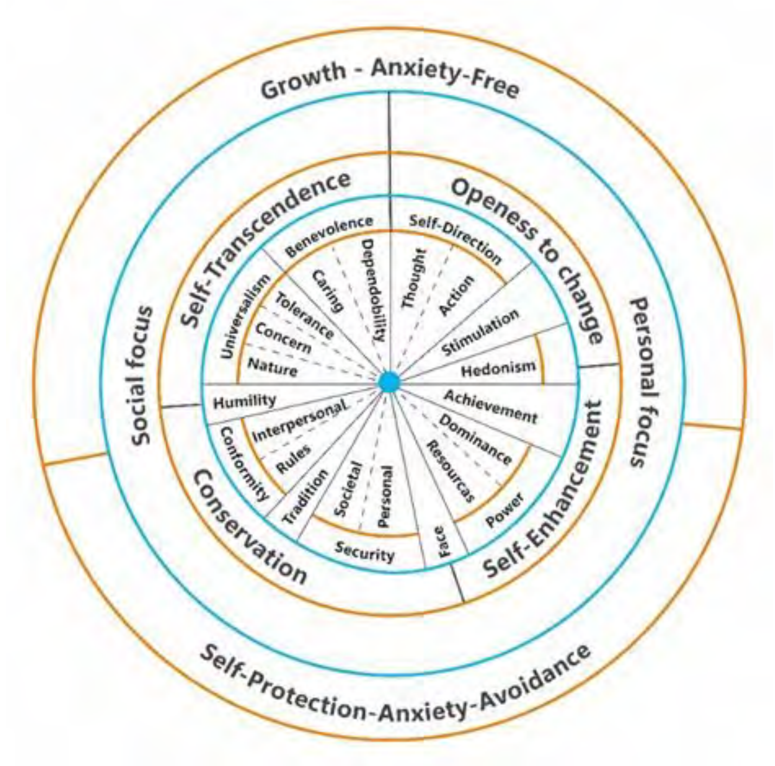
Climate change perception. Modified from Clayton et al. (2015).

Value-belief-norm theory (Stern, 2000)



The original VBN theory (Stern, 2000).

Theory of basic human values (Schwartz et al., 2012)



Value (abbr.)	Conceptual definition in terms of motivational goals
Self-direction-thought (SDT)	Freedom to cultivate one's own ideas and abilities
Self-direction-action (SDA)	Freedom to determine one's own actions
Stimulation (ST)	Excitement, novelty, and change
Hedonism (HE)	Pleasure and sensuous gratification
Achievement (AC)	Success according to social standards
Power-dominance (POD)	Power through exercising control over people
Power-resources (POR)	Power through control of material and social resources
Face (FAC)	Security and power through maintaining one's public image and avoiding humiliation
Security-personal (SEP)	Safety in one's immediate environment
Security-societal (SES)	Safety and stability in the wider society
Tradition (TRA)	Maintaining and preserving cultural, family, or religious traditions
Conformity-rules (COR)	Compliance with rules, laws, and formal obligations
Conformity-interpersonal (COI)	Avoidance of upsetting or harming other people
Humility (HUM)	Recognising one's insignificance in the larger scheme of things
Benevolence-dependability (BED)	Being a reliable and trustworthy member of the ingroup
Benevolence-caring (BEC)	Devotion to the welfare of ingroup members
Universalism-concern (UNC)	Commitment to equality, justice, and protection for all people
Universalism-nature (UNN)	Preservation of the natural environment
Universalism-tolerance (UNT)	Acceptance and understanding of those who are different from oneself

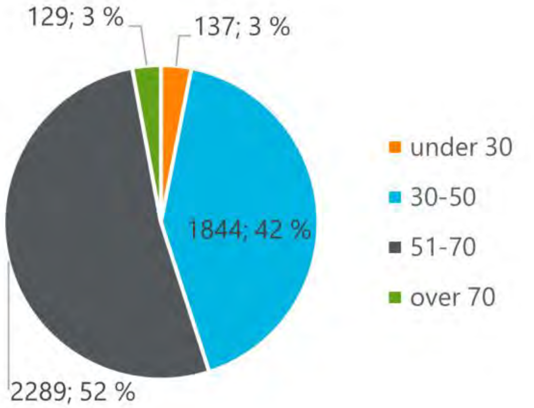
Data and methods

- Interviews and group discussions with farmers in 2016-2019
  - ✓ 20 farms across Finland
- 2018 survey on farmers' views
  - ✓ Values, climate perceptions, farming methods and future perspectives
  - ✓ Representative sample, 4401 responses (12%)
- Follow-up survey in January 2020
  - ✓ 2000 responses (45%)
- 2022 third survey
- 2024 fourth survey
  - ✓ Not used in thesis

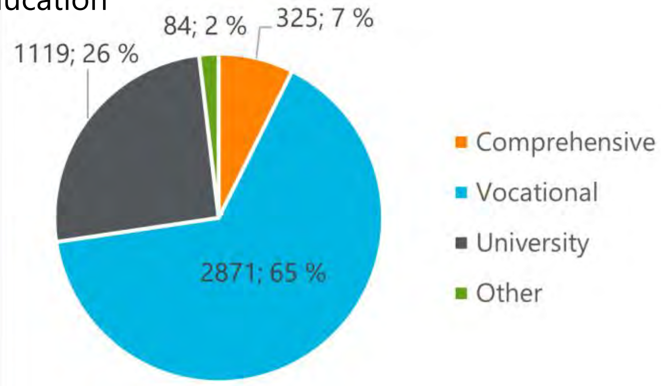
Article	Analysis	Analysis methods
I	Statistical differences in group means	One-way analysis of variance (ANOVA)
	Statistical differences in group means, post-hoc test for more than two groups	Tukey's HSD test
II	Statistical differences in group means, two groups	Independent samples t-test
	Statistical differences in group means	One-way analysis of variance (ANOVA)
	Statistical differences in group means, post-hoc test for more than two groups	Tukey's HSD test
	Internal consistency of sum variables	Cronbach's alpha
	Combined variability of different variables	Pearson's r
III	Internal consistency of sum variables	Cronbach's alpha
	Structural distances between variables	Multidimensional scaling (MDS)
	Divergence of the total residuals from real values (model estimation for MDS)	Badness-of-fit-criterion (BOC)
	Structure test of four higher-order values	Confirmatory factor analysis (CFA)
	Goodness-of-fit of the CFA models	Root Mean Square Error of Approximation (RMSEA), Standardised Root Mean Square Residual (SRMR), Comparative Fit Index (CFI), and Chi-square test
	Statistical differences in group means	One-way analysis of variance (ANOVA)
	Statistical differences in group means, post-hoc test for more than two groups	Tukey's HSD test
	Effect size evaluation	Hedges' g
IV	Internal consistency of sum variables	Cronbach's alpha
	Combined variability of different variables (non-parametric)	Spearman's rho
	Relations between the sum variables	Path model
	Estimation technique	Maximum likelihood (ML) estimation
	Model evaluation	Lagrange's multiplier test
	Statistical differences	Chi-square test
	Goodness-of-fit of the path models	Root Mean Square Error of Approximation (RMSEA), Standardised Root Mean Square Residual (SRMR), Comparative Fit Index (CFI), and Chi-square test

Respondent demographics (2018)

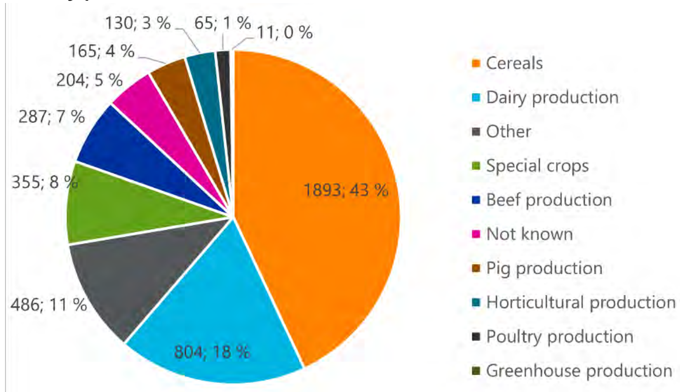
Age



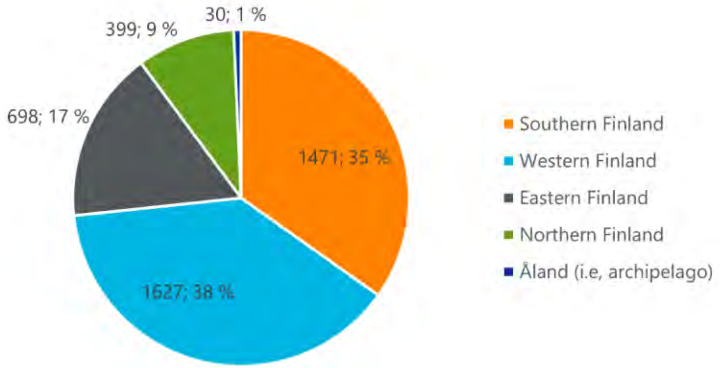
Education



Farm type



Region

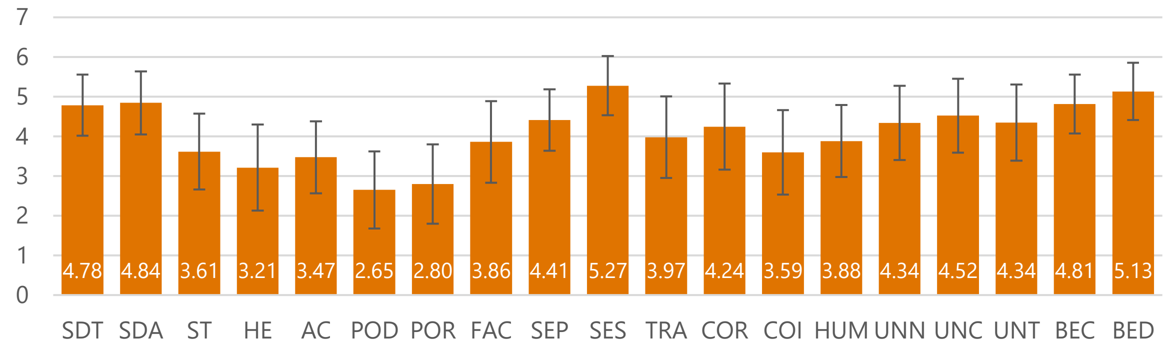


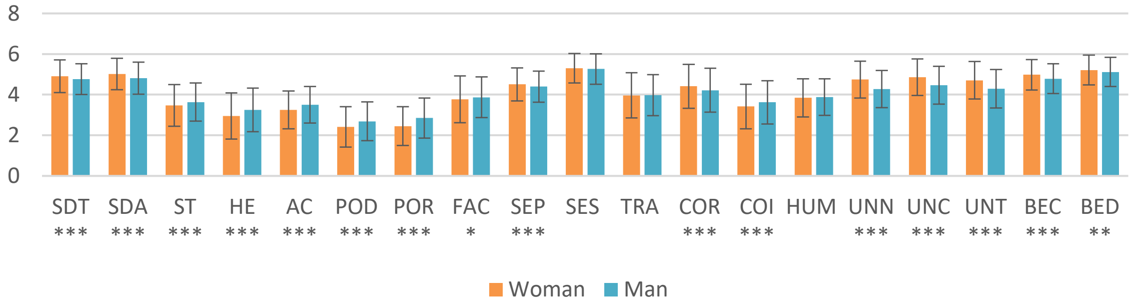
	Survey 2018		Survey 2020	
	N	%	N	%
ımber of farms	4,401		2,000	
Gender[1]				
Female	569	*13*	223	*11*
Male	3,831	*87*	1,777	*89*
Age				
under 30	137	*3*	12	*1*
30-50	1,844	*42*	719	*36*
51-70	2,289	*52*	1,167	*58*
over 70	129	*3*	98	*5*
Education[2]				
Comprehensive	325	*7*	138	*7*
Vocational	2,871	*65*	1,229	*62*
University	1,119	*25*	615	*31*
Other	84	*2*	18	*1*
Farming system				
Organic[3]	657	*15*	312	*16*
Conventional	3,743	*85*	1,688	*84*
Farm size (ha)				
less than 30	1,792	*41*	758	*38*
30-49	876	*20*	412	*21*
50-99	1,053	*24*	494	*25*
100 and over	679	*15*	302	*15*
Revenue (euros)[4]				
less than 20 000	886	*20*	418	*21*
20 000-50 000	1,111	*25*	520	*26*
0 000-100 000	914	*21*	382	*19*
000-300 000	1,032	*23*	469	*23*
00 - 500 000	280	*6*	116	*6*
- 1 000 000	176	*4*	67	*3*

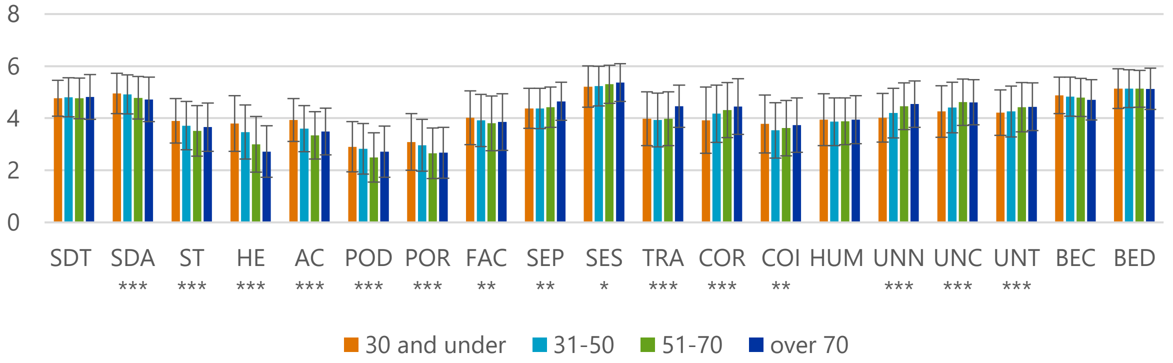
Finnish farmers’ values

Values are “desirable transsituational goals, varying in importance, that serve as guiding principles in the life of a person or other social entity” (Schwartz, 1994: 21).

- Societal security (SES), benevolence (BED, BEC) and self-direction (SDA, SDT) values were most important
- Societal security important for all farmer groups
- Differences between groups:
  - ✓ Gender: universalism/ self-direction, power
  - ✓ Age: hedonism, achievement, power/ tradition, universalism
- Universalism (UN), benevolence (BE)and hedonism (HE) values are connected with environmentally friendly behavior



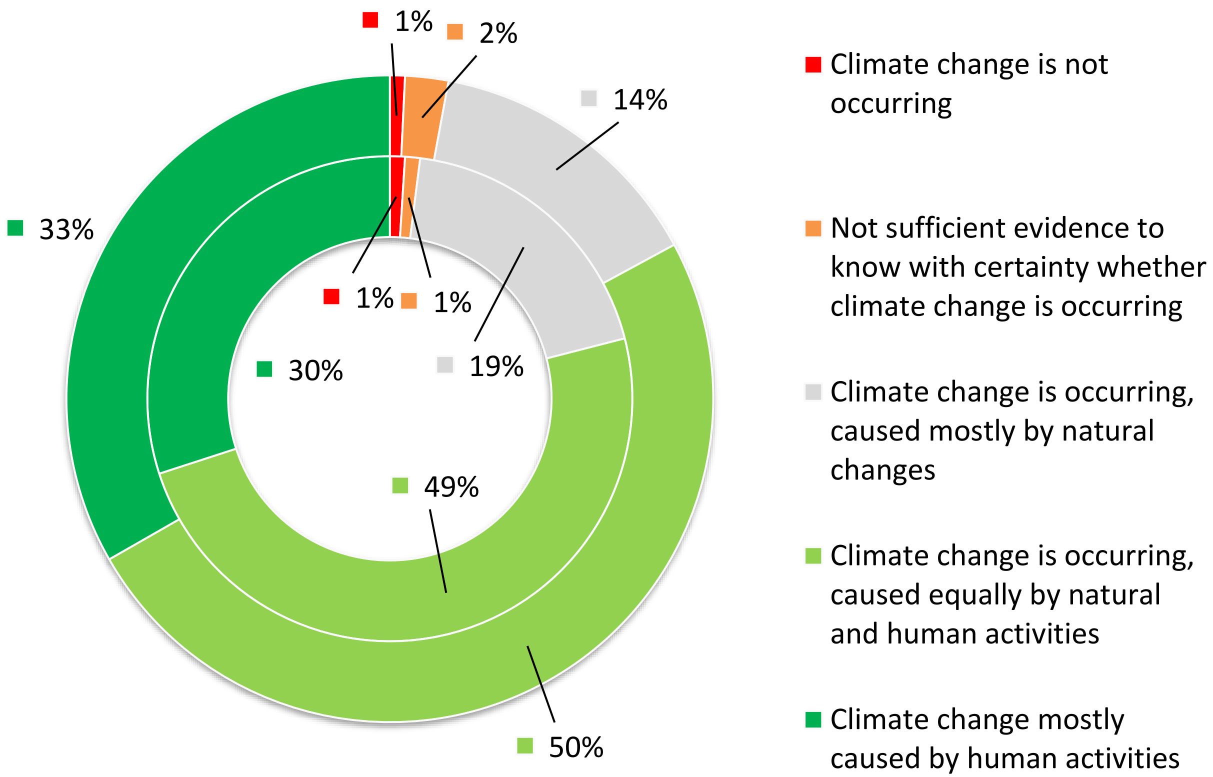




Belief in climate change

Belief means one’s personal knowledge of things. It can be scientifically correct or not. What is important is that the person believes it to be true (Heberlein, 2012).

- Climate skepticism among farmers is very low
- Disagreement concerning the cause of climate change
- Belief in anthropogenic climate change had slightly declined in two years in all farmer groups
- Anthropogenic origin of climate change was more supported by women, older farmers, university-educated farmers, organic farmers, farmers with smaller farms, and farmers from the eastern and southern parts of Finland and from Åland
- Belief of anthropogenic origin connected with felt possibility to mitigate



Finnish farmers’ climate change belief in 2018 (outer ring, N=4397, mean=4.13, SD= 0.73) and in 2020 (inner ring, N=2000, mean=4.06, SD=0.78). Respondents were asked to “Choose a statement that best describes your opinion”.

Risk perception and personal experience of risks

Risk perception (or awareness of consequences) entails the belief that environmental conditions such as climate change threaten something one values (Steg et al., 2005). It is the subjective judgement of people concerning a risk (IPCC, 2018).

- Most farmers (74%) acknowledge climate change to be a threat to global agriculture
- Only a third of the farmers considered climate change a threat to agriculture in Finland and another third disagreed with the statement
- No variation between 2018 and 2020
- Men and conventional farmers regarded both the national and global threat as less serious than did women and organic farmers
- For the global threat, no other differences between different groups were found
- Younger farmers and farmers with smaller farms regarded the threat to Finnish agriculture as less severe

- Climate risks are identified and expected to increase in the future
  - ✓ Milder winters, more frequent heavy rains, pressure from diseases, pests, floods, and weeds were expected to become more common in the future

Personal experience of risks

- Climate change related risks to agriculture were not felt constantly
- Most observed risks not directly connected to climate change

"During the last 20 years, we've seen the coldest, warmest, driest, and wettest years on record. ***Something is happening to our environment****."*

Climate change opportunities

Climate change opportunities can be direct opportunities caused by global warming and indirect opportunities where an action becomes beneficial because of the need to adapt to or mitigate climate change

- Many Finnish farmers think climate change will bring opportunities to Finnish agriculture
- At a personal level, the opportunities were not seen to be so great

"We need more information about what can be done at farm level to help the climate. ***However, food production in the north will play an increasingly important role in feeding the world's population in the future****, and this must not be risked by wrong or hasty decisions."*

- In 2020 farmers were more positive towards opportunities than in 2018
- Men and farmers with higher education regarded the opportunities more positively
- No differences between age groups
- Research on opportunities is still scarce

Possibility and responsibility for climate action

The **perceived ability to reduce threat** (or the felt possibility to perform pro-environmental behavior) is related to the term self-efficacy: "a judgement of one's capability to accomplish a certain level of performance" (Bandura, 1986).

- Farmers' perception of their possibilities to mitigate climate change at farm level were positive and grew from 2018 to 2020
- Women, highly educated and organic farmers regarded the mitigation possibilities higher than the other groups
- Farm size and region differentiated the perceptions only moderately, age and farm type were not relevant

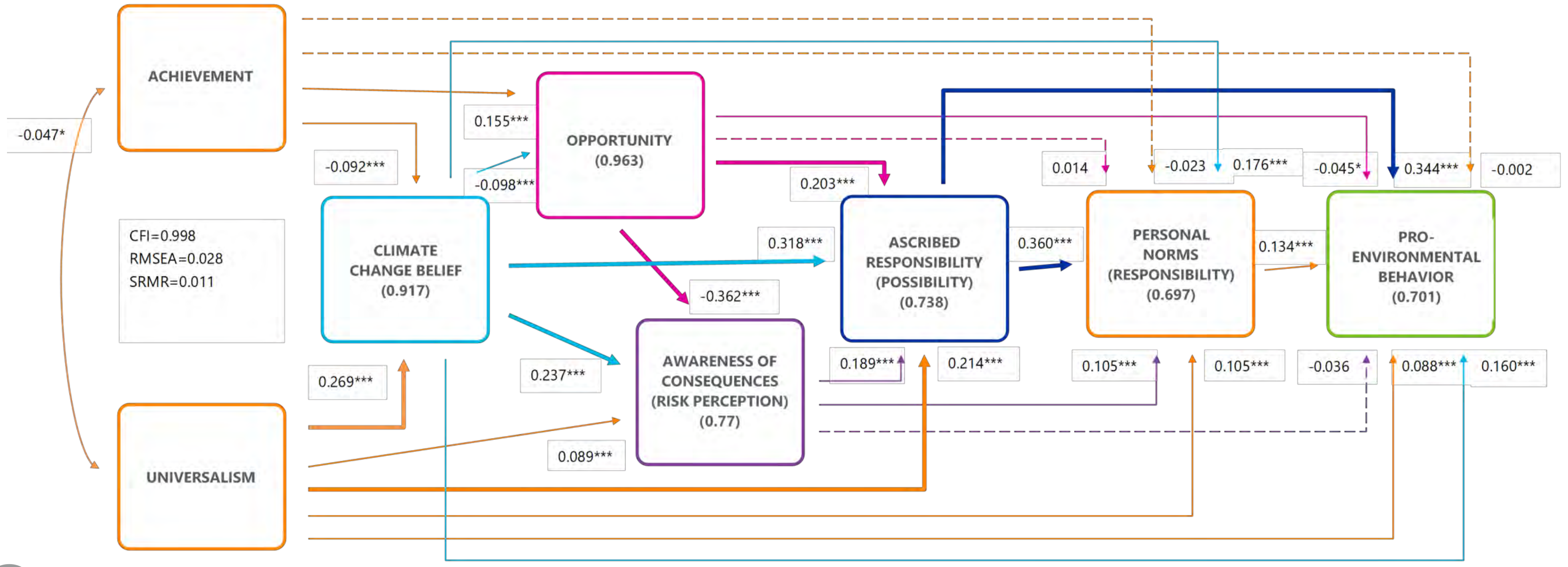
Personal norms are standards or rules for one's own behavior (Kallgren et al., 2000).

- Almost 50% of the farmers believed the agricultural sector should participate in mitigation efforts, and the same number of farmers thought that mitigation was farmers' responsibility.
- Personal responsibility of climate action was significantly lower (34%)
- Sectoral and personal responsibility did not alter between 2018 and 2020
- Greater responsibility for adaptation
  - ✓ Measures clearer and more central to the good land management practices

*"Farmers receive very **conflicting information about climate change and their opportunities to influence the change through their own actions**. For example, more grass should be grown, but there should be no animals (ruminants) that use the grass crop. Vegetation cover should be increased, but at the same time, this will increase plant diseases and pests. Direct sowing will be reduced if the use of glyphosate or similar total herbicides is banned."*

Predictors of farmers pro-environmental behavior

- Responses from 2020 survey formed the basic model
  - ✓ Separate models were built for 2018, women and men, farmers under and over 40, and organic and conventional farmers to enable comparisons between the different farmer groups.
- Plausible predictors of Finnish farmers' pro-environmental behavior in the climate change context existed
- Differences between different group models existed: women, young and organic



Values form the basis

- Achievement values are not directly related to pro-environmental personal norms or pro-environmental behavior
- Achievement had a negative effect on climate change belief and was positively connected to climate change opportunities
    - ✓ farmers with high scores for achievement question the anthropogenic origins of climate change and believe more in the opportunities that climate change will bring to Finnish agriculture
- Universalism had direct positive effect on pro-environmental behavior and all the other elements studied, except for achievement and opportunity
- The effect of universalism on risk perception was stronger when mediated by climate change belief
    - ✓ belief in the anthropogenic origins of climate change does matter for pro-environmental behavior

Possibility an important mediator

- Climate change belief had a positive direct effect on farmers’ felt responsibility for mitigation and on pro-environmental behavior
- Connections were significantly higher when mediated via the possibility element
    - ✓ even if the notion of anthropogenic climate change does motivate farmers on its own, a high understanding that they actually can mitigate makes the effect even stronger
- The felt possibility to mitigate had a direct effect on both responsibility and pro-environmental behavior, and the effect of possibility on pro-environmental behavior alone was quite large, and responsibility’s mediating effect was not very big
    - ✓ felt possibility to contribute to pro-environmental behavior is very important for Finnish farmers and thus the highest predictor of farmers’ pro-environmental action

Opportunity reduces risk perception

- Climate change opportunity had a strong negative connection to risk perception
  - ✓ climate change opportunities reduces the belief in climate change risks to agriculture
- Opportunity was positively connected to the possibility to mitigate climate change
  - ✓ Surprising result
  - ✓ Might be explained my carbon farming possibilities
- Opportunity had a direct negative connection with pro-environmental behavior
  - ✓ This can be understood as farmers' unwillingness to mitigate something that is thought to bring benefits

Conclusions

- Environmental psychology can help us understand farmers' choices and motivations, and plan targeted policy and interventions
- No single unitary group of "farmers" exist
- The age of the farmer was one of the most interesting demographic variables studied. Younger farmers:
  - ✓ Were more skeptical about climate change and its risks
  - ✓ felt less responsibility to mitigate climate change
  - ✓ believed more in their possibilities to adapt to the changes than older farmers
- Possible consequences of climate change can also be opportunities as well as risks
  - ✓ Should be taken into consideration when modeling behavior
- Risks associated with climate change are not related to farmers' everyday experiences that would lead to pro-environmental behavior
- Opportunities reduce the notion of risks
- Farmers' felt possibility to mitigate climate change proved to be the most important predictor of pro-environmental behavior

Recommendations

1) Variability of mitigation and adaptation measures should be offered and supported. This variation of measures will ensure that policy will be accepted and thoroughly implemented by farmers.

2) The same variability should apply to the climate-change-related communication, knowledge sharing, and education of farmers, as different farmers place an emphasis on differing elements of climate change perceptions.

3) Discussion of climate change opportunities should not be avoided but openly embraced. An open discussion and thorough understanding of climate change opportunities would help solve this bias and prepare our farmers and policy instruments for the future opportunities.

4) Agricultural research and policy should prompt tangible climate change mitigation practices that are easily applicable at farm level and have proven environmental benefits. These practical measures and other farmers' experiences will increase farmers' motivation to mitigate climate change.

5) As farmers are the best specialists in their own field of work, farmers with different backgrounds should be invited to participate in the planning of the policy processes alongside other specialists, policymakers, and researchers.

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Thank you!

OPAL·Life
Life
AC
HE
POR
POD
VALUES
UNN
UNT
UNC
BEC
TRUST
Q136-152
PERCEPTION OF POSSIBILITY
Q101-106
PAST BEHAVIOR
Q91+92+95
KNOWLEDGE
Q90-100
Q135
Q135
BELIEFS
MEDIATE
CLIMATE CHANGE BELIEFS
AWARENESS OF (AC) CONSEQUENC.
ASCRIBED RESPONSIBILITY (AR)
Q101-109
Q81-89
Q119+121
NORMS
PERSONAL NORMS (PN)
PREDICT
CLIMATE SMART
Q110-114
Q115-118
Q110+112
PERCEPTION OF RISK
Q107-108
Q108
PERSONAL EXPERIENCE
Q1-11
Q81-89
PERSONAL EXPERIENCE OF POSSIBILITY
Q12-19
2018
2020
ADAPTATION
2018
2020
MITIGATION
Risk
Poss.
Risk

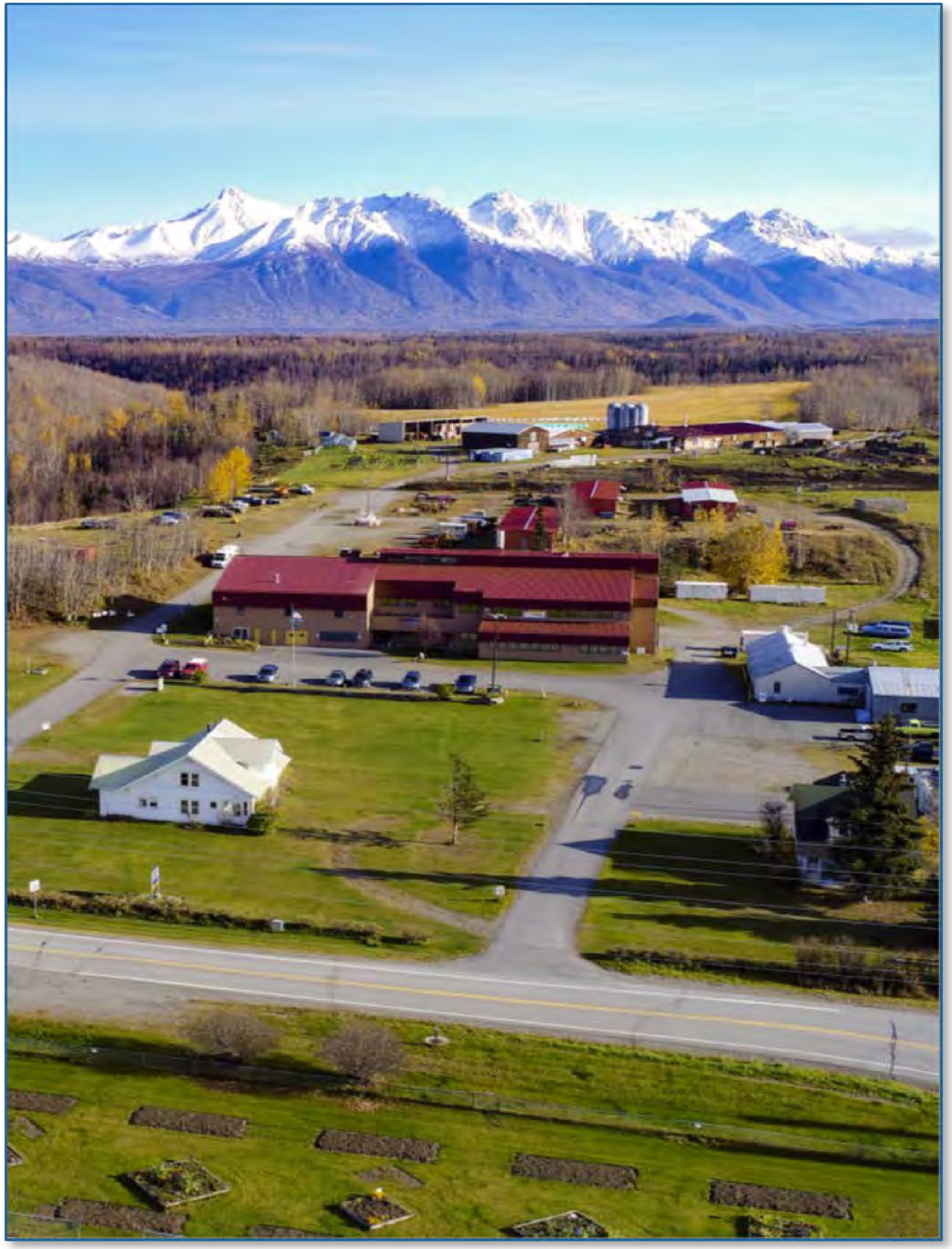
University of Alaska Fairbanks:

100 years of agriculture in Alaska and the Alaska food system

Jodie Anderson

Director, UAF Institute of Agriculture, Natural Resources and Extension

Circumpolar Agriculture Conference
5 September 2023



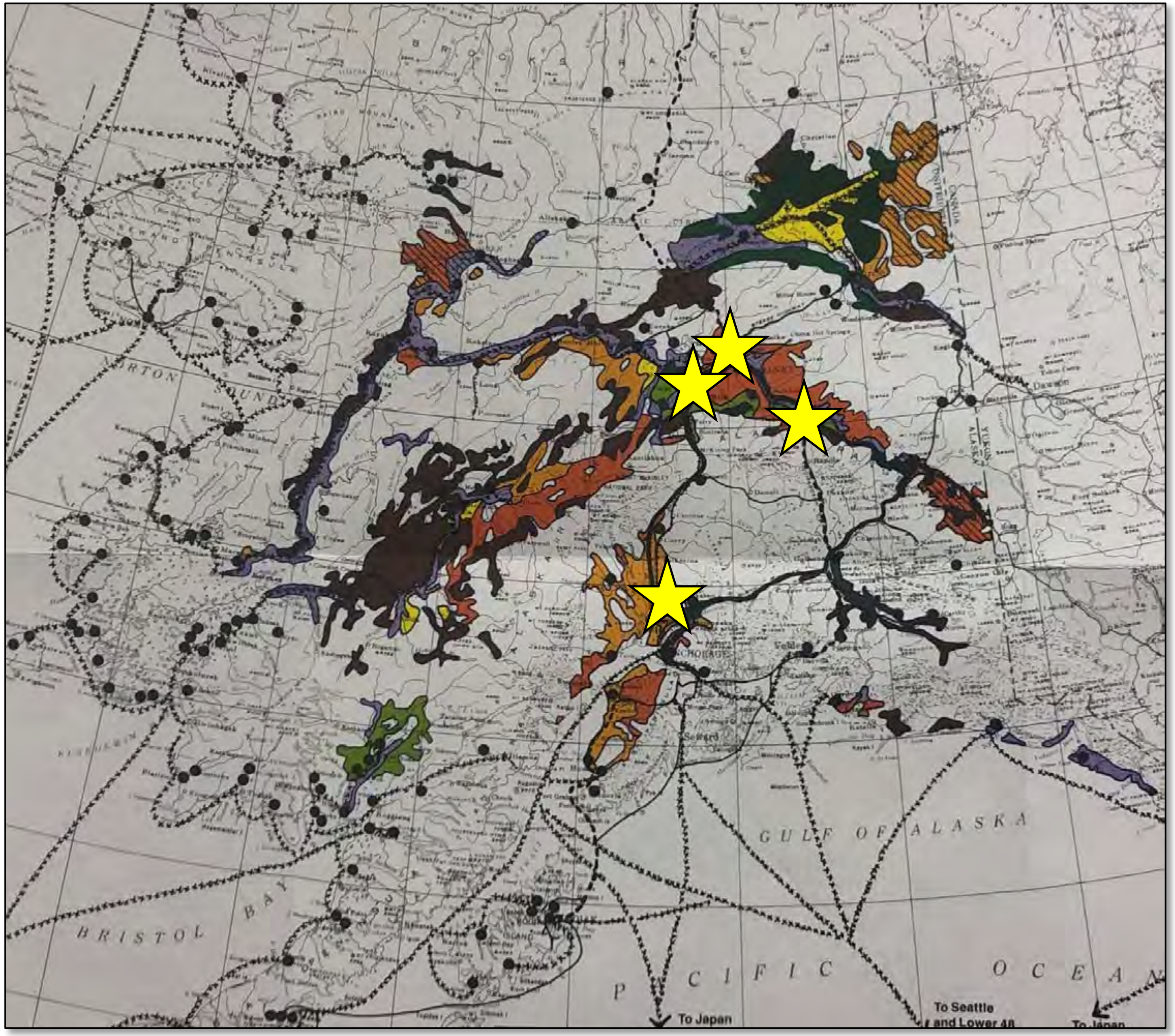
INSTITUTE OF AGRICULTURE, NATURAL RESOURCES & EXTENSION

University of Alaska Fairbanks

Some Perspective. . .

https://www.nrcs.usda.gov/wps/portal/nrcs/ak/technical/dma/nrcs142p2_035899/

Agricultural Soils in Alaska – March, 1983



★ Indicates AFES locations

Agriculture in Alaska

- 990 farms statewide *
- 849,753 acres (343882.8 ha) in ag production *
- $70.5 million USD market value of ag products sold (up 20% since 2012 census) *
- $14.4 million USD net cash farm income (up 68% from 2012 census) *
- 62 farmers markets in 2023 - from 13 listed in 2005, 37 in 2014, and 41 in 2017

*2017 USDA Ag Census

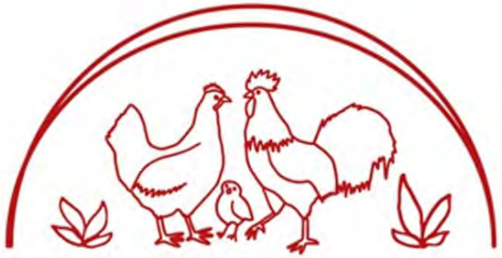
SMALL, BUT **MIGHTY.**

The number of small farms (1-9 acres) is **up 73%**. It doesn't take a lot of space to grow food in AK!

47%

OF ALASKAN FARMERS ARE **WOMEN**

National average: 27%



ALASKA IS

#1 IN THE NATION

FOR NEW FARMERS.

46% of Alaskan farmers have **less than 10 years** of farming experience. We are **#1 in the Nation** for beginning farmers.

THE NUMBER OF ALASKA FARMS GREW

30%

OVER THE PAST 5 YEARS.

This goes against the national trend of a 3% decrease in the number of farms - but we're growing!

THE VALUE OF FOOD SOLD DIRECTLY TO CONSUMERS INCREASED FROM **\$2.2 MILLION** IN 2012 TO **\$4.5 MILLION** IN 2017

All data from 2017 USDA Ag Census

ALASKA FARMLAND TRUST

Hunger in Alaska

- 14% Alaskans struggle with hunger *
- 20% Alaska kids live in homes that may not have enough food *
- Roughly 1 in 10 Alaska seniors faces the threat of hunger *

* Food Bank of Alaska

Alaska Food System

- Strong subsistence lifestyle
- 95% of our food is imported
- Transportation is expensive and complicated
- Poor post-harvest infrastructure
- Insignificant agricultural industry

UAF
INSTITUTE OF AGRICULTURE, NATURAL RESOURCES & EXTENSION
University of Alaska Fairbanks

Questions?

Thank you!

jmanderson@alaska.edu

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Torshavn Faroe Island

Bernt *Skarstad*

Leader of Norsk Bonde og Småbruker associaation in county of Nordland , Norway

Norsk Bonde- og Småbrukarlag

Background

<u>Farmer and entreprenur</u>

- Dairy cow, beef cattle, pig
- Grass and Sea weed production
- Outfield building buisness
- Norges Bondelag 15 year (6 year leader)
- Norsk Bonde og Småbrukerlag 3 year (1 year leader)
- Artic Farming

Tema

- Norwegian agricultural model
- Farmers organizations
- Cooperative organizations
- Agricultural agreement
- Artic farming

Norvegian agricultur model

- Norway was wery poor 1800 ----
- How did the Norwegian agricultural model became ?
- Why
- Four Pilars
- Agrucultural agreement system
- Import protection
- Market balancing
- Legal instruments / rules
- How do you relate to the Norwegian agricultural model?

- Negotiating parties
- The State at the Ministry of Agriculture and Food
- Norges Bondelag (Norwegian Farmers Associtian) 60 000 members
- Norsk Bonde og Småbrukerlag (NorvegianFarmer and smallholder association) 10 000 members
- Democratic prosess
- Complicated calculation prosesses

Prosess line for the Norwegian Agricultural agrement

NORGES BONDELAG

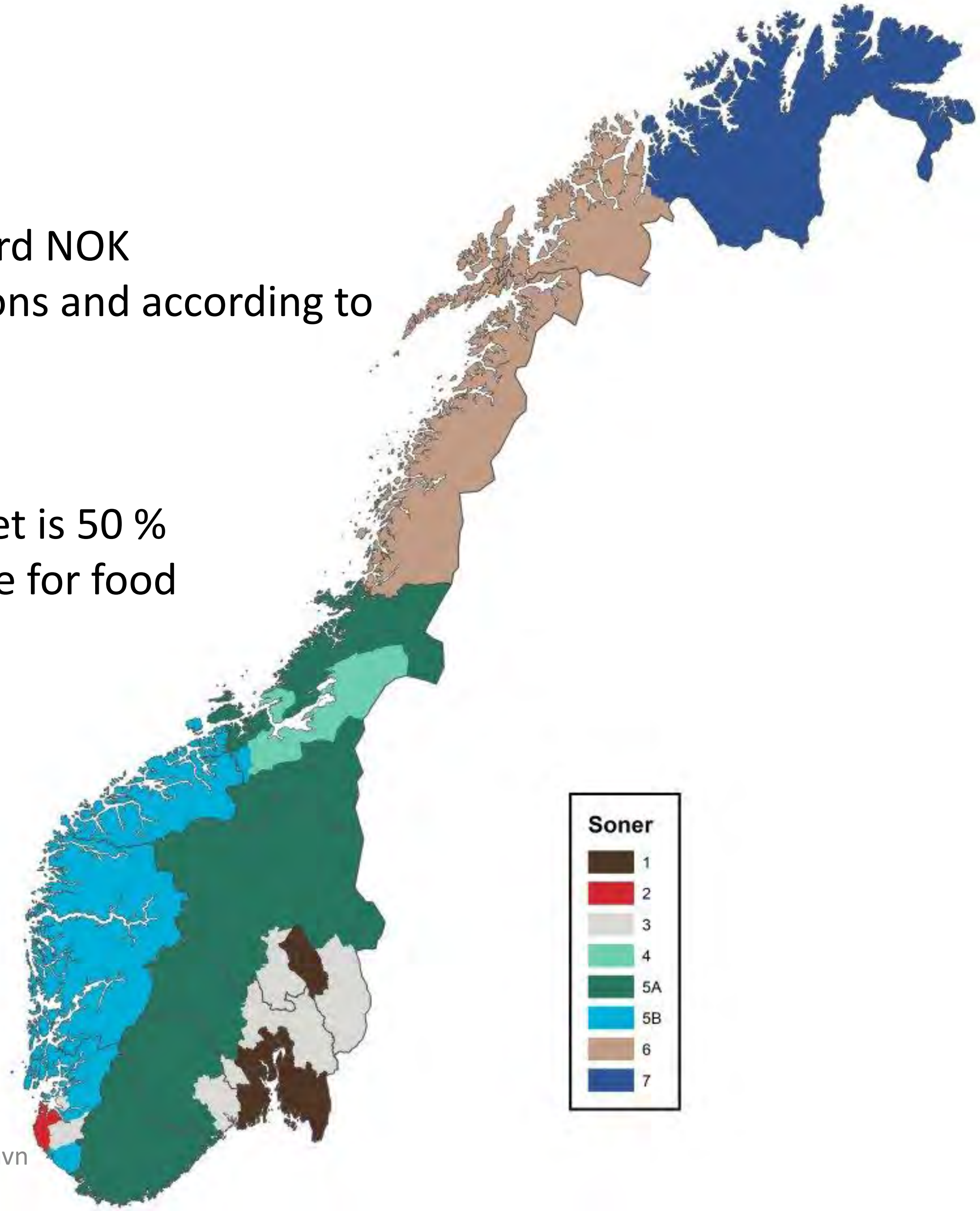
Norsk Bonde- og Småbrukarlag

TINE
Nortura
Felleskjøpet
Norsvin
Gjensidige
HONNING CENTRALEN
geno
NLT
TYR FRA AVL TIL BIFF
NORGES PELSDYRALSLAG

Felleskjøpet Rogaland Agder — siden 1899
Landkreditt
gartnerhallen
Norges Skogeierforbund
Norsk Landbruksrådgiving
NSG Norsk Sau og Geit
HOFF

Budget for agro agrement is about 20 mrd NOK
Product prices + subsidies create value for about 200 mrd NOK
Subsidies are distributed according to operaring conditions and according to where you live in Norway
Price writedownon grain

Norway is only 40 % self sufficient in food . Political target is 50 %
Norwegian consumers spend about 11 to 12 % of income for food
Norwegian consumers throw away 30 % of all food
Norway has very good infrastruktur
Norway has particulary good animal health



Norwegian agricultur modell a suksess or not

- Very democratic prosess
- Political focus on agriculture every year
- 13,5 % of cultivated area is not in use, mostly in north of Norway
- Much of the grazing area is not in use anymore
- More than one farm stop farming every day in Norway, mostly in the north
- The average age of farmers is 54 year
- We import 60%of what we eat.
- Potential for much more agriculture
- Is Norway the next Dubai ? (I HOPE NOT)

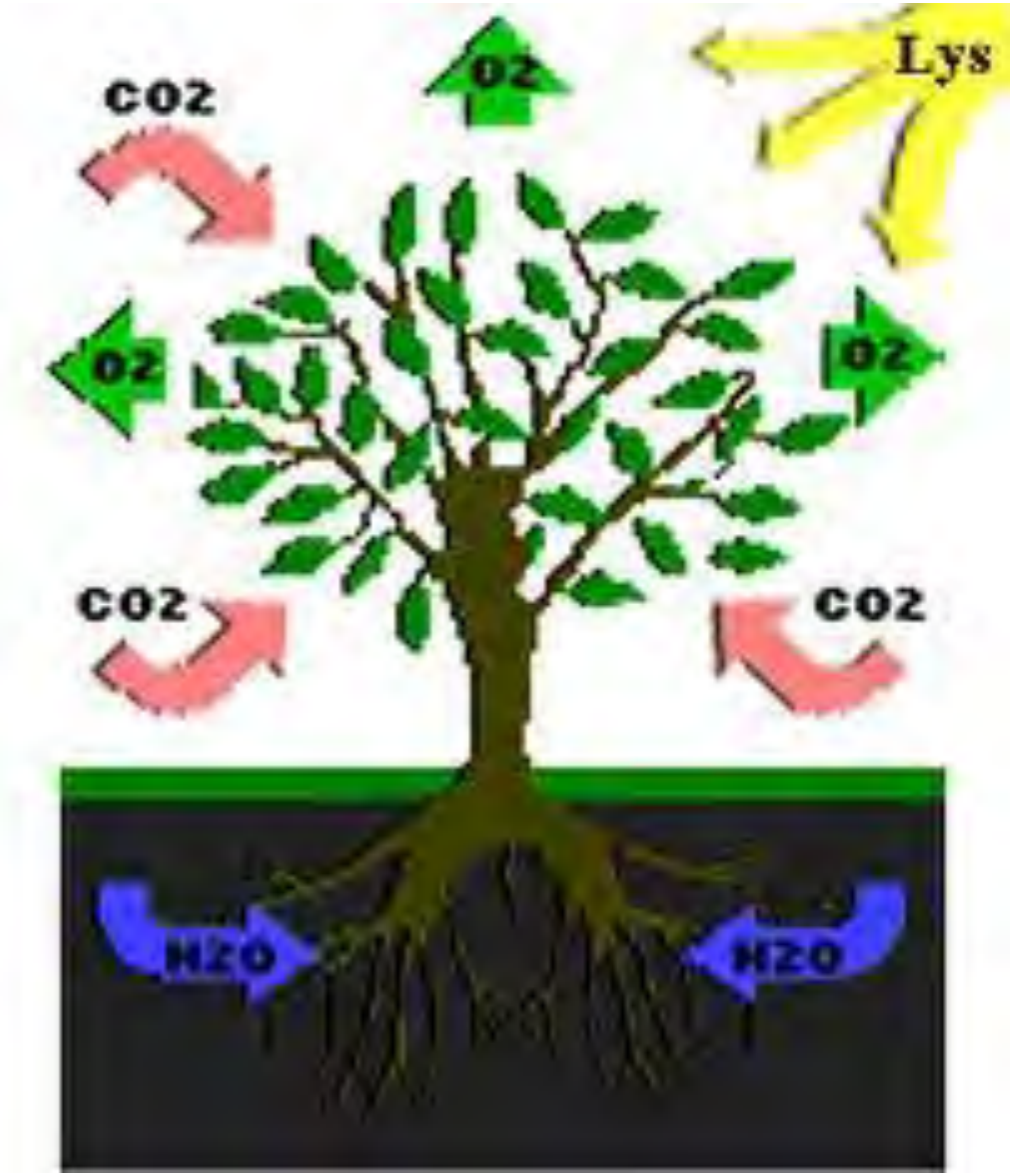
Artic agriculture

<u>Vision</u>

Best in the World at Artic agriculture

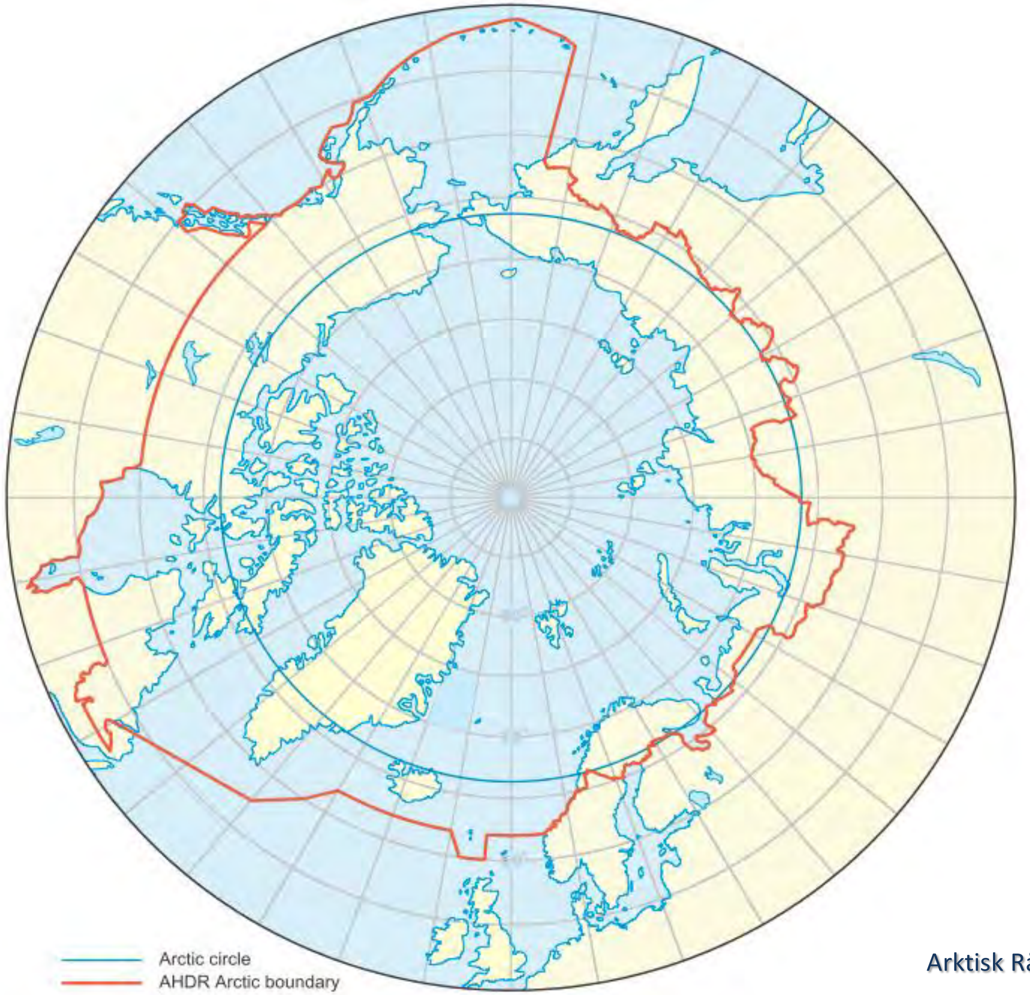
Senter for artic agriculture
NIBIO Holt Tromsø

The most powerfull and sustainable energi .

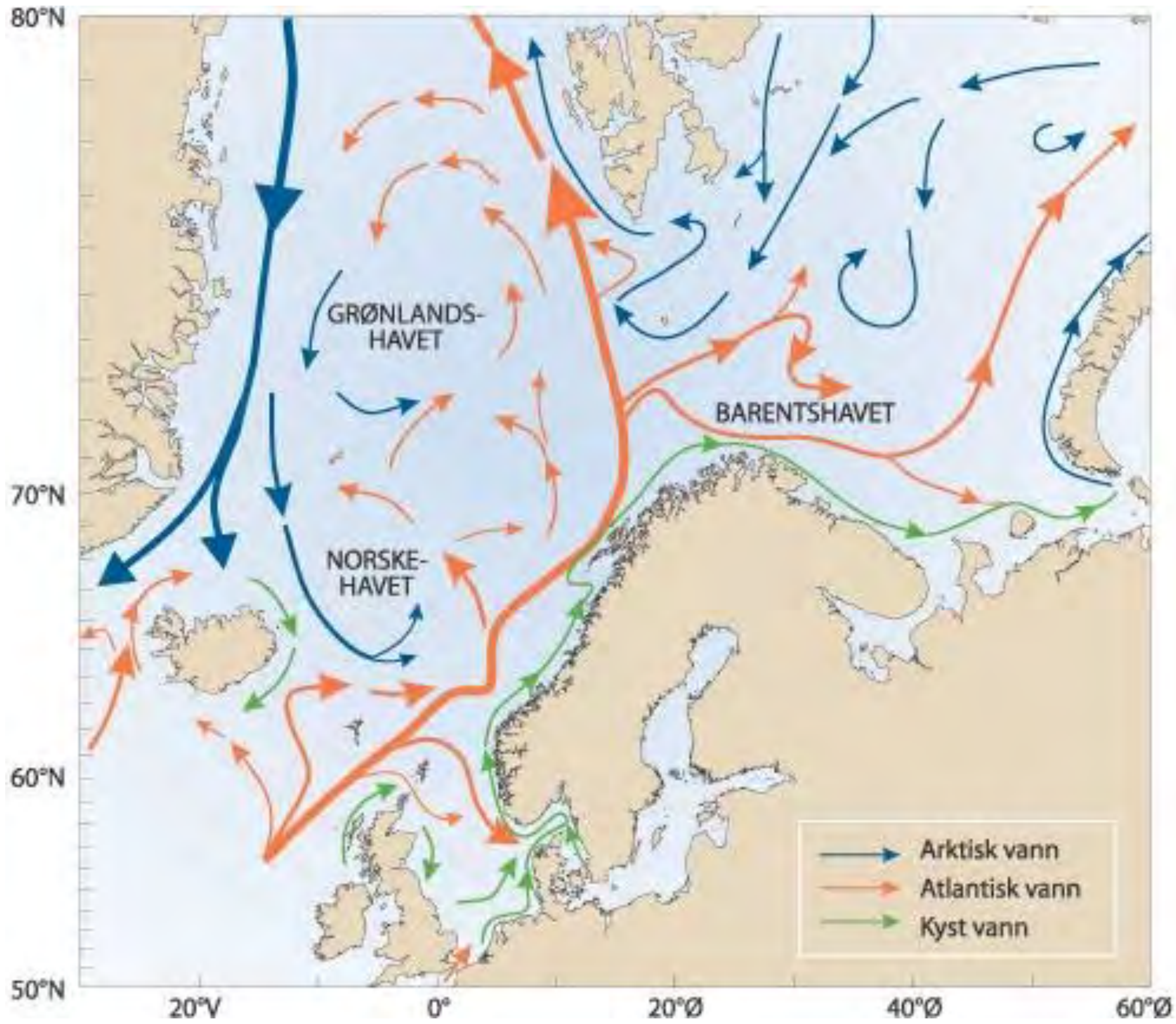


Photosynthes is is my religion

Artic limit made of Artic council



Arktisk Råd/Arctic Council


80°N
70°N
60°N
50°N
20°V
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20°Ø
40°Ø
60°Ø
GRØNLANDS-
HAVET
NORSKE-
HAVET
BARENTSHAVET
Arktisk vann
Atlantisk vann
Kyst vann

Artic agriculture

- Unik, clean and sustainable
- Take care of our own food production
- Environmentally correct
- More focus on our own food production in the Artic area
- Build a brand of Artic produkt

Potential in Artic agriculture

- Potential for increasing production of products from arctic agriculture
- More grazing animal
- Economic potential
- Culture
- Politics
- Human hands

Potential Artic agriculture

- Vegetables with unique quality
- Grazing animals:
  - Sheep
  - Reindeer
  - Beef animals
- Fish farming, fisheries
- Sea weed farming
- Tourism
- Food preparation in an unstabil World


Nicolaisen©2008

ARCTIC COUNCIL

- More focus on bio-economy
- More focus på internasjonal artic agriculture
- Arctic agriculture is a part of the climate solution
- The Golf stream , photosynthesis, sun 24 hour , midnight sun , winterthime , small – scale agriculture gives us unique adventage.
- Artic agriculture need political plan
- Artic product have a unik taste and experience who is sign of research

Salution from CAC 2023 (Bernt,s Wishes)

- CAC want to be political connect to Artic Consil
- CAC gives responssibility to X person as a workgroup for to make a dokument to present for Artic Concil
- The group need a leader , and some økonomi for this work
- The group need close contakt with administration of Artic Concil
- Plan is to have a dokument ready soon as posible

Artic agriculture

<u>Word of the day !</u>

If we not are a part of the solution, we will soon become part of the problem!

We need a political connection to Artic Concil

We can be best if we want enough!

Bernt Skarstad

Thank you for your attention
Bernt




AGRICULTURAL FOOD PRODUCTION IN THE FAROE ISLANDS AND PROSPECTS FOR FUTURE FOOD PRODUCTION

Jens Ivan í Gerðinum, Agricultural Counsellor

FAROESE AGRICULTURE

A timeline through Faroese farming

Current status of Faroese farming

Objective for the future of Faroese farming

2023

FARMING IN THE FAROES

From settlement our culture has been based on farming

Gradually developing and adapting to local conditions

Landraces evolved

Industry development and fisheries made a shift in local economy, and livelihoods

Breeds went extinct, and farming as sector, neglected to some extent

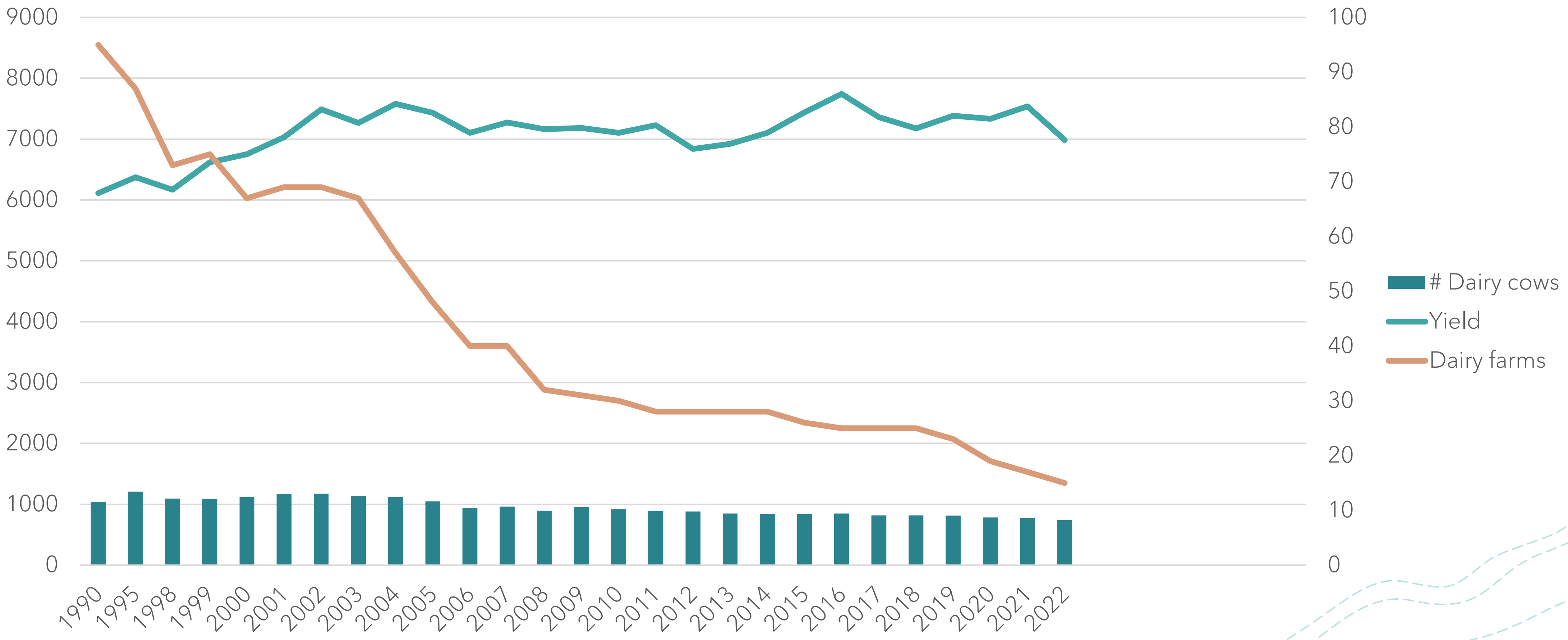
And is but a shadow of what was a century ago

THE FARMING SECTOR 2023

Dairy, lamb and beef

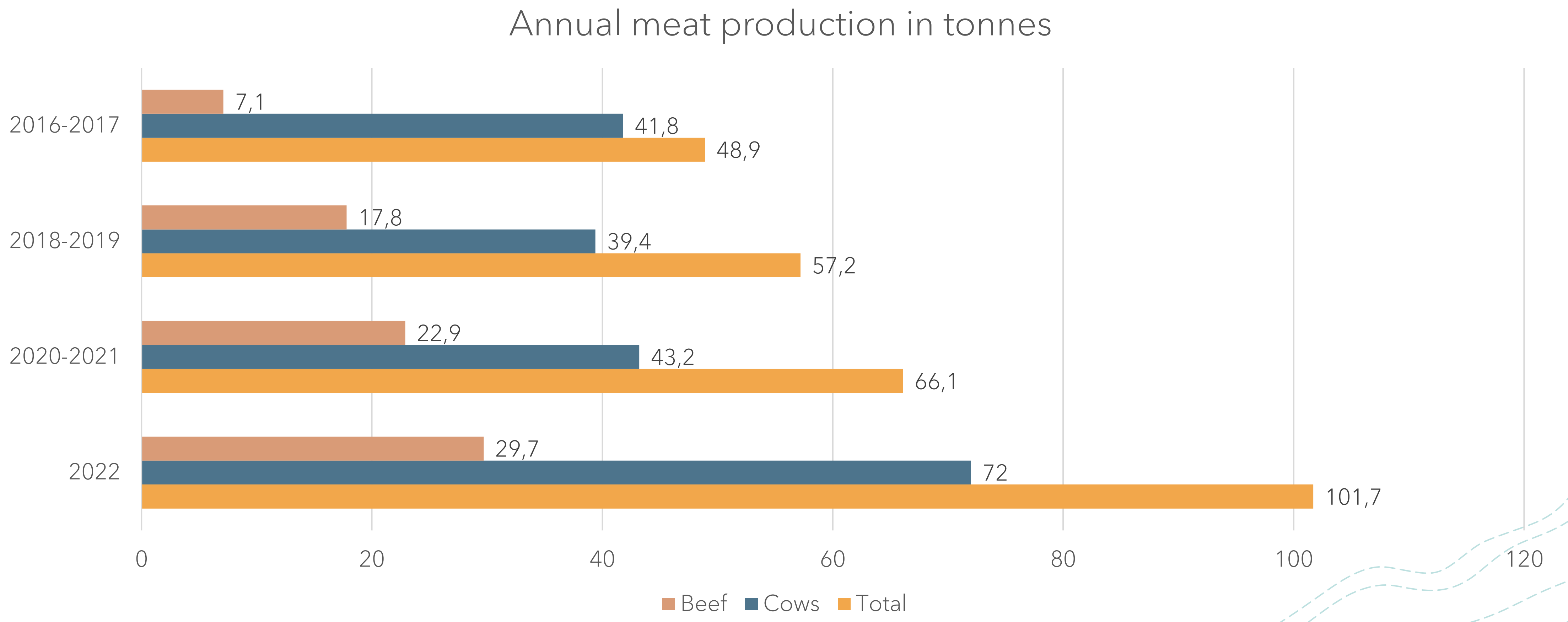
DAIRY

DAIRY FARMING AND TENDENCIES LAST 30 YEARS



BEEF

TREND CHANGE IN BEEF PRODUCTION



LAMB

ANNUAL TURN-OVER AT FARM

	Turn-over	+ subsidies	Self sufficiency
Dairy	€7,2 mill		~100%
Beef (& cows)	€1,1 mill		8%
Lamb (& mutton)	€8,7 mill		44%
Total	€17 mill	€2,5 mill	

"BURN DOWN YOUR CITIES AND LEAVE OUR FARMS, AND YOUR CITIES WILL SPRING UP AGAIN AS IF BY MAGIC; BUT DESTROY OUR FARMS AND THE GRASS WILL GROW IN THE STREETS OF EVERY CITY IN EVERY COUNTRY."

- William Jennings Bryan

PROSPECTS FOR THE FUTURE

Land management

Map and prepare arable land

Food security

Establish the necessary funds
to utilise our natural resourses

Tell the story

Inform and educate farmers
and the local community

Farmers in policymaking

Local knowledge for resilience
is vital in island communities

Work the land

Farm, cultivate wherever possible.
For the land cannot be centralised

SOMETHING TO THINK ABOUT

Visitors comments

- ”This is a lamb and beef country”
- ”the day I decited to farm the soils on my farm I instantly became better at farming my animals”

A take on SWOT analysis

- STRENGHTS: Abundancy of high quality water. Grass from sea level to highest peaks. Plenty of sunlight during summer. Stable temperatures. Great varieties in topographie.
- WEAKNESS: To forget to focus on the strenghts solely!

…if we´re clever to catch the O, then T might never be much of an issue.

THANKS FOR YOUR ATTENTION

Jens Ivan í Gerðinum

jiig@bst.fo

www.bst.fo

NIBIO

NORSK INSTITUTT FOR BIOØKONOMI

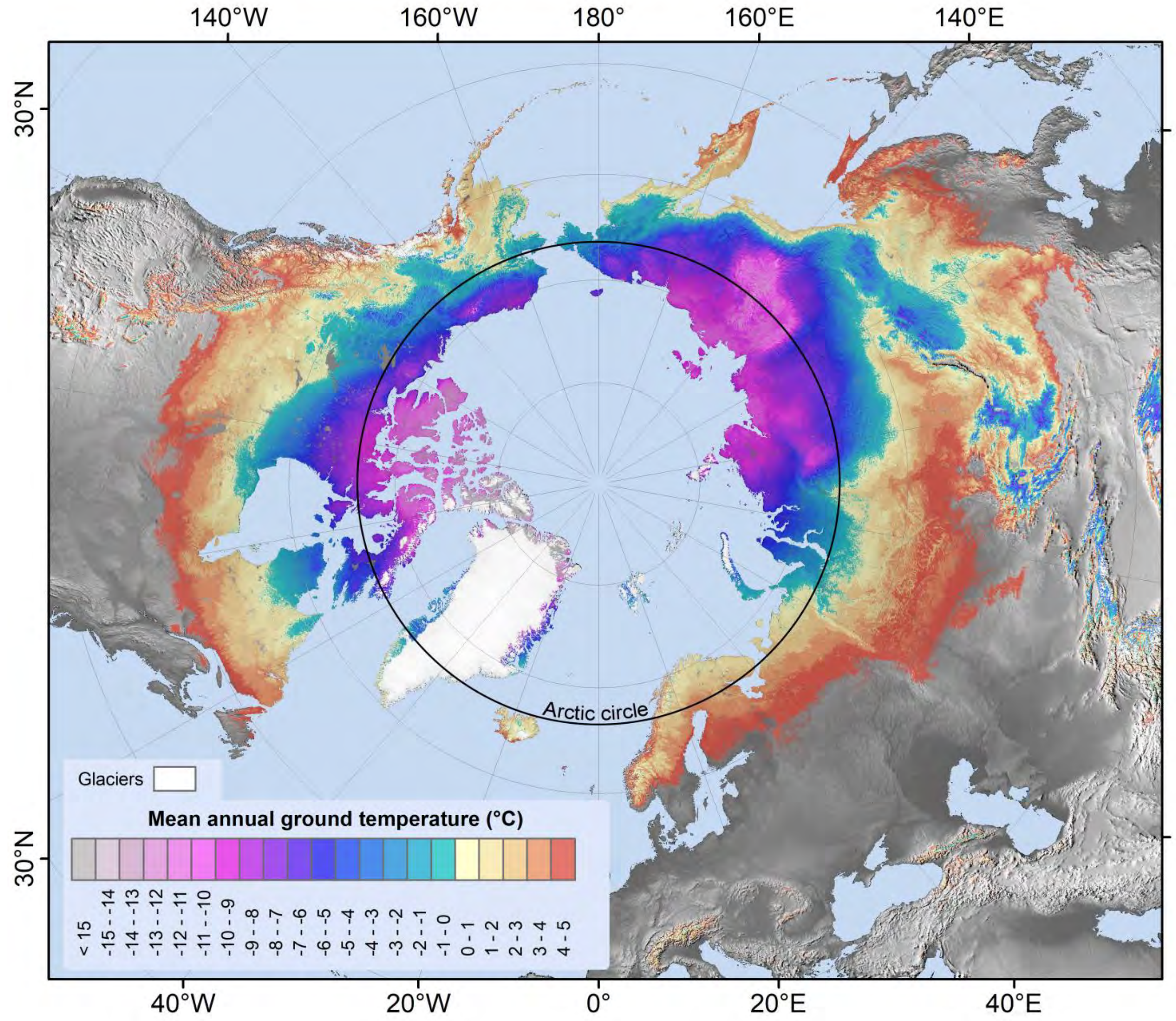
Arctic light conditions and developing growth-models for optimized yields in a warmer climate in Northern Norway

Jørgen Mølmann · 11th CAC, Torshavn · September 5-7, 2023

Outline of talk

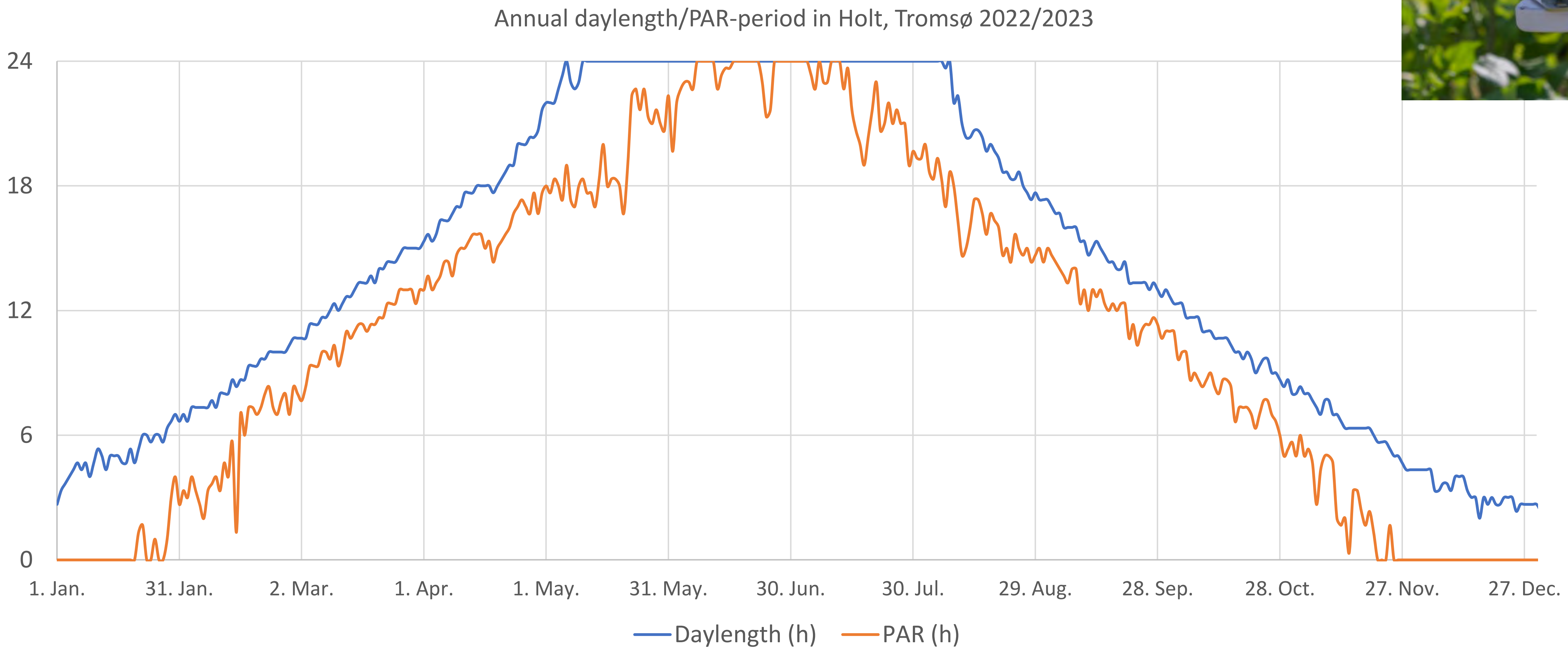
- Background – Arctic agriculture, climate sensors, growth models
- Arctic light conditions – photosynthesis
- Arctic light project – phytotron studies
- Developing light-based growth models for potato and Swede roots
- Application of models
- Future use of models and climate sensors

Lower Arctic latitudes without permafrost and Midnight Sun



(adapted from Obu et al.2018)
https://doi.org/10.1594/PANGAEA.888600

Daylength and diurnal photosynthetic light period (PAR)



NIBIO

Arctic agriculture in Northern Norway

Christian Uhlig

Arctic agriculture ...

...with
sweet
Taste!

NIBIO

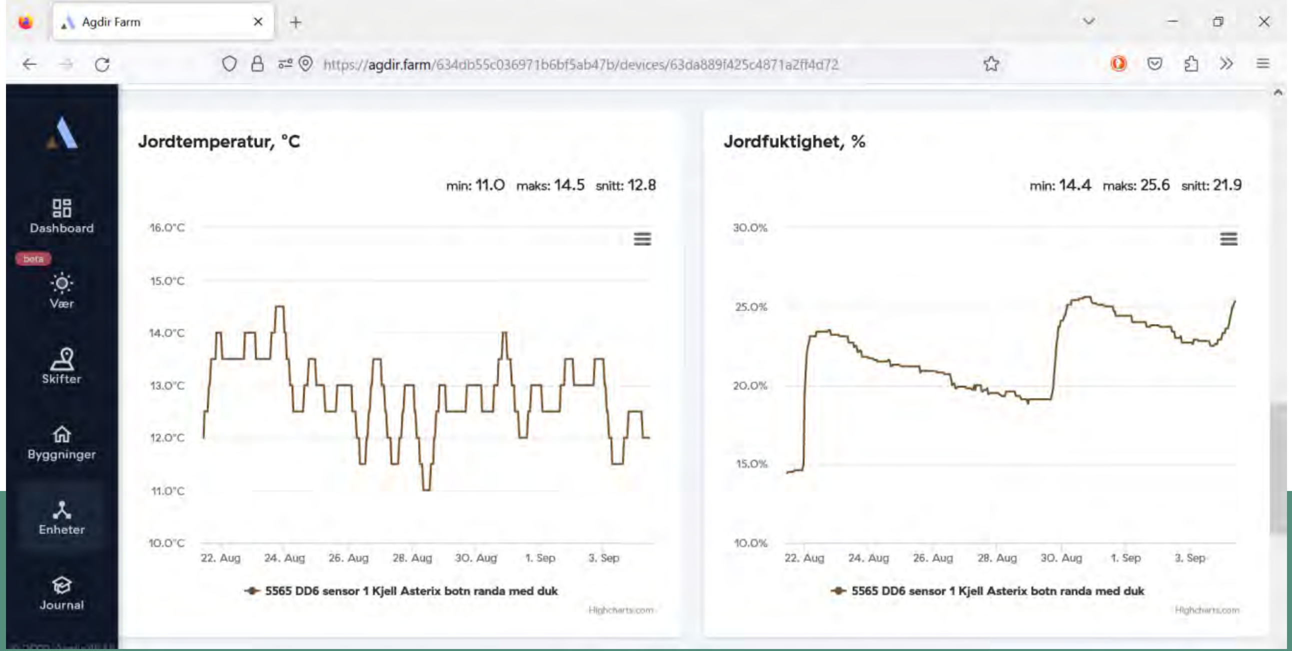
Warmer climate in Northern-Norway potato, vegetables and berries

- Getting a head start in spring is vital – pre-sprouting, fibre cover, plastic tunnel
- Earlier snow-melt, thawing and higher temperatures due to climate change
- Important to know **optimum temperatures**

NIBIO

Background –
agricultural climate sensors

- Air/ground sensor-suites with realtime GSM-data transfer
- There is a need for local adapted growth-models, especially at high latitudes



Daydegree models for growth do not work for Northern-Norway

I.e. Broccoli (Lord) – semi-field trials at different latitudes

Gjennomsnitt 2009-2011	Tromsø 70°N 18°E	Grimstad 58°N 8°E	Grossbeeren 52°N 13°E
Høstetid (DAP)	**59**	**58**	**56**
Daylength (h)	23.6	18.5	15.6
Photosynthetic light period (h)*	15.7	13.6	12.9
Temperature (°C)	11.3	16.2	19.3
Daydegreedays	371.7	649.6	800.8

Johansen et al. 2017 J Sci Food Agric 97
doi: 10.1002/jsfa.8196

*global radiation >50Wm^2

ARKTISK LYS-project (2020-2023) «ARCTIC LIGHT»

Forskningsrådet

STØTTET AV GROFONDET

SpareBank 1 NORD-NORGE

Troms og Finnmark fylkeskommune
Romssa ja Finnmárkku fylkkagielda
Tromssan ja Finmarkun fylkinkomuuni

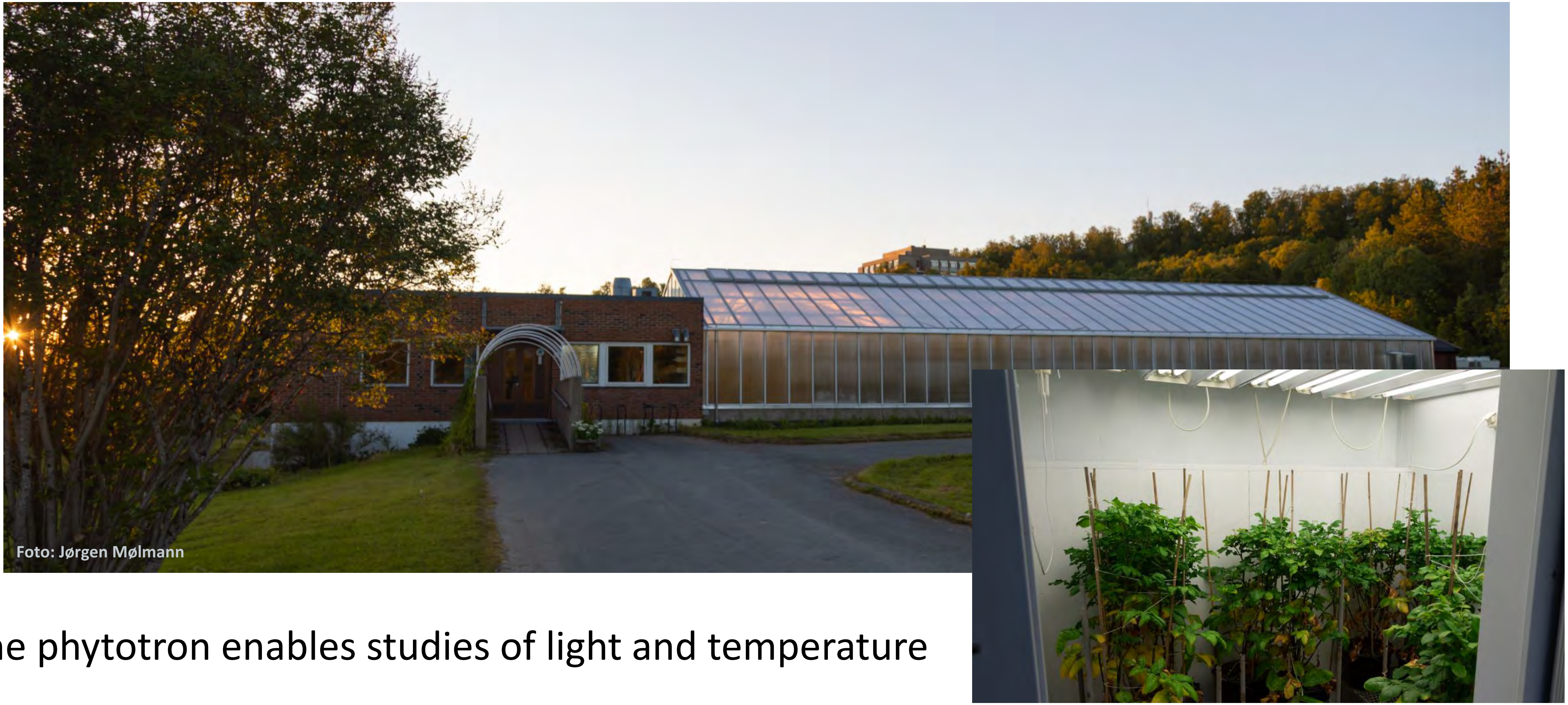
To address questions regarding climate-enhancement

- Fertilization-levels for non-vowen fibre/plastic cover
- Develop growth models for Arctic light conditions

Partners:

- Tromspotet AS
- NIBIO Tromsø
- NLR Nord-Norge AS

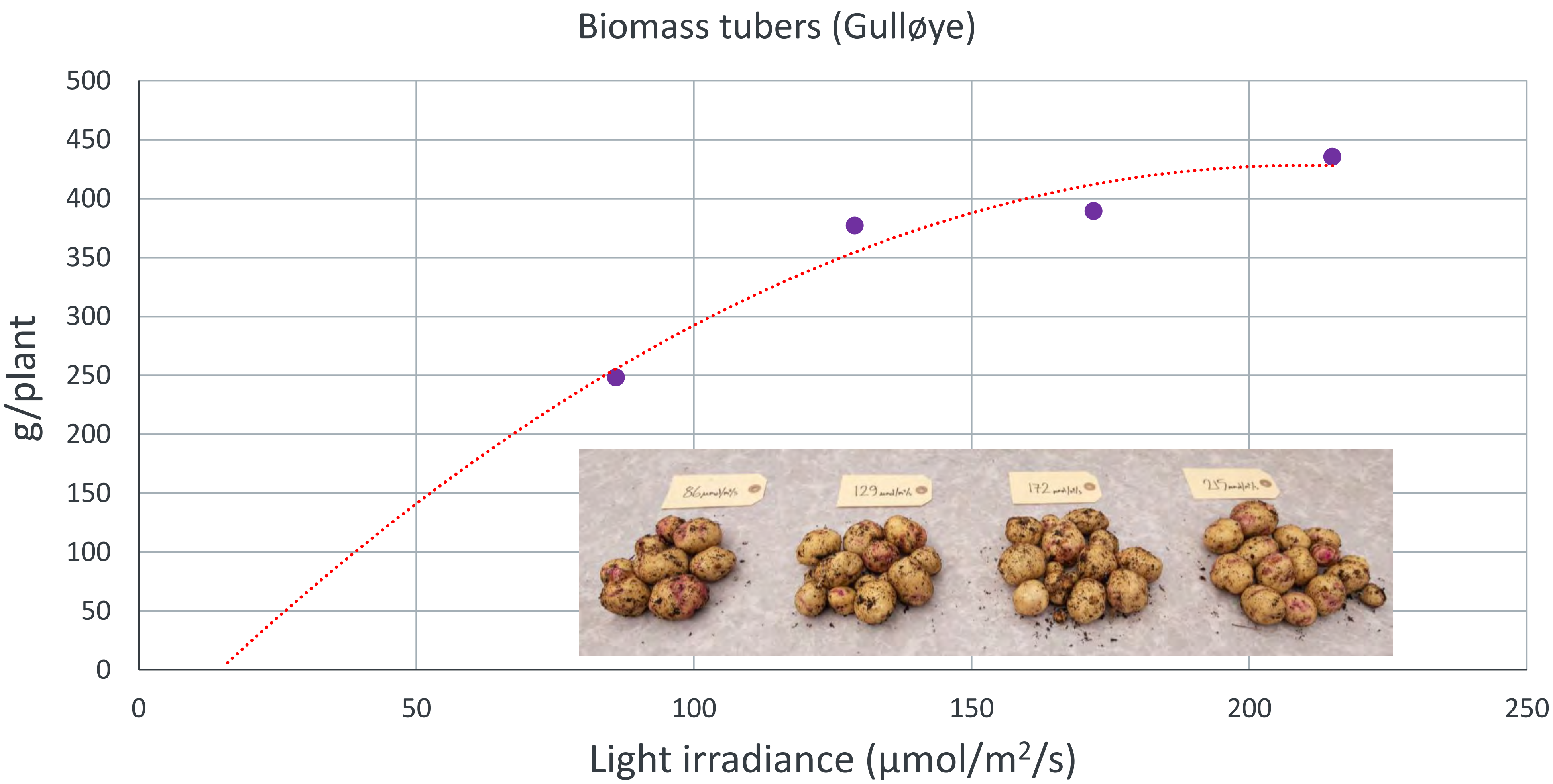
Phytotron at Biologisk klimalaboratorium Holt, Tromsø



The phytotron enables studies of light and temperature

Heliothermal growth model = ∑ (light x temp.)

The daily photosynthetic light period (PAR-hours) is key for modelling plant growth

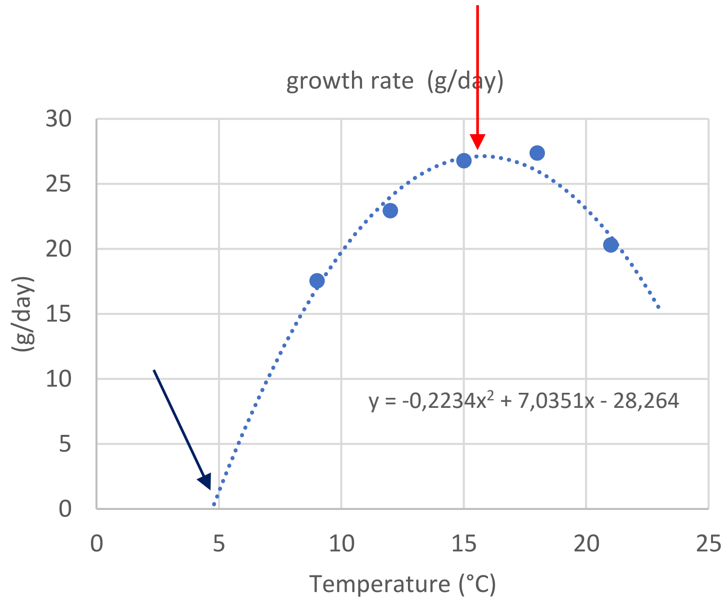


Developing light- og temperature-based model for plant growth

Photosynthesis drives plant growth

Photosynthesis (h) at given temperature (°C)

- Based on temperature response in phytotron experiments at identical light conditions
- Optimum temperature = 100% photosynthesis for growth
- Base temperature = 0 % photosynthesis
- Species, cultivar and development state-dependent
- Assumes no limiting factors (water, nutrients, etc…)



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Phytotron pot-experiments for Swede roots (rutabaga)

Five temperaturetreatments:

- 9 °C (under 18 h PAR-period)
- 12 °C ״
- 15 °C ״
- 18 °C ״
- 21 °C ״

• Observing BBCH-development times to hypocotyl swelling, and root growth rate (g) and (cm/week).

BBCH – developmental time (days) for Swede

Feller et al. 1995

BBCH 09 : Germination

BBCH 11 : 1st leaf (>3,0cm)

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.

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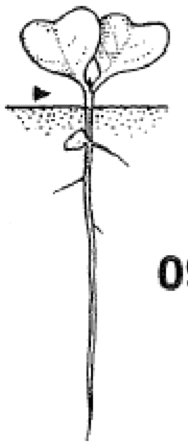
BBCH 19 : 9th leaf (>3,0cm)

BBCH 41 : Root swelling (>0,5cm)

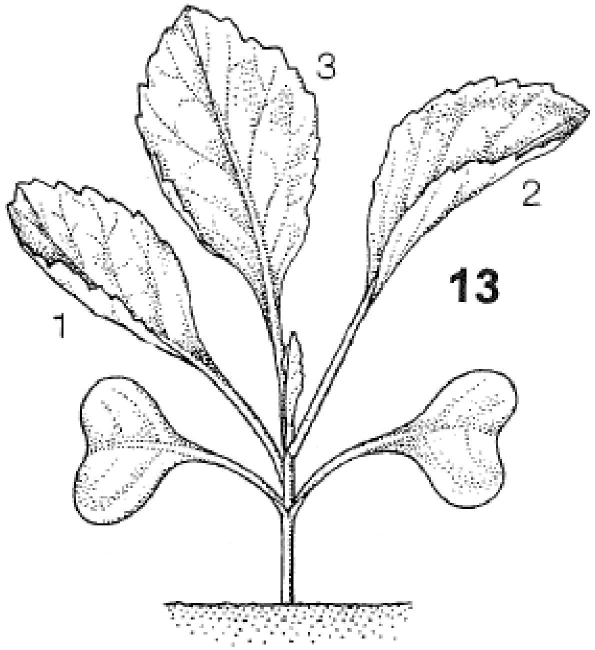
.

.

BBCH 49: 100 % root size



09



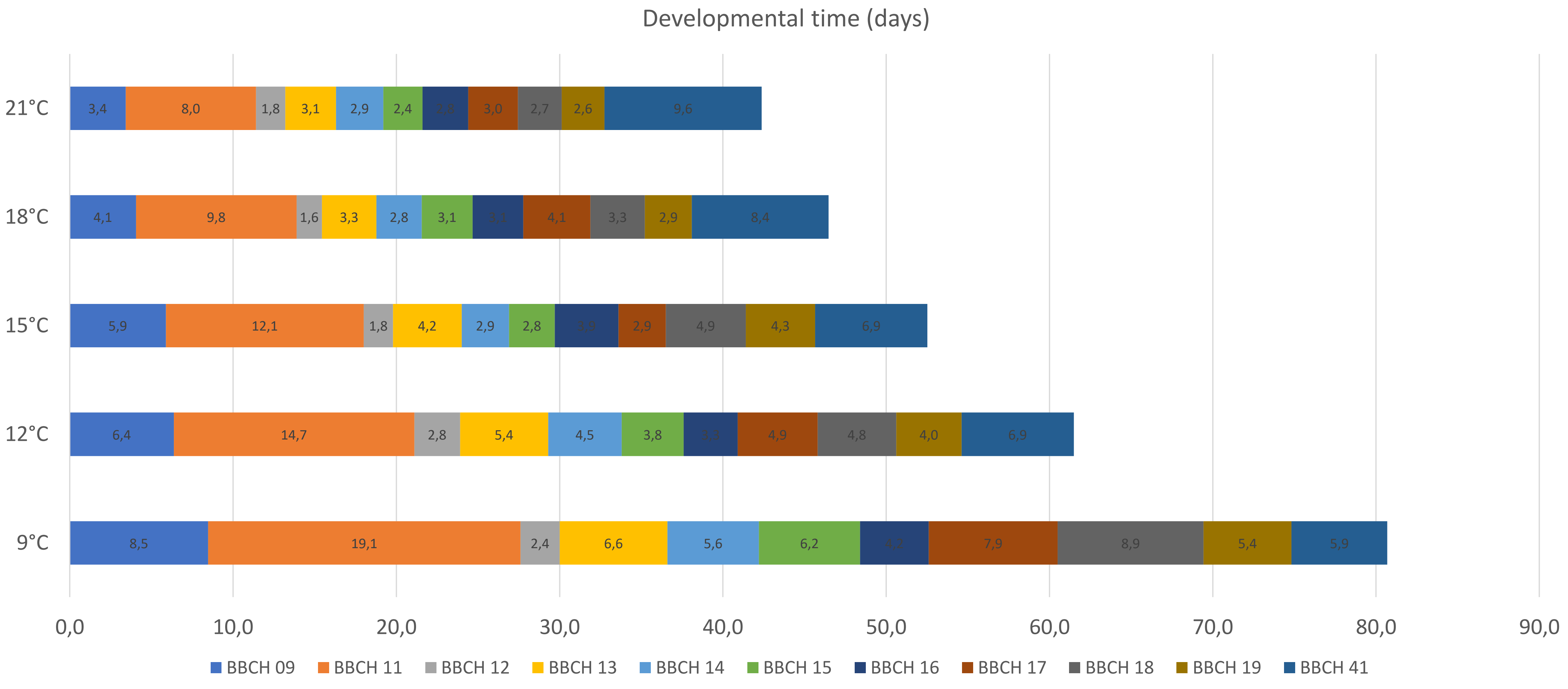
13

49

and Root fresh mass (g) measured at harvest

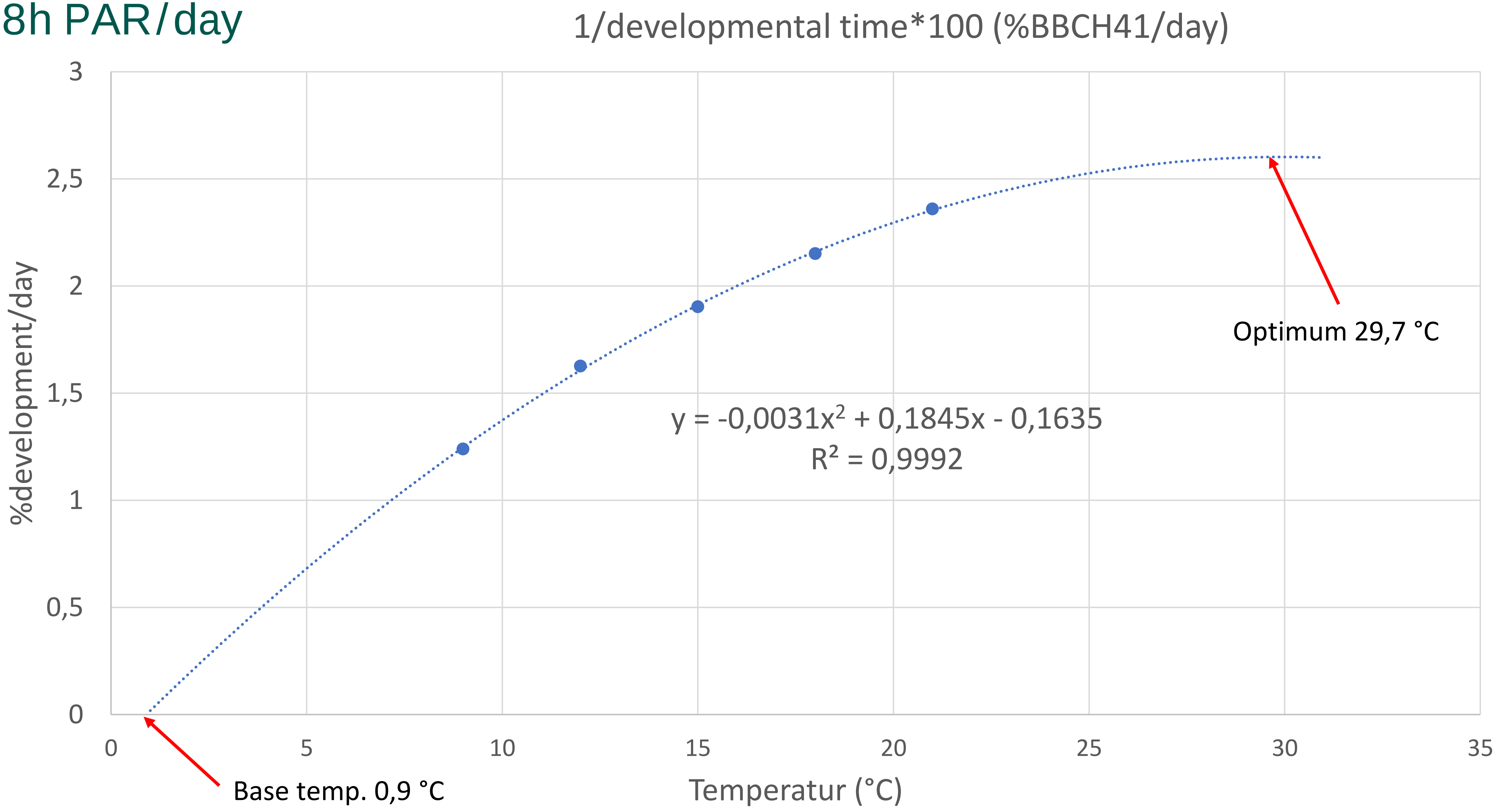
NIBIO

Developmental time Swede root leaf growth until BBCH 41



Vegetative swede leaf developmental rate – regression

at 18h PAR/day

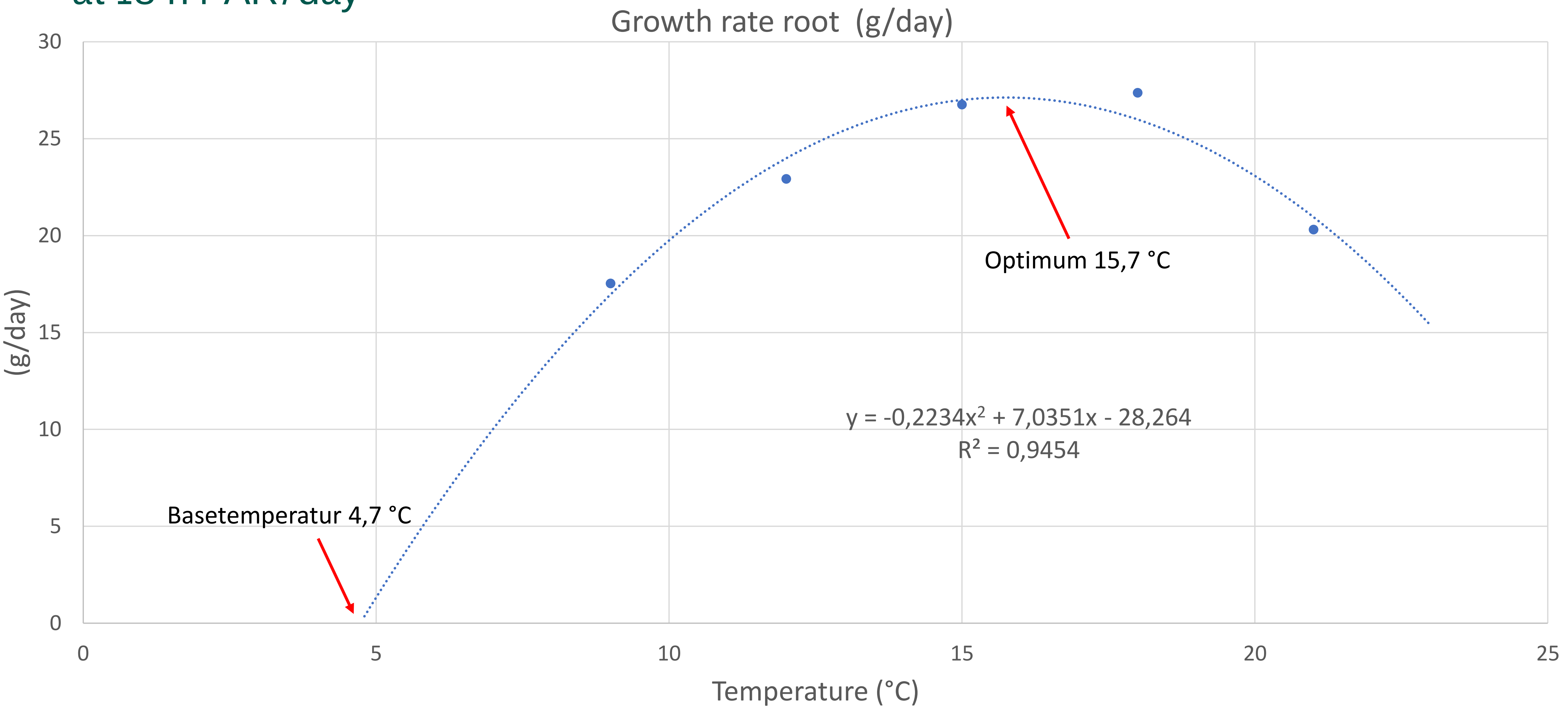


Root growth and root developmental period gives growth rate per day

Temperature	Root FM (g)	Root development (days)	Growth rate (g/day)
9 °C	830.9	49.1	16.9
12 °C	1060.3	61.5	22.9
15 °C	1013.3	52.5	26.8
18 °C	1046.5	46.5	27.4
21 °C	757.4	42.4	20.3

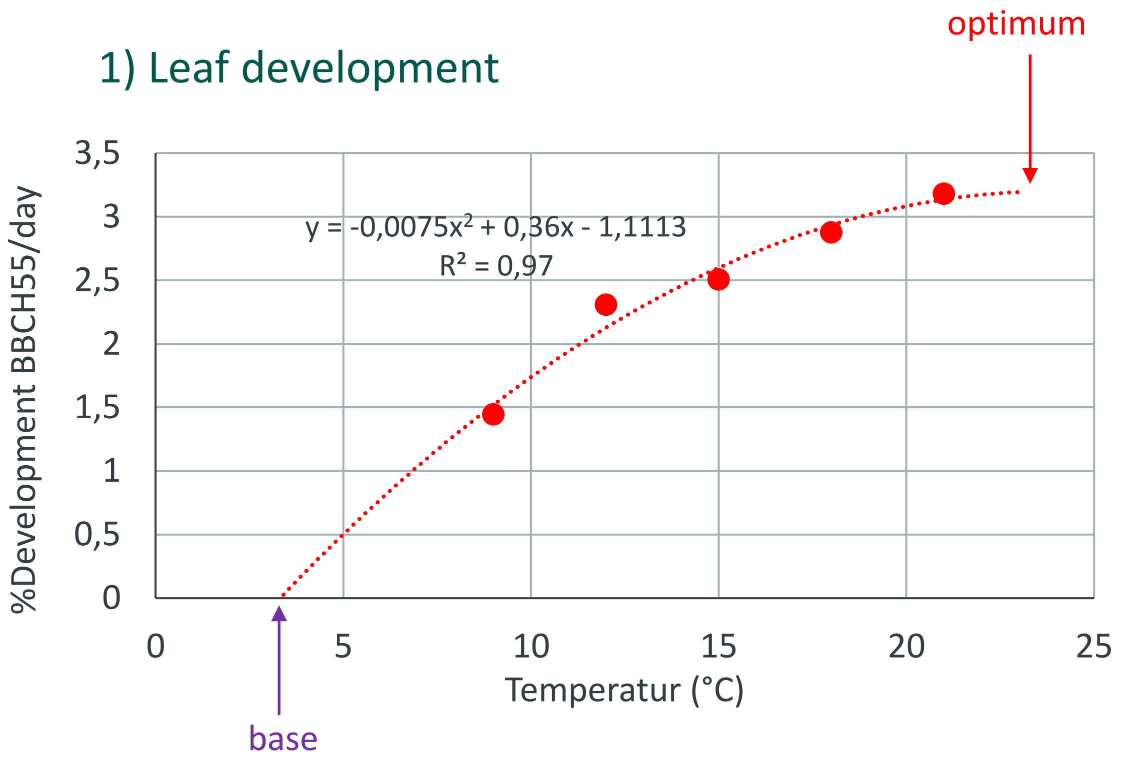
Rate of root vegetable swelling (g/day)

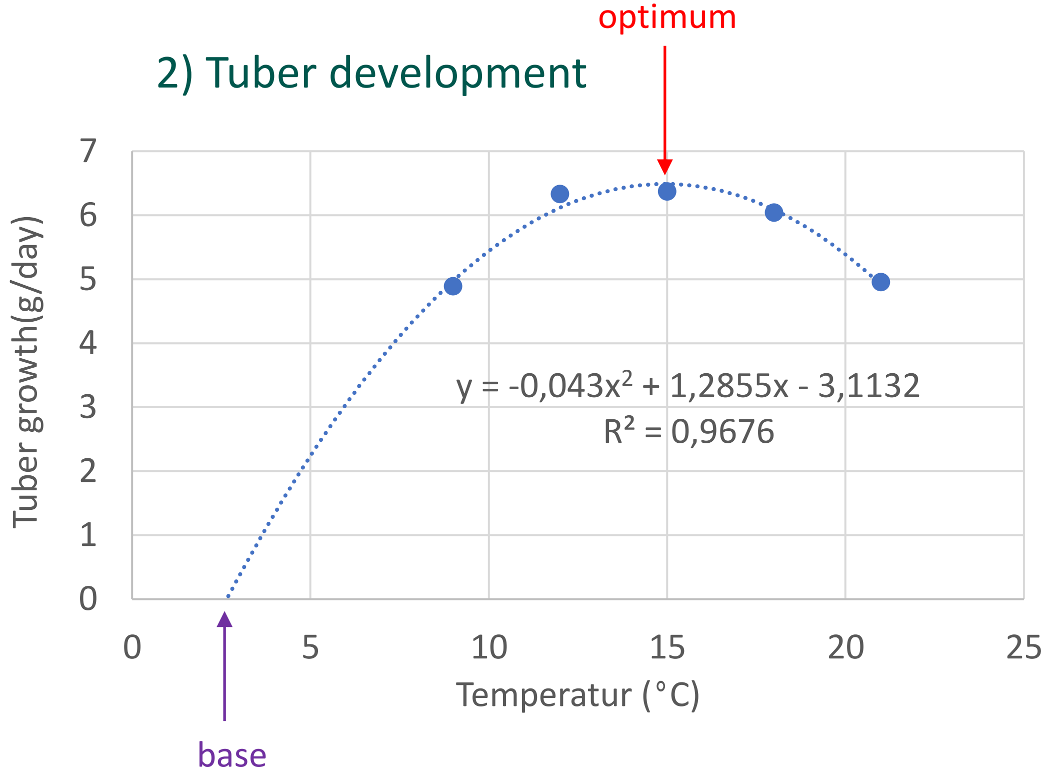
at 18 h PAR/day



Light and temperaturebased growth model for potato

cv. Gulløye (18 h PAR/day)





Two-step growth models: 1) Vegetative phase

2) Root bulb/tuber phase

=> Sum of growth per light hour (h_T) at temperature (T)

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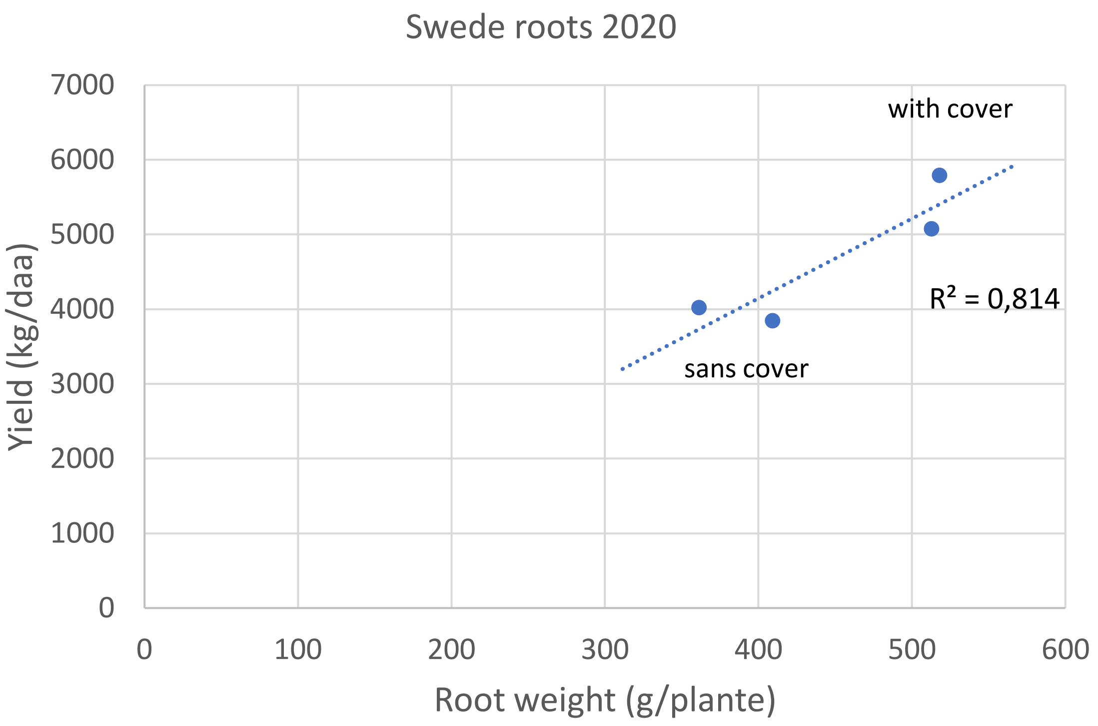
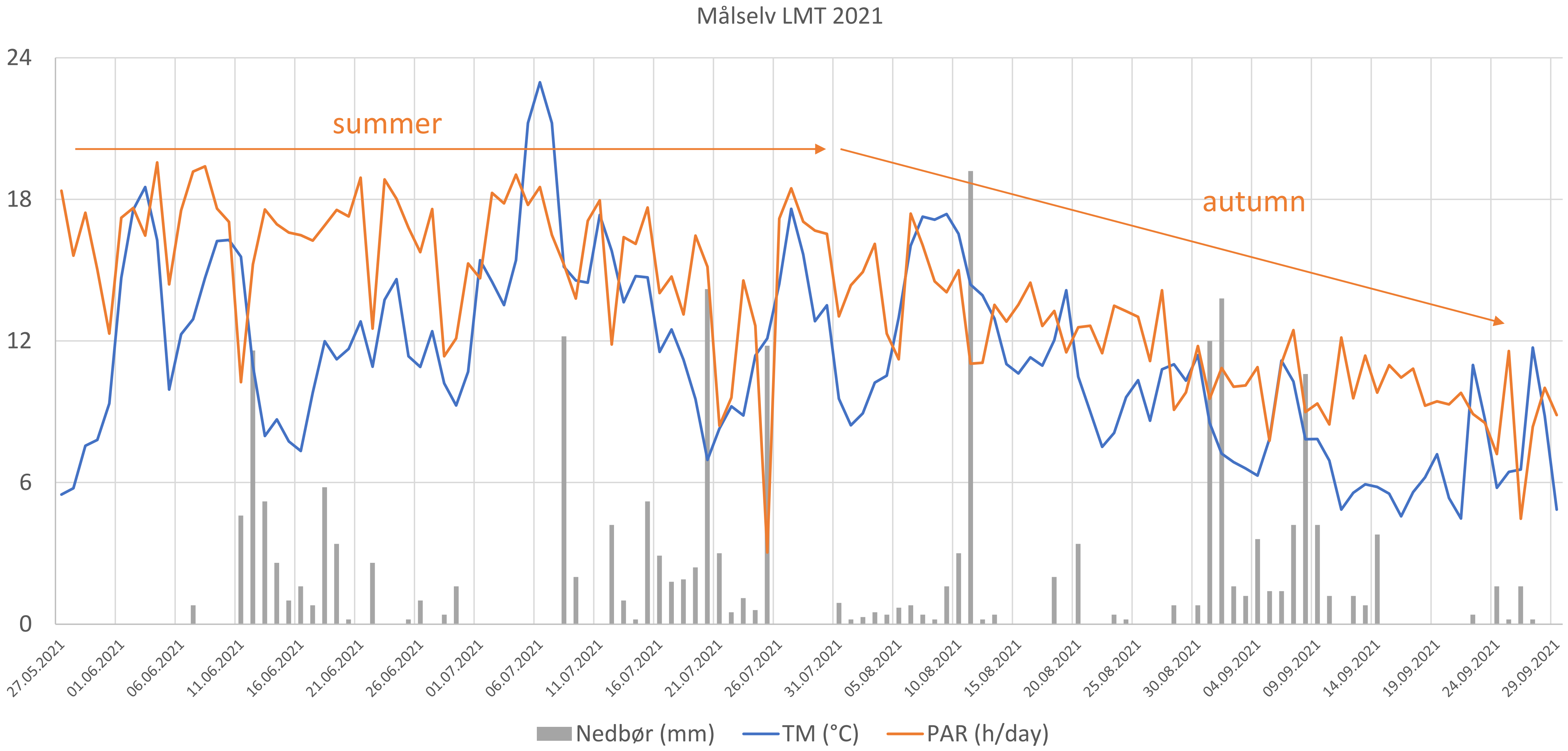
To-stage growth model seems promising – so far…

Yield increment per photosynthesis hour at temperature

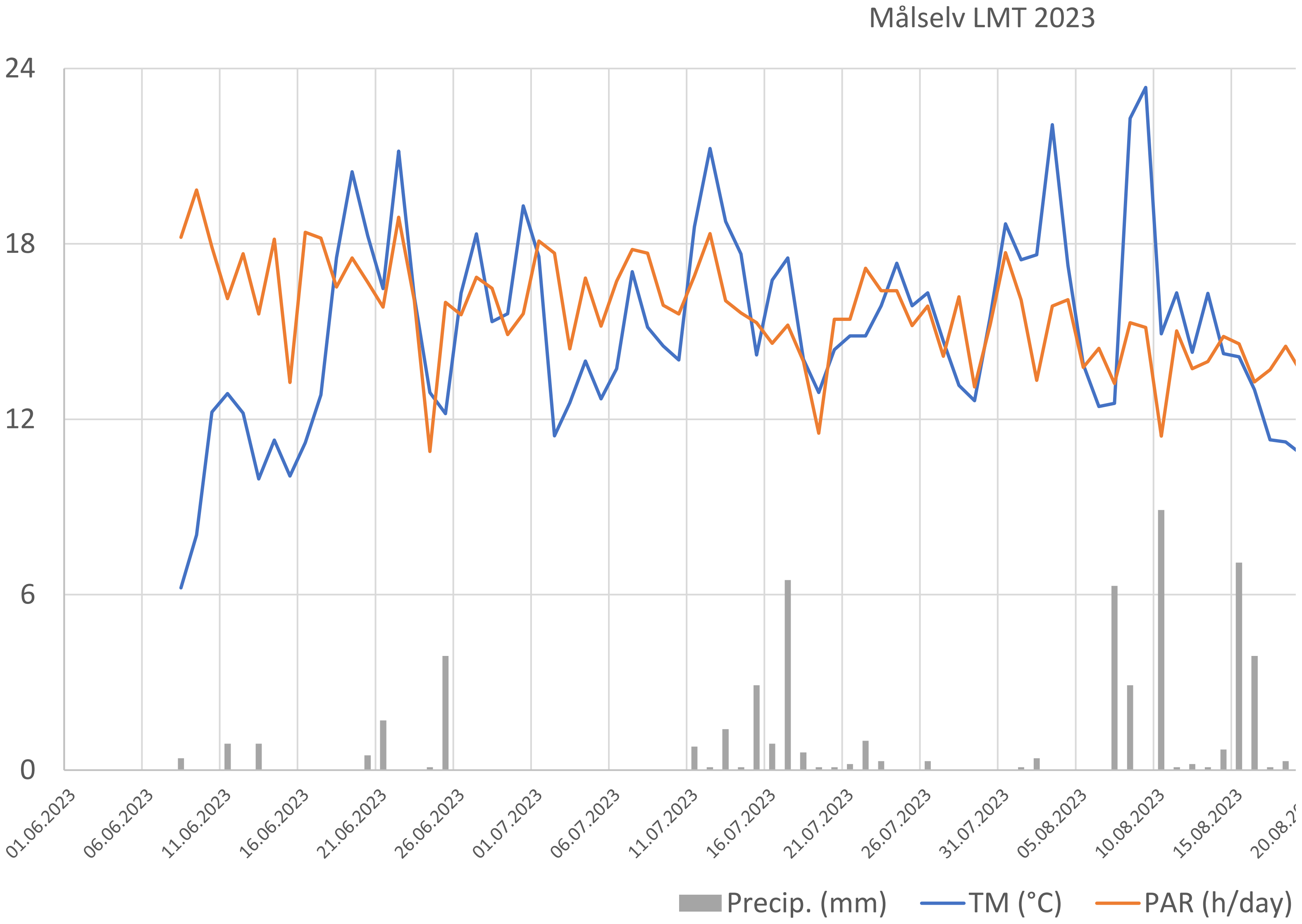


NIBIO

The 2-step growth model works well accounting for seasonal light and temperature changes



The 2-stage model in practice for Swede roots ... When taking the cover off in 2023?



Målselv valley:
-Late spring sowing June 8-12.

-Cover taken off at Moen **July 15**
Cover taken off at Grundnes **August 2**

Model result with fiber cover
1)
LMT-stasjon Målselv (Grundnes)
BBCH 41 => July 24

2)
Bardufoss (Moen)
BBCH 41 => July 18

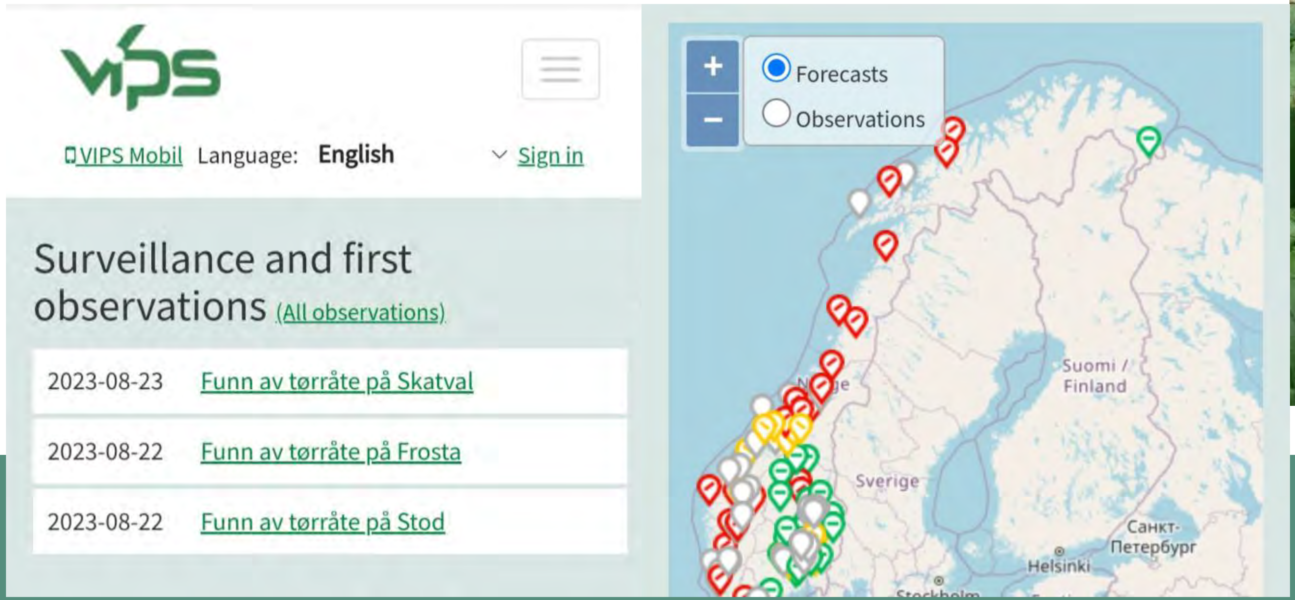
Cabbage root fly in 2023

- Maximum egg laying week July 10-17

…in Målselv at Moen and Grundnes, Northern Norway

Future prospects:
Integrating growth models for plant development

- Meteorological data
- Climate sensors in farmers production fields
- Drought warning
- When to remove the non-vowen fibre cover
- Pressure from pests, VIPS



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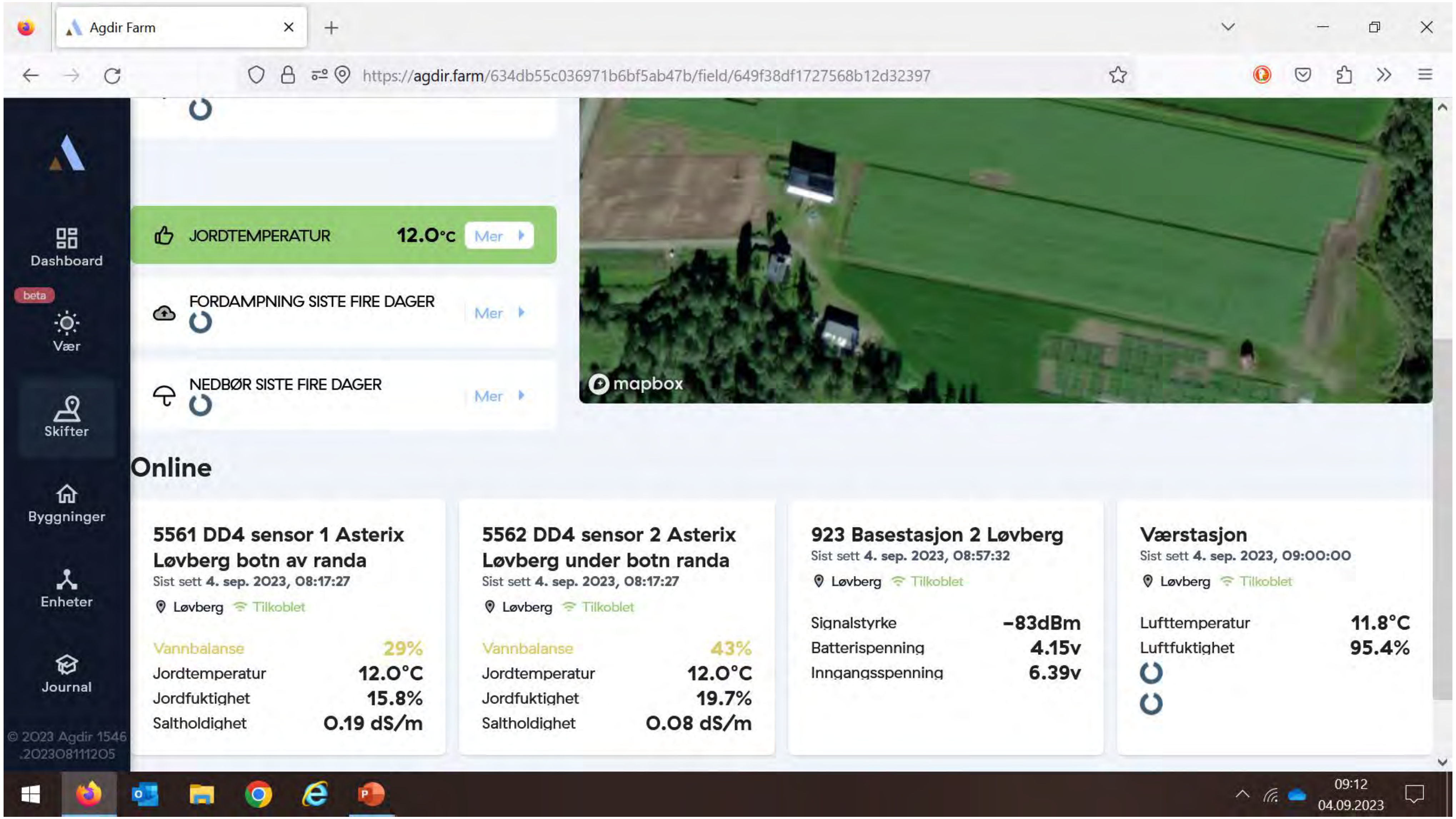
The future is *here* now!   …exampe of sensor suite interface



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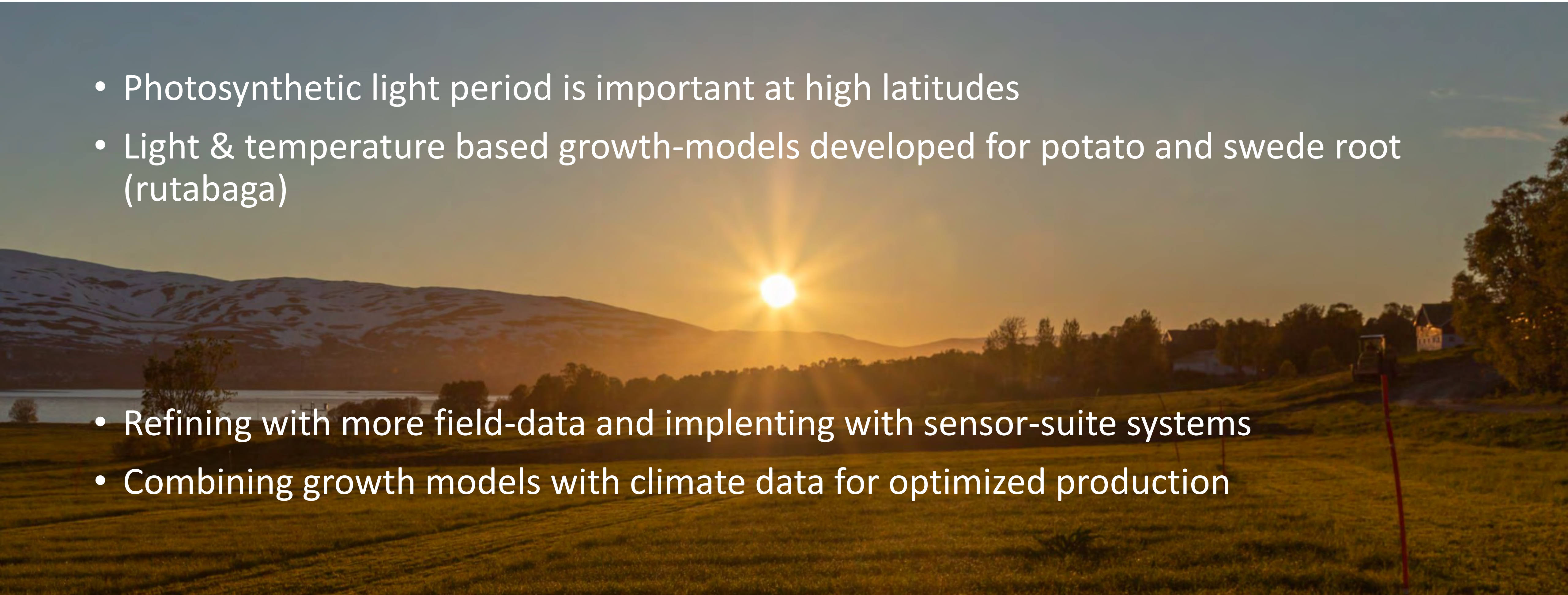
Summary – Light based growth models in Arctic agriculture



- Photosynthetic light period is important at high latitudes
- Light & temperature based growth-models developed for potato and swede root (rutabaga)

- Refining with more field-data and implenting with sensor-suite systems
- Combining growth models with climate data for optimized production

Thank you for listening!

Acknowledgements

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Food self-sufficiency and Food security in Iceland

Perspectives on Arctic and Global realities and challenges

Presentation at the 11th Circumpolar Agricultural Conference;
Tórshavn, Faroe Islands, September 2023.

Jóhannes Sveinbjörnsson, Agricultural University of Iceland

Two recent projects – delegated by the Icelandic government to the Agricultural University of Iceland (AUI):

1. A report on the status of food security in Iceland – special focus on food self-sufficiency.

Erla Sturludóttir & Jóhannes Sveinbjörnsson (editors), 2021. Fæðuöryggi á Íslandi (Food security in Iceland). AUI-Report nr. 139 (56 p.) for the Ministry of Fisheries and Agriculture.

2. A proposal for a strategy for food security in Iceland (May 2022).

Jóhannes Sveinbjörnsson, 2022. Aðgerðir til að auka fæðuöryggi Íslands- tillögur og greinargerð (A proposal for strategy for food security in Iceland). AUI-Report nr. 157 (21 p.) for the Ministry of Food, Agriculture and Fisheries.

Some important concepts

English	**Food Security**	**Food Safety**	**Food self-sufficiency**
Dansk	Fødevareforsyningssikkerhed	Fødevaresikkerhed	Selvforsyning af fødevarer
Føroyskt	Matvørutilbúgvingartrygd	Matvørutrygd	Matvørusjálvbjargni
Norsk	Matsikkerhet	Mattrygghet	Selvforsyning med mat
Svensk	Livsmedelssäkerhet	Livsmedelshygien	Självförsörjning med mat
Íslenska	Fæðuöryggi	Matvælaöryggi	Sjálfsaflahlutfall matvöru

risk of foodborne illness,
storage, quality

Food self-suffiency: The ability by which a country satisfies its food needs from its own production

Food security: Exists when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 2008).

Food security – by definition - can exist irrespective of the degree of food self-suffiency

But how secure is the supply of imported food?

And how secure is the domestic supply of food?

Closed borders and complete food self-sufficiency

Complete dependency on food import

Most countries are somewhere in between…

The Global Food Security Index

- is the most used measure of food security at national level – four pillars

FOOD SECURITY ENVIRONMENT

Rank / 113			Score	Δ
1	↔	Finland	83.7	+1.0
2	↔	Ireland	81.7	+0.1
3	▲5	Norway	80.5	+2.1
4	▲5	France	80.2	+1.9
5	▼2	Netherlands	80.1	+0.2
6	▼2	Japan	79.5	0
=7	▼3	Canada	79.1	-0.4
=7	▲4	Sweden	79.1	+1.4
9	▼3	United Kingdom	78.8	-0.5
10	▲7	Portugal	78.7	+1.7
11	▼1	Switzerland	78.2	+0.2
12	▼1	Austria	78.1	+0.4
13	▼6	United States	78.0	-0.7
=14	▲1	Denmark	77.8	+0.5
=14	↔	New Zealand	77.8	+0.4
16	▲2	Czech Republic	77.7	+1.1
17	▲5	Belgium	77.5	+3.0
18	▼7	Costa Rica	77.4	-0.3
19	▼4	Germany	77.0	-0.3
20	▼2	Spain	75.7	-0.9
21	▼1	Poland	75.5	+0.5
22	▲15	Australia	75.4	+4.7
23	▲3	United Arab Emirates	75.2	+1.6
24	▲3	Israel	74.8	+1.7
=25	▼2	Chile	74.2	-0.2
=25	▲14	China	74.2	+3.6
27	▼2	Italy	74.0	-0.1
28	▲1	Singapore	73.1	+0.3
29	▲3	Bulgaria	73.0	+0.8
30	▼9	Qatar	72.4	-2.2

1) AFFORDABILITY

Rank / 113			Score	Δ
1	▲34	Australia	93.3	+9.1
2	▲2	Singapore	93.2	+1.5
3	▲4	Netherlands	92.7	+1.8
=4	▲9	Belgium	92.6	+3.0
=4	▼3	Ireland	92.6	-0.5
6	▼4	Denmark	92.1	-0.5
=7	▼2	Finland	91.9	+0.9
=7	▲2	Sweden	91.9	+1.5
9	▼1	New Zealand	91.6	+1.1
10	▼5	United Kingdom	91.5	+0.5
=11	▲1	Austria	91.3	+1.3
=11	▲16	Bahrain	91.3	+4.1
=11	▲15	Czech Republic	91.3	+4.0
=11	↔	France	91.3	+1.1
15	▲5	Portugal	90.0	+1.2
16	▲2	Japan	89.8	+0.9
17	▼1	Italy	89.5	+0.5
18	▼3	Switzerland	89.2	+0.1
19	▼1	Slovakia	89.1	+0.2
20	▲2	Spain	89.0	+0.7
=21	▼12	Israel	88.6	-1.8
=21	▲3	Oman	88.6	+1.2
=21	▼18	Qatar	88.6	-3.2
24	▼8	Greece	88.5	-0.5
25	▼4	Canada	88.3	-0.3
26	▼12	Germany	87.9	-1.6
27	▲3	Poland	87.4	+1.3
28	▲11	Norway	87.2	+4.0
29	▼6	United States	87.1	-0.5
30	▼6	Malaysia	87.0	-0.4

2) AVAILABILITY

Rank / 113			Score	Δ
1	↔	Japan	81.2	-0.5
2	↔	China	79.2	+0.5
3	↔	Singapore	77.8	-0.6
4	▲26	Portugal	77.0	+10.2
5	↔	Switzerland	76.8	+0.1
6	▼2	Canada	75.7	-1.3
7	▼1	United Arab Emirates	73.8	-2.4
8	↔	Costa Rica	73.0	+0.7
9	▼2	Qatar	72.9	-0.6
10	▼1	United Kingdom	71.6	-0.2
11	▲5	South Korea	71.5	+2.5
12	↔	El Salvador	71.2	+0.7
13	▲4	Nepal	70.9	+2.2
14	▼1	Netherlands	70.7	+0.6
=15	▲5	Finland	70.5	+3.0
=15	↔	Ireland	70.5	+1.0
17	▲2	Czech Republic	69.4	+1.3
18	▲21	France	69.0	+5.8
19	▼8	Chile	68.8	-2.4
20	▼6	Italy	68.7	-0.9
21	▲14	Sweden	68.3	+3.8
22	▼2	New Zealand	67.7	+0.2
=23	▲10	Israel	67.2	+1.4
=23	▲37	Kazakhstan	67.2	+10.2
=23	▼3	Saudi Arabia	67.2	-0.3
26	▲3	Austria	67.1	+0.1
27	▲5	Germany	67.0	+1.0
28	▼3	Bulgaria	66.5	-0.9
29	▲8	Uruguay	65.6	+1.7
30	▲21	Turkey	65.3	+5.6

3) QUALITY AND SAFETY

Rank / 113			Score	Δ
1	↔	Canada	89.5	0
2	↔	Denmark	89.1	0
3	↔	United States	88.8	0
=4	▲10	Belgium	88.4	+6.0
=4	↔	Finland	88.4	0
6	▼1	France	87.7	+0.2
7	▼1	Israel	87.4	0
8	▲9	Norway	86.8	+6.0
9	▼1	Ireland	86.1	0
10	↔	Argentina	85.5	0
11	↔	Sweden	85.0	0
12	▼5	Netherlands	84.7	-2.3
13	▲25	Australia	84.0	+7.9
14	▼2	Brazil	83.9	+0.1
15	▼2	Poland	81.5	-1.9
16	▲3	United Arab Emirates	81.3	+1.1
=17	▼2	Austria	81.2	0
=17	▼2	Spain	81.2	0
19	▼2	Greece	80.8	0
20	▲1	Germany	79.9	0
21	▼12	Portugal	79.8	-6.0
22	▲1	Bulgaria	79.5	+0.7
23	▲4	Costa Rica	79.2	+1.1
24	▲3	Mexico	78.9	+0.8
25	▼1	Russia	78.7	0
26	▲4	Turkey	78.5	+0.6
=27	▲6	Romania	77.9	+1.0
=27	▼1	Slovakia	77.9	-0.5
29	▼9	United Kingdom	77.6	-2.4
30	▲1	Japan	77.4	-0.3

4) SUSTAINABILITY AND ADAPTATION

Rank / 113			Score	Δ
1	↔	Norway	87.4	0
2	↔	Finland	82.6	0
=3	↔	Ireland	75.1	0
=3	↔	New Zealand	75.1	0
5	↔	Costa Rica	73.3	+0.5
6	↔	United Kingdom	71.1	0
7	↔	Germany	70.8	0
=8	↔	Czech Republic	70.3	0
=8	↔	France	70.3	0
10	↔	Austria	69.7	0
11	↔	Switzerland	69.5	0
12	↔	United States	69.4	0
13	↔	Netherlands	69.2	0
14	↔	Sweden	68.3	0
15	↔	Peru	68.1	+0.6
16	▲2	Guatemala	67.9	+1.4
17	▼1	Poland	66.7	0
18	▼1	Chile	66.6	0
19	▼1	Spain	66.4	-0.1
20	↔	Japan	66.1	-0.1
21	↔	Uruguay	65.8	0
22	↔	Kazakhstan	65.4	+1.4
23	▲1	Portugal	64.5	+0.8
24	▼1	Denmark	63.8	0
25	↔	Ecuador	62.0	0
26	▲7	Turkey	61.2	+1.6
27	▼1	Belgium	61.0	0
28	▲1	Mexico	60.2	-0.1
29	▲1	Canada	60.1	0
=30	▲2	Honduras	60.0	+0.2

Countries with small populations are not accounted for in the GFSI….needs to be reconsidered

1. Affordability: Measures the ability of **consumers** to purchase food, their vulnerability to price shocks and the presence of programmes and policies to support consumers when shocks occur.

1) AFFORDABILITY

Rank / 113			Score	Δ
1	▲34	Australia	93.3	+9.1
2	▲2	Singapore	93.2	+1.5
3	▲4	Netherlands	92.7	+1.8
=4	▲9	Belgium	92.6	+3.0
=4	▼3	Ireland	92.6	-0.5
6	▼4	Denmark	92.1	-0.5
=7	▼2	Finland	91.9	+0.9
=7	▲2	Sweden	91.9	+1.5
9	▼1	New Zealand	91.6	+1.1
10	▼5	United Kingdom	91.5	+0.5
=11	▲1	Austria	91.3	+1.3
=11	▲16	Bahrain	91.3	+4.1
=11	▲15	Czech Republic	91.3	+4.0
=11	↔	France	91.3	+1.1
15	▲5	Portugal	90.0	+1.2
16	▲2	Japan	89.8	+0.9
17	▼1	Italy	89.5	+0.5
18	▼3	Switzerland	89.2	+0.1
19	▼1	Slovakia	89.1	+0.2
20	▲2	Spain	89.0	+0.7
=21	▼12	Israel	88.6	-1.8
=21	▲3	Oman	88.6	+1.2
=21	▼18	Qatar	88.6	-3.2
24	▼8	Greece	88.5	-0.5
25	▼4	Canada	88.3	-0.3
26	▼12	Germany	87.9	-1.6
27	▲3	Poland	87.4	+1.3
28	▲11	Norway	87.2	+4.0
29	▼6	United States	87.1	-0.5

Norway (outside EU like Iceland) scores lower than other Nordic (EU) countries in this category.

	Norway				Sweden				
1) AFFORDABILITY	**87.2**	**+4.0**	**28**	**▲11**	**91.9**	**+1.5**	**=7**	**▲2**	**69.0**
1.1) Change in average food costs	100.0	+16.5	=1	▲43	98.0	+8.5	17	▲11	70.7
1.2) Proportion of population under global poverty line	99.8	0	=12	▼1	99.6	0	=21	↔	76.6
1.3) Inequality-adjusted income index	85.8	0	1	↔	82.8	0	8	↔	55.5
1.4) Agricultural trade	46.4	+0.8	105	▲1	76.0	-2.6	=18	▼5	67.6
1.5) Food safety net programmes	100.0	0	=1	↔	100.0	0	=1	↔	72.4

2. Availability: Measures agricultural **production** and **on-farm** capabilities, the risk of **supply disruption**, national capacity to disseminate food and research efforts to expand agricultural output.

Iceland would score low (-er than Norway) in most of these issues

The Nordic countries- focused on these issues

Series		Norway Score	Δ	Rank	Δ		Japan Score	Δ	Rank	Δ
2) AVAILABILITY		**60.4**	**-2.1**	**51**	**▼11**		**81.2**	**-0.5**	**1**	↔
2.1) Access to agricultural inputs		67.1	-10.3	=34	▼18		85.1	-8.6	4	▼1
2.2) Agricultural research and development		68.0	-3.1	12	▼3		82.3	+1.8	3	▲2
2.3) Farm infrastructure		58.9	+0.1	=52	▲2		100.0	+0.8	1	↔
2.4) Volatility of agricultural production		6.8	0	=109	▲1		91.8	0	=10	▲1
2.5) Food loss		92.6	-2.1	=9	▼7		89.1	-0.2	20	▼2
2.6) Supply chain infrastructure		78.1	0	13	▲1		77.7	0	14	▲2
2.7) Sufficiency of supply		85.2	0	=30	▼2		69.5	+0.8	63	▲2
2.8) Political and social barriers to access		96.3	-2.5	1	↔		90.1	+1.2	11	▲1
2.9) Food security and access policy commitments		0.0	0	=80	▼2		52.5	0	=27	↔

SD of cereal and vegetable productivit

2.9.1. Food security strategy (52.5): An assessment of whether there is a food security strategy in the country
2.9.2. Food security agency (48.5): An assessment of whether the government is responsible and can be held accountable for food security

At the moment, Iceland would also score zero here!

3. Quality and safety: Measures the variety and nutritional quality of average diets, as well as the safety of food.

Series		Denmark Score	Δ	Rank	Δ		Madagascar Score	Δ	Rank	Δ
3) QUALITY AND SAFETY		**89.1**	**0**	**2**	↔		**34.9**	**-5.9**	**113**	**▼2**
3.1) Dietary diversity		61.5	0	30	▼1		32.3	0	111	↔
3.2) Nutritional standards		100.0	0	=1	↔		29.8	-27.3	=94	▼25
3.3) Micronutrient availability		82.7	0	9	↔		55.8	0	93	↔
3.4) Protein quality		100.0	0	=1	↔		32.1	-2.5	109	▼2
3.5) Food safety		100.0	0	=1	↔		25.4	+1.0	108	↔

Top 4:

GOOD SCORE 70-79.9		Δ
Portugal	71.4	0
Spain	71.1	0
Norway	70.3	0
Czech Republic	70.0	+0.9

In the Quality and Safety pillar, Iceland would score high – as the other Nordic countries

4. Sustainability and adaption: Assesses a country's exposure to the impacts of climate change; its susceptibility to natural resource risks; and how the country is adapting to these risks.

Series		Denmark Score	Δ	Rank	Δ		Norway Score	Δ	Rank	Δ
4) SUSTAINABILITY AND ADAPTATION		**63.8**	**0**	**24**	▼1		**87.4**	**0**	**1**	↔
4.1) Exposure		52.6	0	106	↔		80.3	0	8	↔
4.2) Water		58.7	0	=28	↔		100.0	0	1	↔
4.3) Land		82.8	0	3	↔		85.1	0	2	↔
4.4) Oceans, rivers and lakes		32.3	0	=82	↔		67.7	0	=11	↔
4.5) Political commitment to adaptation		96.3	0	=1	↔		91.4	0	=17	▲1
4.6) Disaster risk management		52.9	0	=51	▼6		99.1	0	=24	▼2

4.1. Exposure to the impacts of climate change (temperature rise, drought, flooding, sea level rise)
4.2. Health of fresh-water resources and how depletion might impact agriculture
4.3. Health of land and how land degradation might impact agriculture
4.4. Health of oceans, rivers and lakes (eutrophication, marine biodiversity)
4.5. The degree to which countries are creating systems and adopting practices to manage risks that exposures to the impacts of climate change are posing to the agricultural sector
4.6. A measure of disaster risk management (pests, diseases, natural disasters, etc.)

Food security in Iceland –the four pillars of GFSI

Iceland-presumption	
✓	**1. Affordability:** the ability to purchase food, vulnerability to price shocks, food safety net programs
?	**2. Availability**: Enough food available? Always? Risk assessment, solutions when crisis occur.
✓	**3. Quality and safety**: Is the food safe and nutritious? Is the diet well balanced?
✓	**4. Sustainability and adaption**: Are the resources secure with respect to future food security?

	Degree of self-sufficiency %	Degree of coverage %
Bornholm	6	339
Faroe Islands	22	446
Greenland	17	278
Iceland	53	100
Åland	59	135

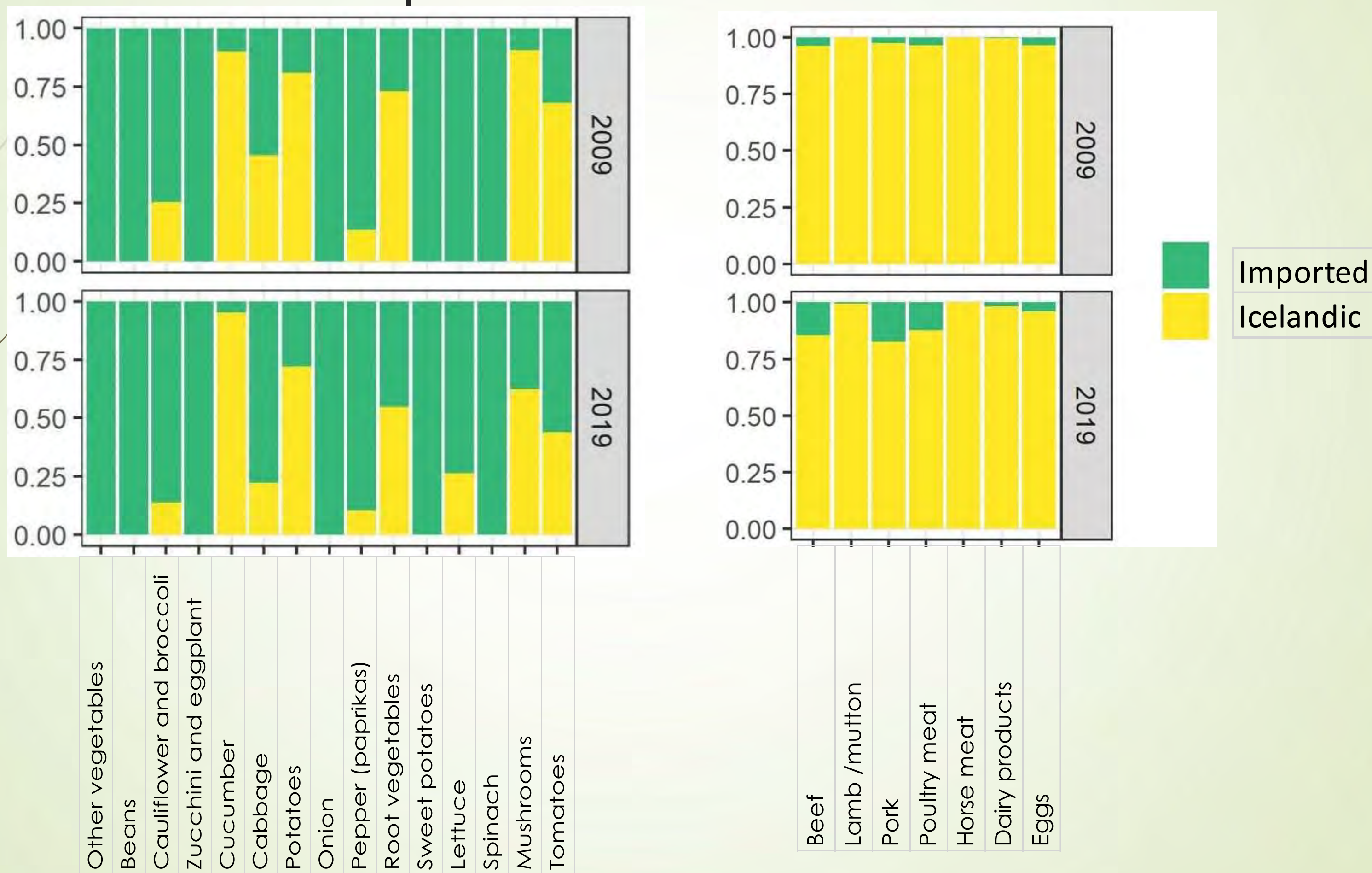
Coverage = Self-sufficiency + export

The much higher degree of coverage than of self-sufficiency is caused by great export of fish from the Faroe Islands, Greenland and Iceland; pork export from Bornholm and that Åland exports potatoes, cereals, vegetables and fish.

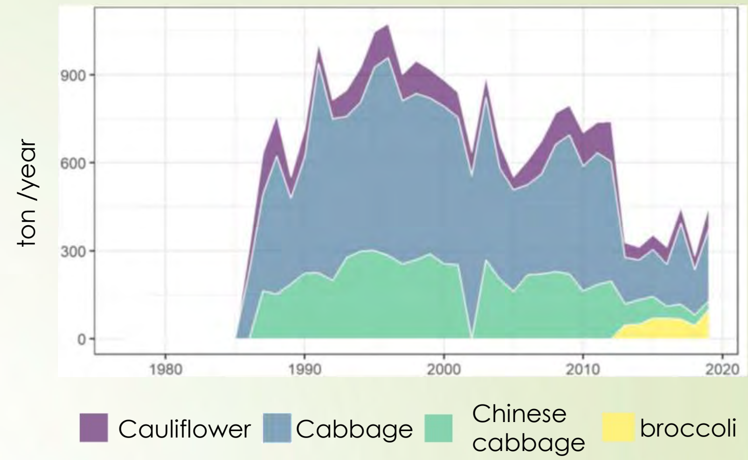
TemaNord 2022:528: Selvforsyning af fødevarer i fem nordiske øsamfund

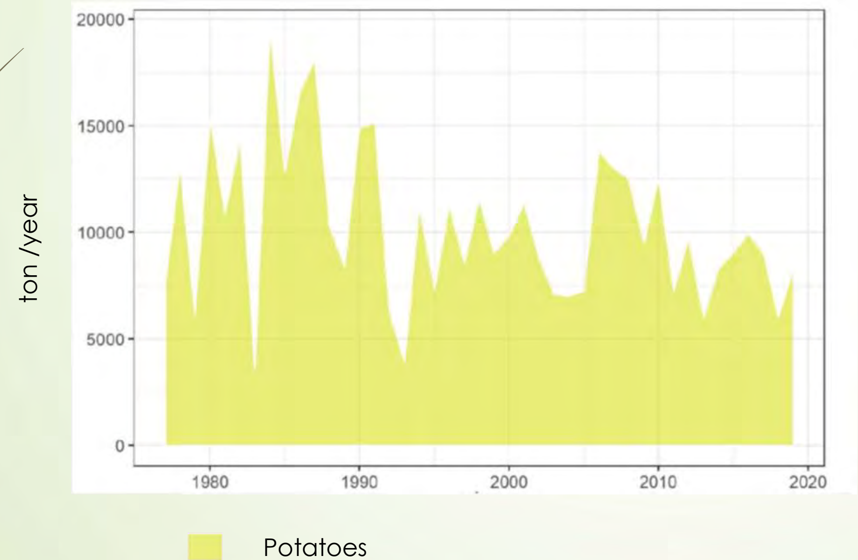
https://pub.norden.org/temanord2022-528/

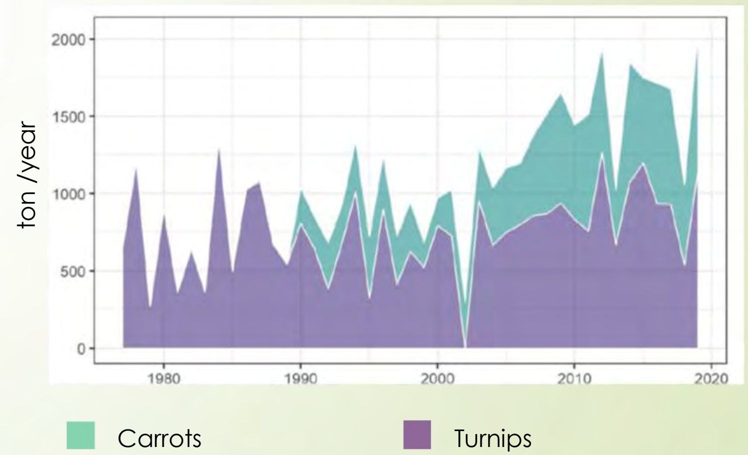
Ratio of imported and Icelandic vegetables and animal products in 2009 and 2019



Outdoor production of vegetables / root vegetables in Iceland

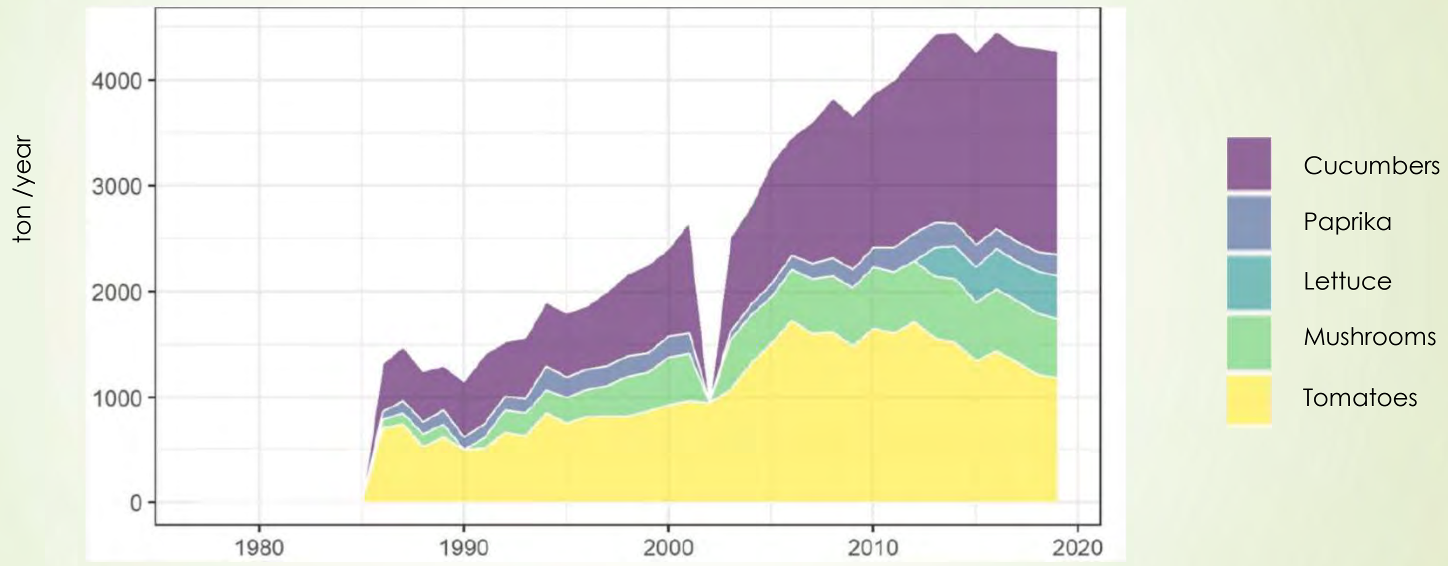




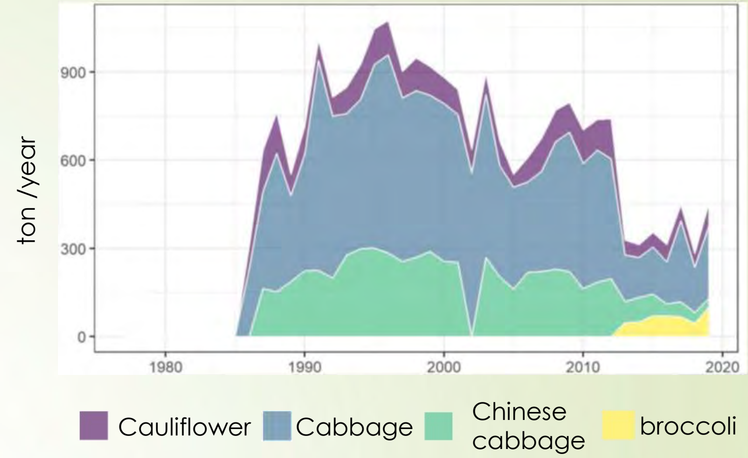


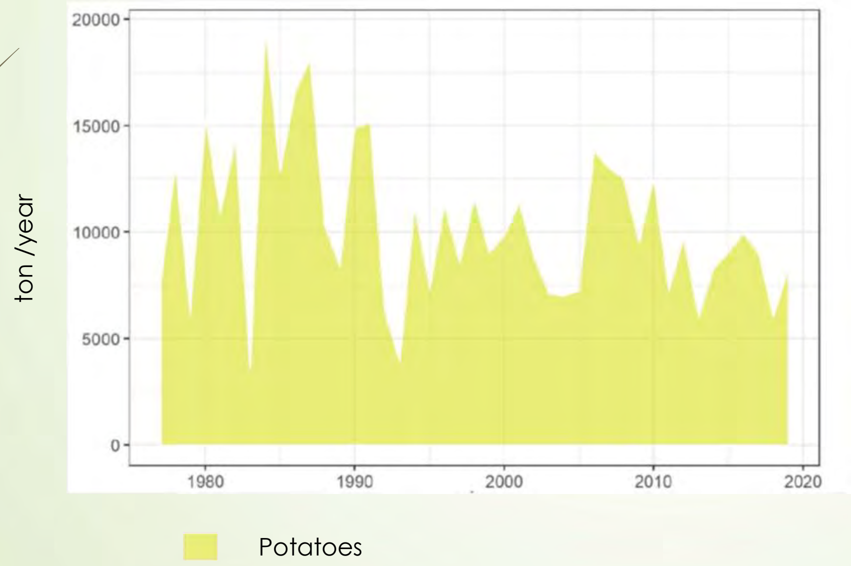
Greenhouse production of vegetables

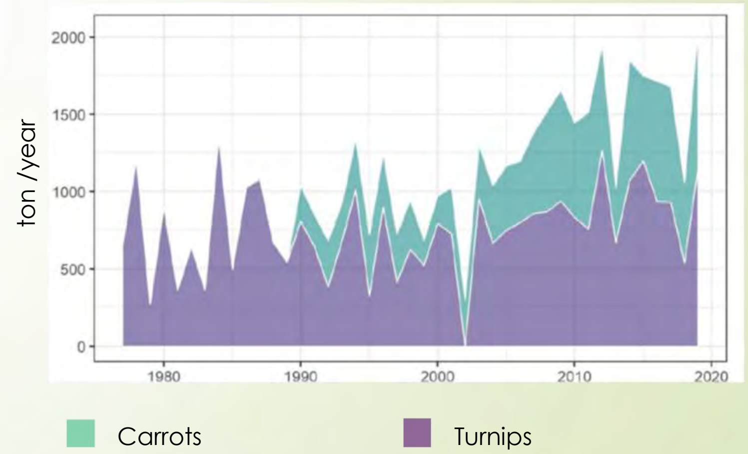
geothermal energy used for warming, electricity for supplementary lighting



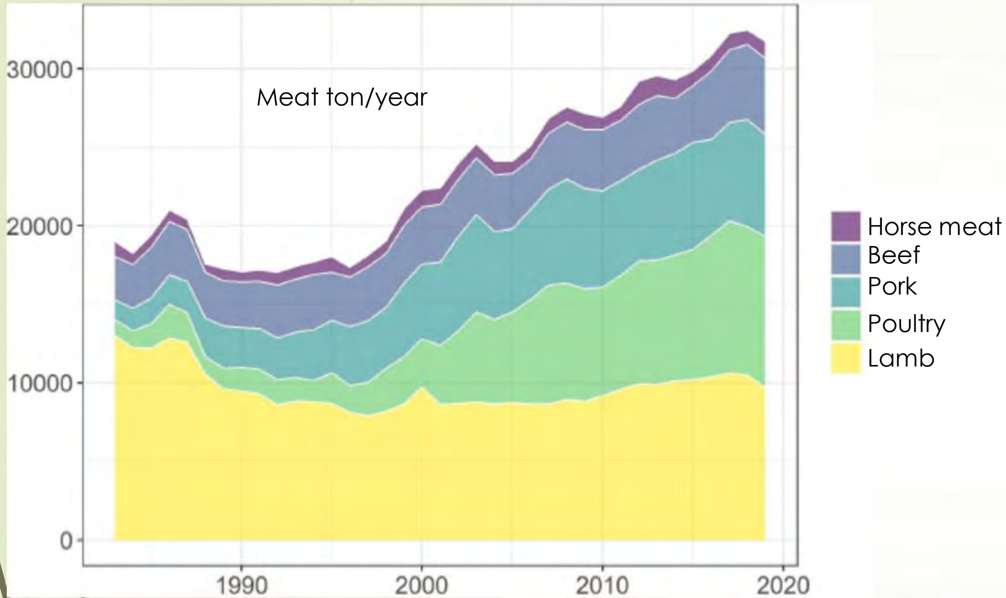
Outdoor production of vegetables / root vegetables

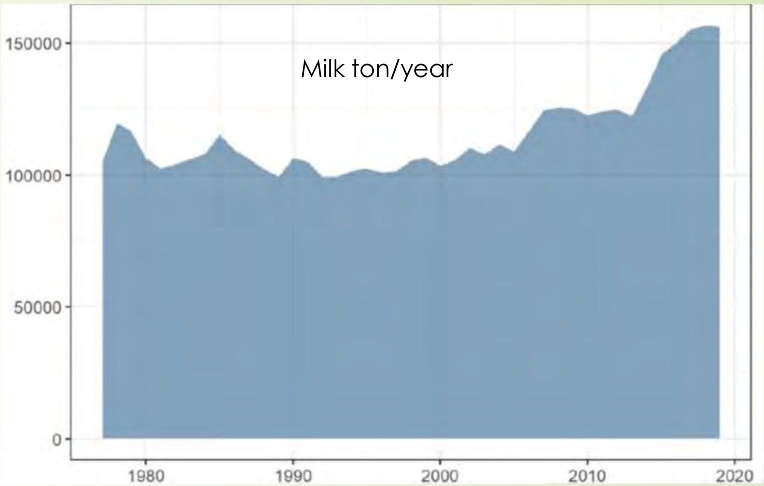


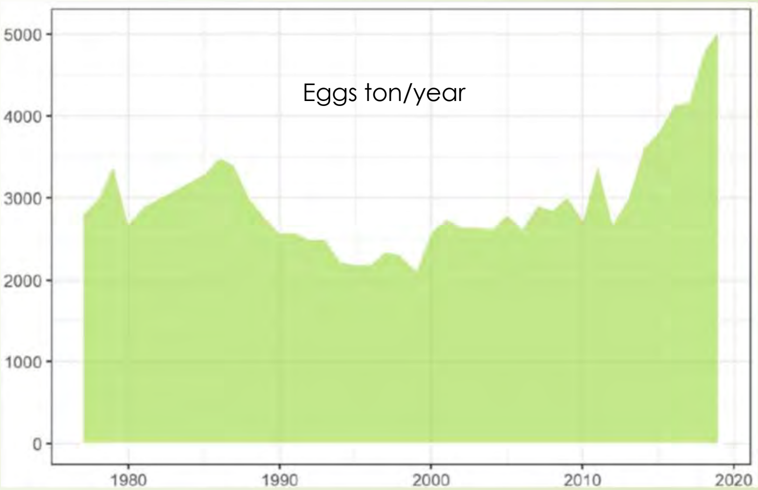




Land animal products – domestic production more or less follows the domestic market- some export of lamb



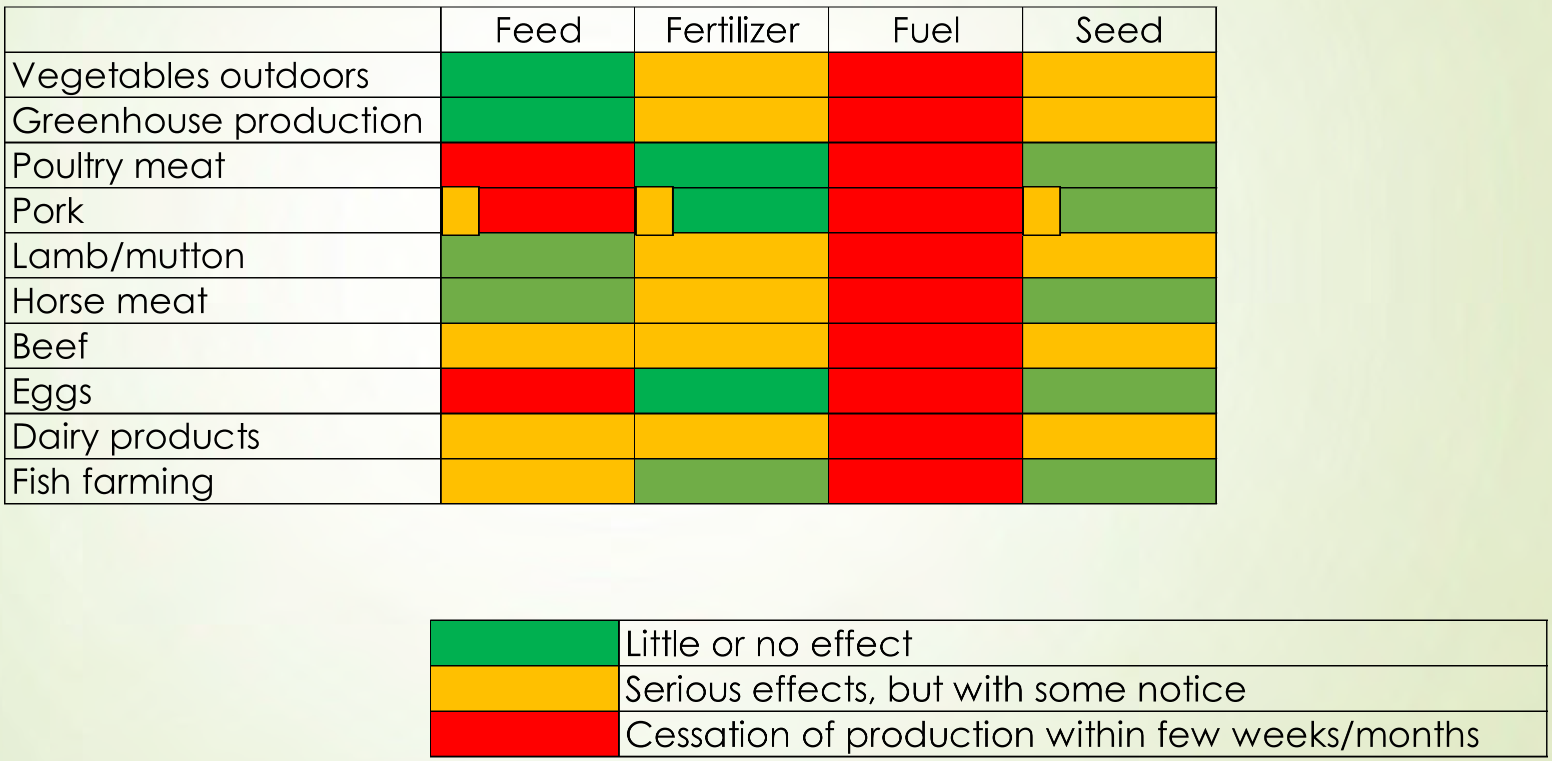




Fish

- Wealthy marine resources – yearly fish catch more than 1 million tons – 1.3% of the world fish catch in 2019
- In comparison: Icelanders are 0.005% of the world population!
- So, although we eat our fish, most of it is exported
- Fish farming: rapid growth, now exceeds the total domestic meat production, mostly exported

Effects of shortage of imported resources on Icelandic food production



Arctic circle

10°C isotherm line in July

Iceland is the only country in the world that has substantial agricultural production north of the 10°C isotherm line for July

Why?

1. **It is a matter of security** – for an island in the middle of the Atlantic Ocean
2. Conditions are favorable for grass-based production
3. We like our own high quality products!
4. We export a lot of fish and aluminium, and tourism is growing ➔ good transportation system
5. 5. It is much easier to transport and store dry feed and food than meat, milk or vegetables
6. Food safety precautions will always be more efficient for domestic production than import

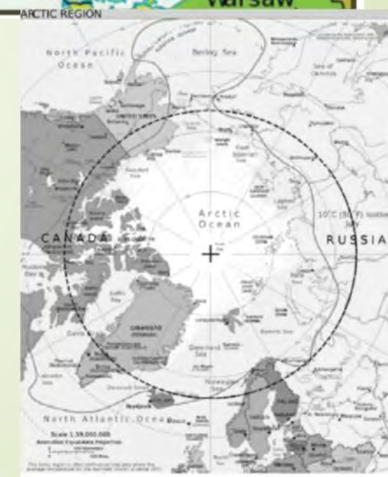


Figure 1. The Arctic Region showing the Arctic Circle (broken line) and the 10°C isotherm for July (solid line).

Food security - compromise

- Iceland´s geographical position limits the assortment of food of plant origin that can be produced
- Huge fish export
- International trade of food is of great importance for Iceland
- But at the same time we need to protect our agriculture to avoid the effects of international threats to food security

Presumably, Iceland's overall food security is relatively high.

But there are certain drawbacks/threats:

- Food self-sufficiency is limited, because of:
  - Limited assortment of domestic products
  - High volatility of production, especially for outdoor vegetables and cereals
  - And thereby insecure earning prospects for the farmers, making it difficult for seasonal Icelandic products to compete with import
- Low income of farmers and farm-workers in animal production is also a threat – in a country with low unemployment rate and high living standards
- So far there has not been any public food security strategy – but is now being developed

What can we do to maintain/increase Iceland´s food independency?

- Preserve resources (sustainable use, diversified ownership, land use plan)
- Energy exchange
- Domestic production of fertilizers and nutrient recycling
- More diverse agricultural production, plant breeding, new techniques
- Increased stability in agricultural business environment;
  - Develop strategies/policies that promote flexibility in production
  - Facilitating adaption of production to demand for different products

Thank you for listening!

University of Saskatchewan

Northern Horticulture: A New University Course

Helen Shook
College of Agriculture and Bioresources, Department of Plant Sciences

Presentation to Circumpolar Agricultural Association
September 2023

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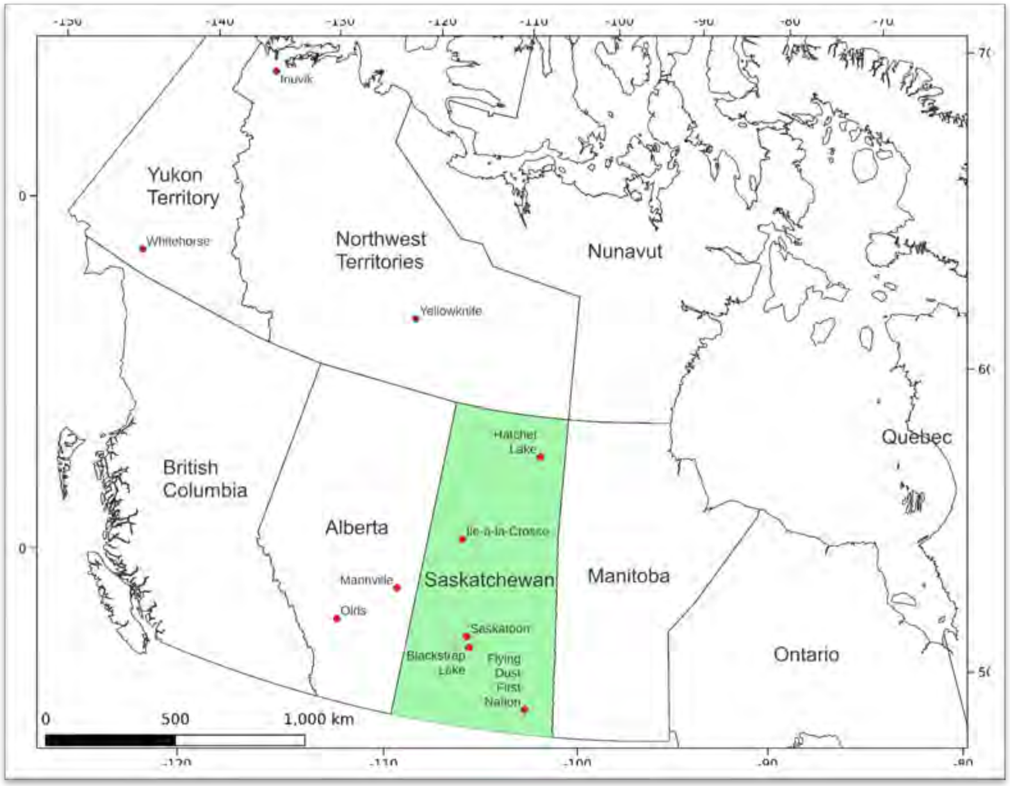
PLSC 298.3 Northern Horticulture

Small-scale Food Production in Arctic and Sub-arctic Regions

University of Saskatchewan



I acknowledge that I live and work on Treaty 6 Territory and the Homeland of the Métis. We pay our respect to the First Nations and Métis ancestors of this place and reaffirm our relationship with one another.

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Dr. Karen Tanino

Professor, Department of Plant Sciences, University of Saskatchewan

Adjunct Professor with IWATE University, Morioka, Japan

Chair of the Northern Agriculture Thematic Network, University of the Arctic

Research Areas

Plant abiotic stress physiology

Eco-physiology

Interactions of plants with the environment

Image: David Stobbe, University of Saskatchewan

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Helen Shook

Research Technician

Horticultural Outreach, Gardening at USask

Website & social media content

- Growing food in the far north, food preservation, food storage etc.

Gardenline

Teaching & curriculum development

Fruit Production, Prairie Horticulture Certificate program

Plant diagnostics (Master Gardener program)

Plant disorders (Master Gardener program)

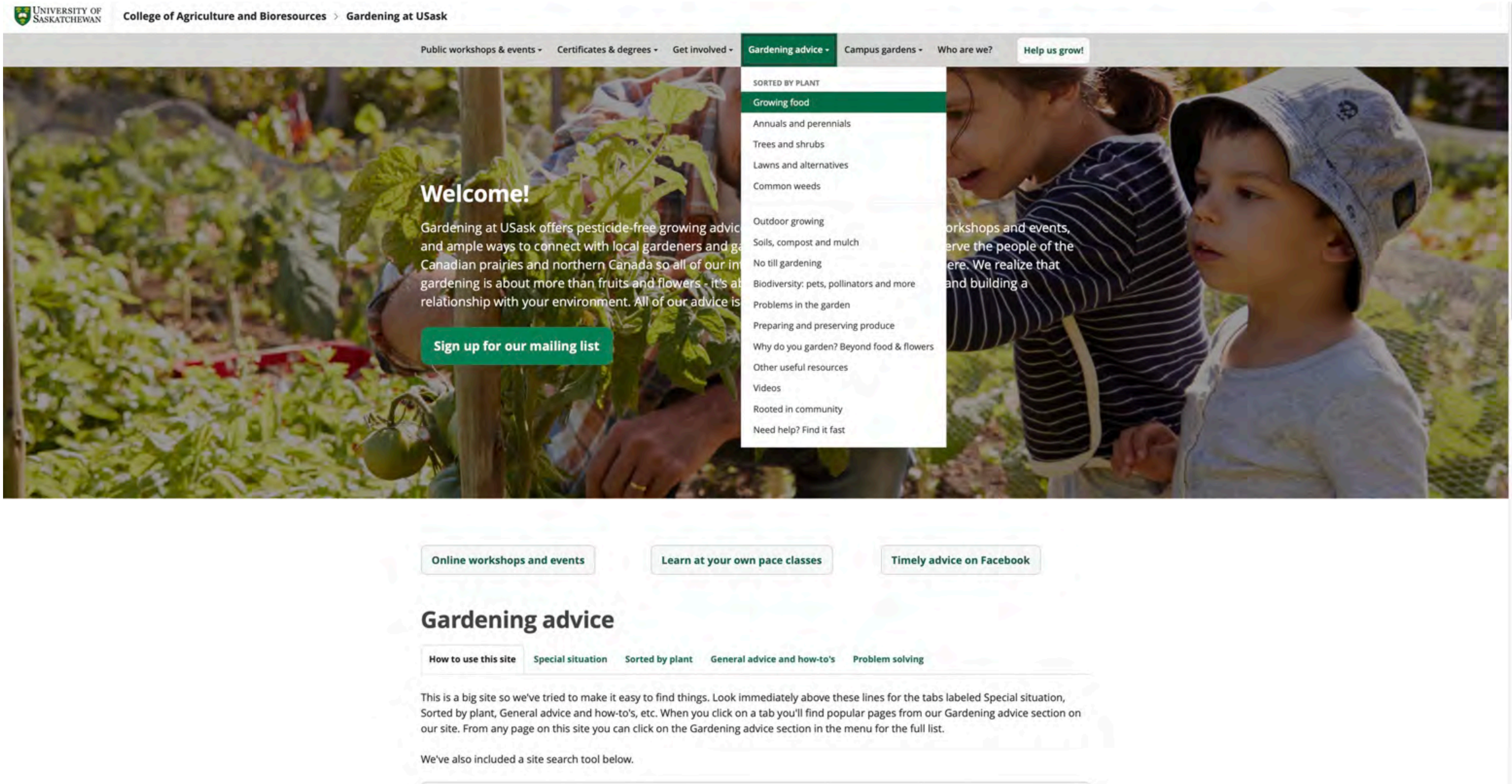
Online workshops (Gardening at USask)

In person workshops at Northern reserves

Northern Horticulture (University of Saskatchewan)

University of Saskatchewan

gardening.usask.ca



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Agriculture on the Canadian Prairies

Combining at Indian Head, Saskatchewan
Image: Dan Loran, Unsplash

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Growing food in the north is different

Mannville, Alberta
Image: Kim Ross

Image: Whitehorse Yukon Community garden

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Hatchet Lake, Saskatchewan

Images: Helen Shook

Course description

Designed for students interested producing food in short-season cold climates in the context of food insecurity.

Provides a framework for designing sustainable, small-scale, community-based food production models from a food sovereignty perspective.

Topics:

- Selecting hardy, adapted fruits and vegetables, pollination, harvest, food storage & preservation.
- Outdoor and indoor growing.
- Environmentally sustainable practices: composting, mulch, no till, pesticide-free insect and disease management.
- Practicum component.

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Learning outcomes

1. Identify policies, practices and issues which influence food insecurity in the north.
2. Analyze the factors involved in designing sustainable, small-scale food production systems in the context of food sovereignty.
3. Best horticultural practices for indoor and outdoor food production.
4. Select and grow fruits and vegetables suitable for short-season cold climates.
5. Techniques and strategies to enhance or lengthen the growing season.
6. Basic understanding of native pollinating insects, harvesting, food storage and preservation techniques, pesticide-free disease and insect pest management.
7. Design/analyse a framework for a northern food sovereignty initiative from seed to harvest.

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About the course

- One term
- Winter 2025
- Ranked for second year university students
- Offered on-line
- Prerequisites can be waived
- No textbook

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Evaluation

Journal Assignment	10%
Quizzes	30%
Northern Horticulture Initiative Framework Paper / Practicum report	30%
Final Exam (online)	30%
Total	100%

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Practicum

Funding for 10 – 15 students to travel to a northern region/country

- Target group: Indigenous/First Nations, low income, or student with a disability
  - Eligible for up to $10,000 CD (€6700)
- Basic grant of up to $5,000 CD (€3385)

Local practicum for all other students

Module 1: Introduction

Define north in terms of geography and climate.

Northern horticulture compared to

- traditional agriculture
- subsistence agriculture
- urban agriculture

Climate change as a barrier and opportunity towards increased food security in remote, sparsely populated northern regions.

Barriers to accessing nutritious, affordable, and culturally acceptable food in northern communities.

Principles of the food sovereignty movement.

The role of traditional foods.

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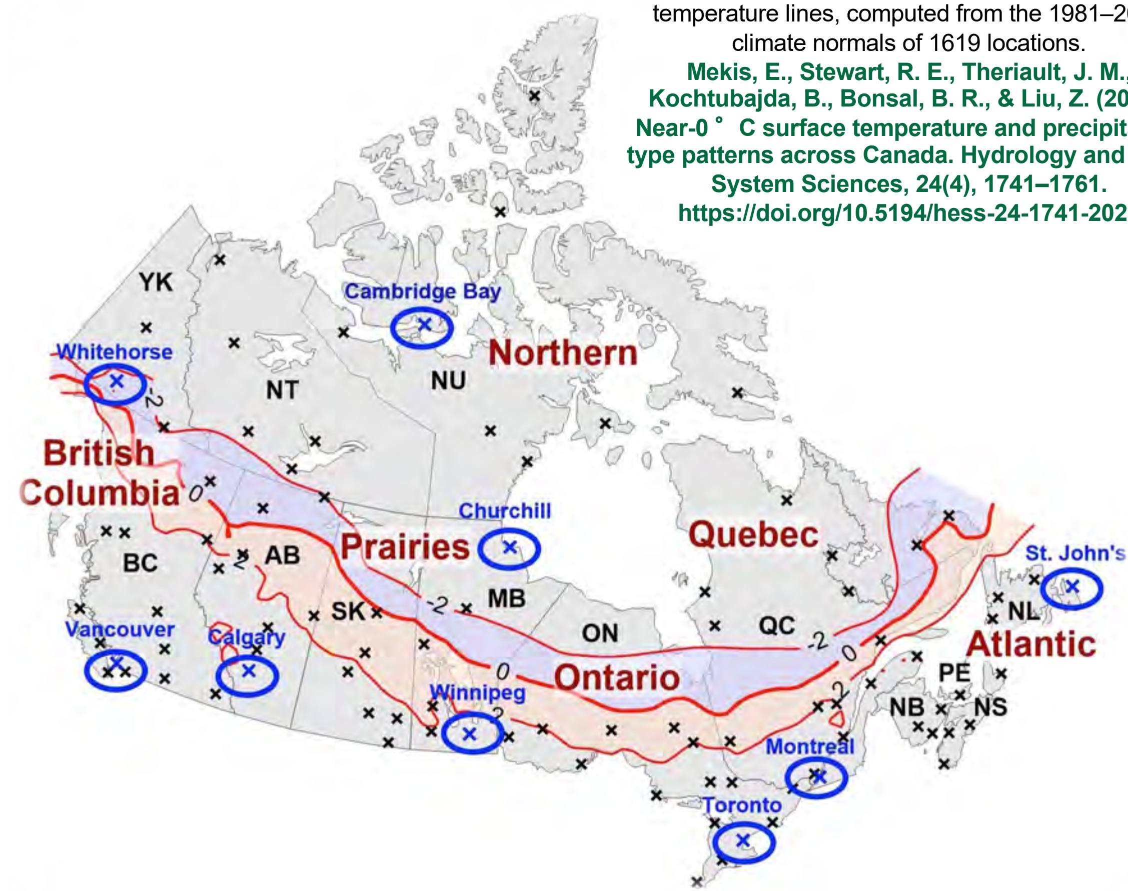
The average annual 2 ∘C, 0 ∘C and -2 ∘C surface temperature lines, computed from the 1981–2010 climate normals of 1619 locations.

Mekis, E., Stewart, R. E., Theriault, J. M., Kochtubajda, B., Bonsal, B. R., & Liu, Z. (2020). Near-0 ° C surface temperature and precipitation type patterns across Canada. Hydrology and Earth System Sciences, 24(4), 1741–1761. https://doi.org/10.5194/hess-24-1741-2020



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Île-à-la-Crosse, Saskatchewan

Image: Karina Chimbo Huatatoca

Module 2: Models of food production in northern horticulture

Community-based initiatives

Inuvik Community Garden, NWT
Image: Bill Braden

Harvesting haskaps at Kam Lake Community Orchard in Yellowknife, NWT.
From: http://www.ykgardencollective.org/locations/kam-lake-community-orchard

University of Saskatchewan

Community-based initiatives

Market day at the Fireweed Community Market , Whitehorse, YT
from: https://fireweedmarket.ca

Summer produce - Yellowknife Farmers' Market, NWT
from http://yellowknifefarmersmarket.ca

Module 2: Models of food production in northern horticulture
Social Enterprise Models

Flying Dust First Nation Riverside Garden, SK from: https://www.cbc.ca/news/canada/saskatchewan/flying-dust-riverside-market-2017-1.3973336

- Stable food supply
- Employment and/or volunteer opportunities
- All ages - from children to elders
- Distribute food at no or low cost
- Learn how to grow vegetables and fruit, cooking and food preservation techniques
- Create profit from the surplus

Module 2: Models of food production in northern horticulture

Business Enterprise Models

Community Supported Agriculture (CSA) - Farm shares

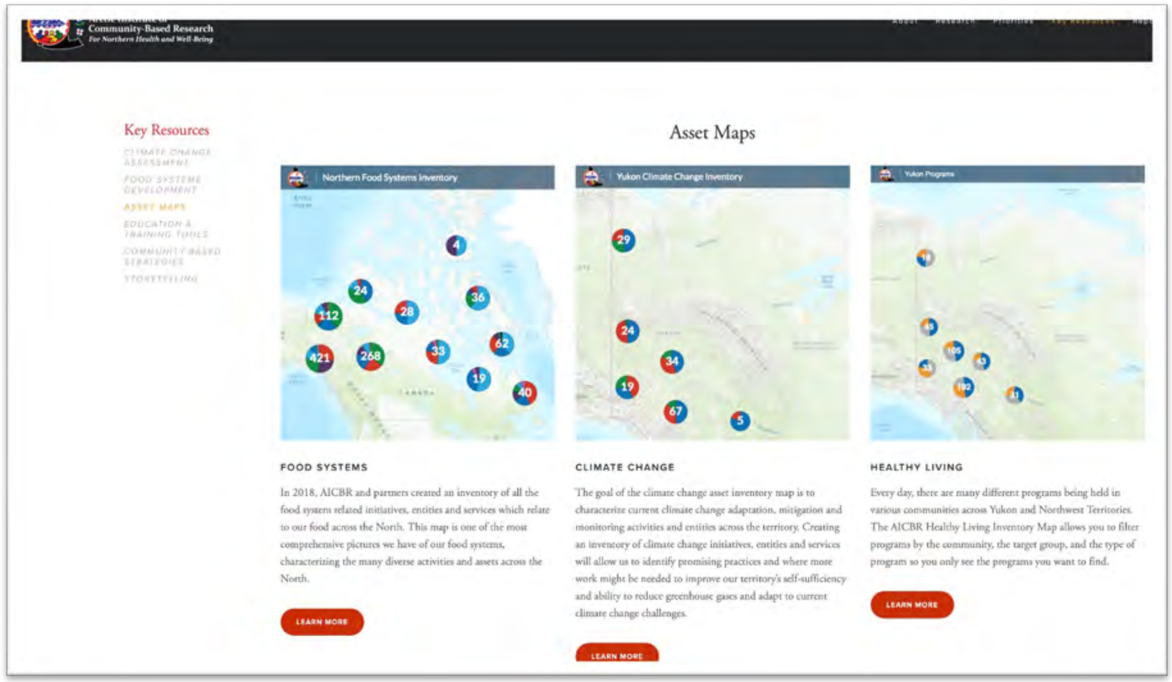
SPIN (Small Plot Intensive) farming

Market gardening

CSA Weekly vegetable box from:
www.springcreekgarden.ca

Module 2: Models of food production in northern horticulture

Asset mapping



Arctic Institute of Community-based Research for Northern Health and Well-being Asset Maps
https://www.aicbr.ca/assets-maps

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Module 3: Outdoor growing - Soils & Water

Developed with Dr. Charles Maule

Soil

- Soil components, texture, aggregate structure, cation exchange capacity, fertility, pH, microbial life etc..
- Northern soils
- Permafrost
- No till soil management
  - Permanent paths & planting beds
  - Mulch on top of bare soil
- Soil improvement (Module 5: Compost & Mulch)

Image: Kim Ross

Module 3: Outdoor growing - Soils & Water

Water

- Application and timing
- Harvesting rainwater and snow water
- Harvesting water from freshwater rivers, lakes, and dugouts
- Sprinklers and drip or trickle irrigation
- Greywater and blackwater

Large tote for collecting rainwater at community garden Saskatoon, SK
Image: Helen Shook

Module 4: Enhancing and extending the growing season

Site selection (light, aspect, slope, access to water)

Raised beds (framed or unframed)

Inorganic mulches for warming soil

Haskap and high bush cranberry orchard
University of Saskatchewan Fruit Program

UNIVERSITY OF SASKATCHEWAN

Module 4: Enhancing and extending the growing season

Barriers to frost and wind

- Shelterbelts
- Cold frames
- Hot caps
- Floating row covers
- Low tunnels
- High tunnels
- Fruit tree shelters

Melons growing under high tunnels near Saskatoon, SK
Image: Helen Shook

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Module 5: Compost and mulches

- Amendments
- Composting
- Wildlife
- Cover crops/green manure
- Animal manure
- Wood ash
- Synthetic vs organic fertilizers
- Mulches (organic & plastic)

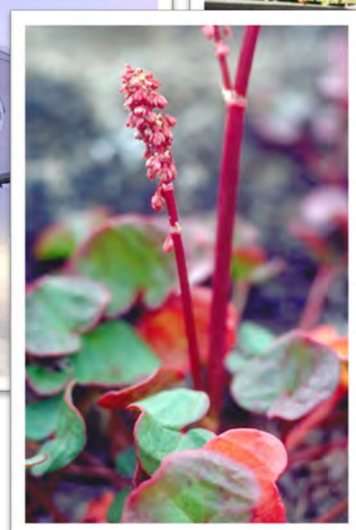
Compost bins made of wood pallets
Image: Kim Ross

University of Saskatchewan

Module 6: Growing food indoors

Closed container growing units

Images courtesy Growcer, photographed by Ashley St. Germain



Qungulit, Mountain Sorrell, Oxyria dignyna.
Image by J.M. Gillett.

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Module 6: Growing food indoors
Passive solar greenhouse

Chinese-style passive solar greenhouse, Fresh Pal Farms, Olds, Alberta. Image: Dong Jianyi

Installation of a thermal rock bed in a home passive solar greenhouse.
Image by Kim Ross, University of Saskatchewan.

University of Saskatchewan

Module 6: Growing food indoors

Growing vegetable seedlings indoors

Containers, growing medium, lighting, bottom heat etc.

Timing

Germination

Watering and care

Hardening off

Troubleshooting

Image: Zoe Schaeffer on Unsplash

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Module 6: Growing food indoors

Microgreens

Seeds
Growing medium
Lighting
Harvesting
Uses

Image: Helen Shook

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Module 7: Vegetables

Temperature
- Seed germination (bolting, vernalization)
- Cold tolerance of vegetables

Selecting what to grow
- Days to maturity
- Number of frost free days
- Growing degree days

Limited northern information
- Need for cultivar trials
- Saving seeds to improve vigor

Planting
- Succession planting, interplanting, fall sowing, crop rotation

Record keeping

Climate Atlas of Canada climateatlas.ca showing Frost-free Season information for Yellowknife, Yukon.

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Module 8: Fruits

Which fruits can be grown in the north?

Canada plant hardiness zone ratings

Woody fruit buds must overwinter

Pollination requirements

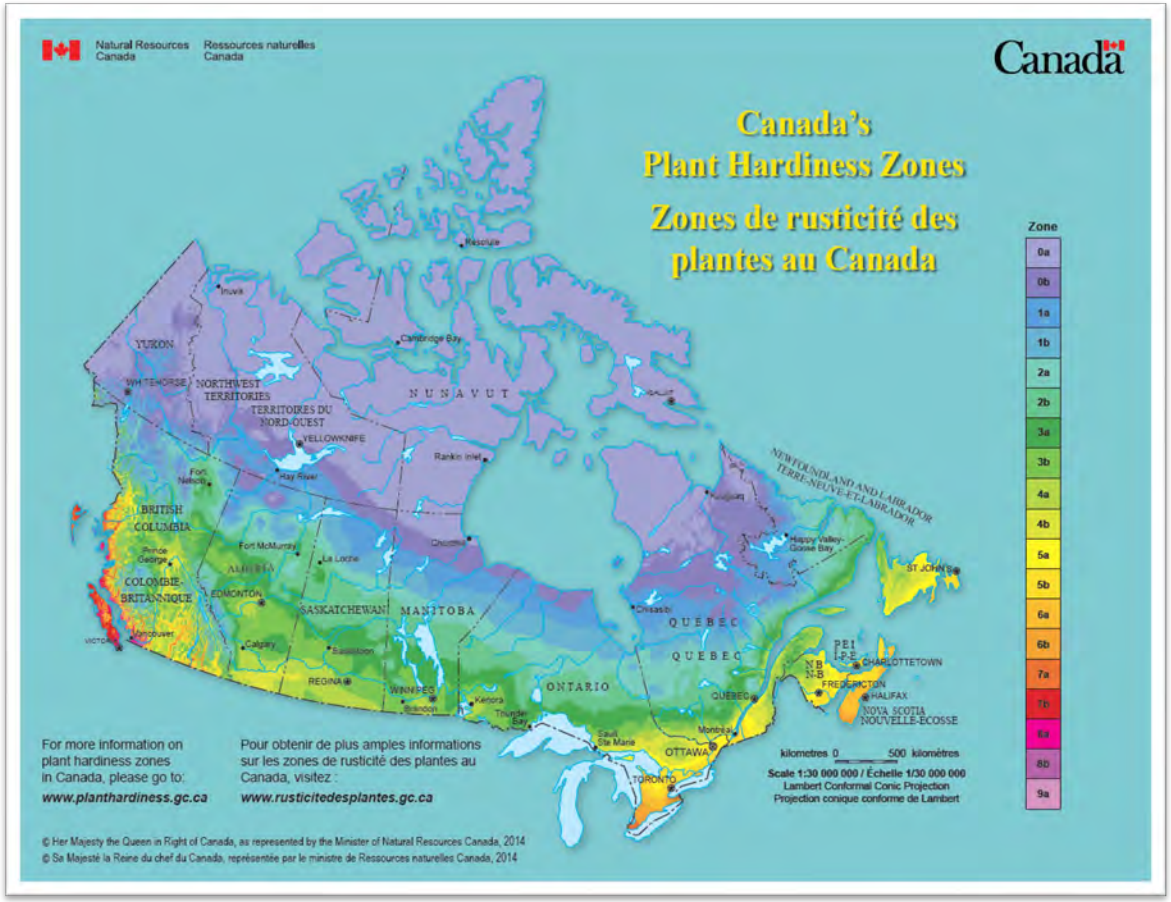
Cultivar selection and sourcing plants

Native fruits

Pruning

Planting

Prevention of disorders



Canada's Plant Hardiness Zones Map (2014).
Retrieved from: planthardiness.gc.ca

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Module 9: Beneficial insects and their role in pollination and pest control

Pollination

Flower structure

Native pollinating insects

- Solitary bees, bumblebees, hoverflies, butterflies, moths, beetles, wasps, and others

Pest insects vs beneficials

- Predators, parasitoids

Providing habitat & food sources for beneficials

Apiculture

Transverse lady beetle (*Coccinella transversoguttata*). Native to Yukon and Northwest Territories but threatened by the introduction of the Seven-spotted lady beetle (*Coccinella septempuncata*) to control greenhouse pests. Image: Henri Goulet

Module 10: Harvesting and food storage

Determining ripeness

Climacteric and non-climacteric fruits

Respiration

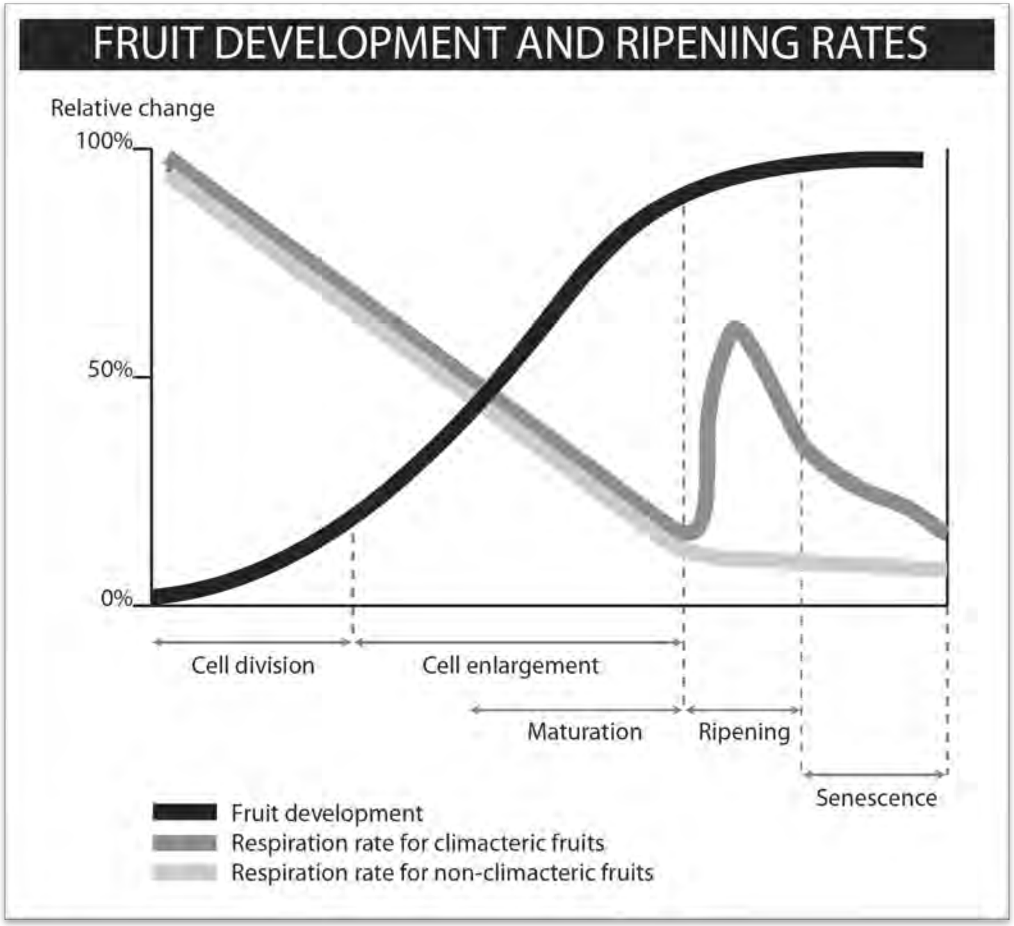
Harvesting techniques

Post harvest cooling and handling

Cleaning, sorting, packaging, curing

Longer term cool storage

Storage locations



Fruit development and ripening rates. Source: Jill Turner, CCDE, University of Saskatchewan

Module 11: Food preservation

Food safety

Freezing, blanching, defrosting

Canning

- Food acidity and processing methods

Drying vegetables, fruits, herbs

Fermentation

- Dry-salting, brining

Canned vegetables. Image by Ray Shrewsberry on Unsplash.

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Northern Horticulture

Toolbox of knowledge/skills for developing sustainable, small-scale food production initiatives in a short-season cold northern climate from seed to harvest in the context of food sovereignty.

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Questions?

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Contact

helen.shook@usask.ca

karen.tanino@usask.ca

Gardening at USask

www.

gardening.usask.ca

Future prospects for agriculture in Northern-Norway in light of climate change

Sigridur Dalmannsdottir, NIBIO Tromsø
CAC Faroe Islands 5-7. september 2023

NIBIO

Experimental station Holt

1923

2023

NIBIO

In the field
in 1950

NIBIO

100 år jubileum
3. September 2023

Agriculture in the Northern Norway is characterized by a cool and short growing season mainly based on perennial forage crops, where winter survival is the far most important trait.

Photo: Nordnorsk landbruksråd, Tromspotet, Tine

N-NORWAY

- Coastal/inland, mountain/lowland
- 113 km2
- Population ca. 500.000
- Norway: Total arable land 6%, in use 3%
- Little less than 50% self sufficiency

The Arctic

Arctic circle

10°C isoterm line, where the average for July is below 10°C

Tromsø:

Polar night from November to

Midnight sun from May to July

NIBIO

NIBIO
NORSK INSTITUTT FOR
BIOØKONOMI

Centre of Arctic agriculture in Norway - NIBIO







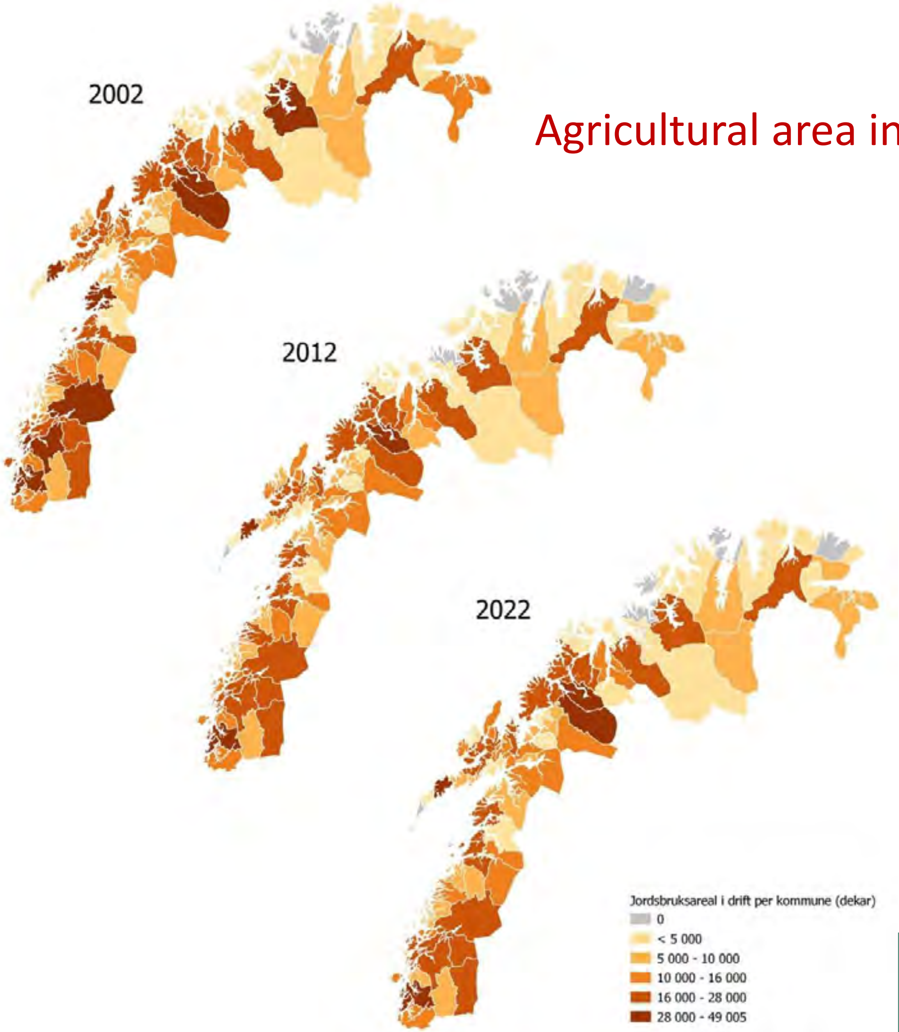

NIBIO in N-Norway

- 4 localities
  - Svanhovd (25)
  - Tromsø (29)
  - Bodø (9)
  - Tjøtta (16)

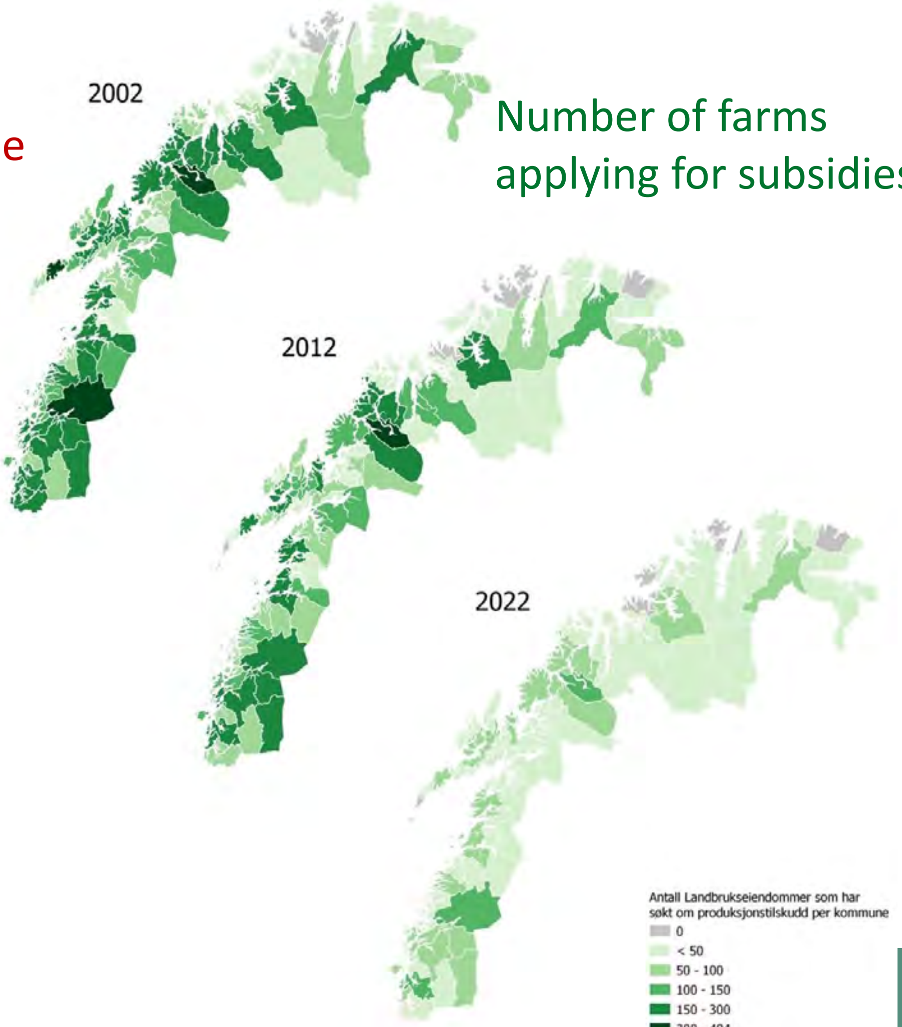
- Ca 80 employes

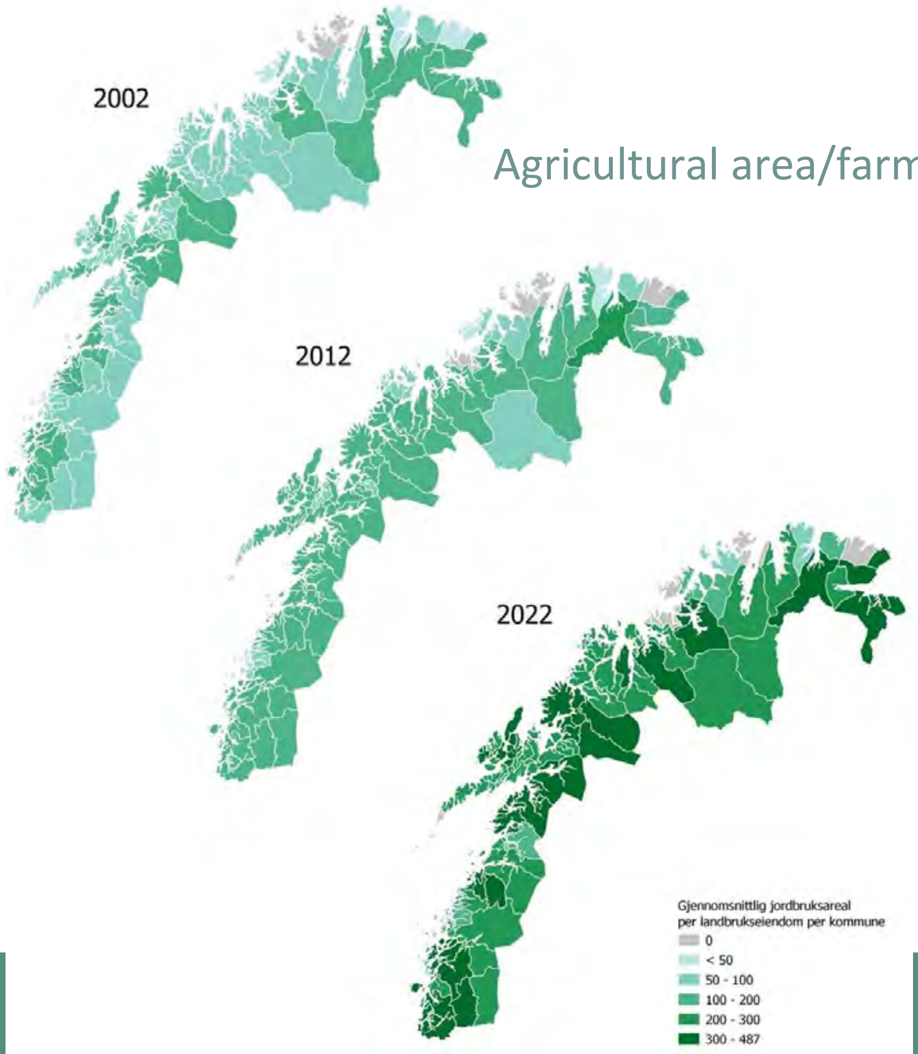
NIBIO

Agricultural area in use



Number of farms applying for subsidies





Fewer people do more work

is this sustainable?

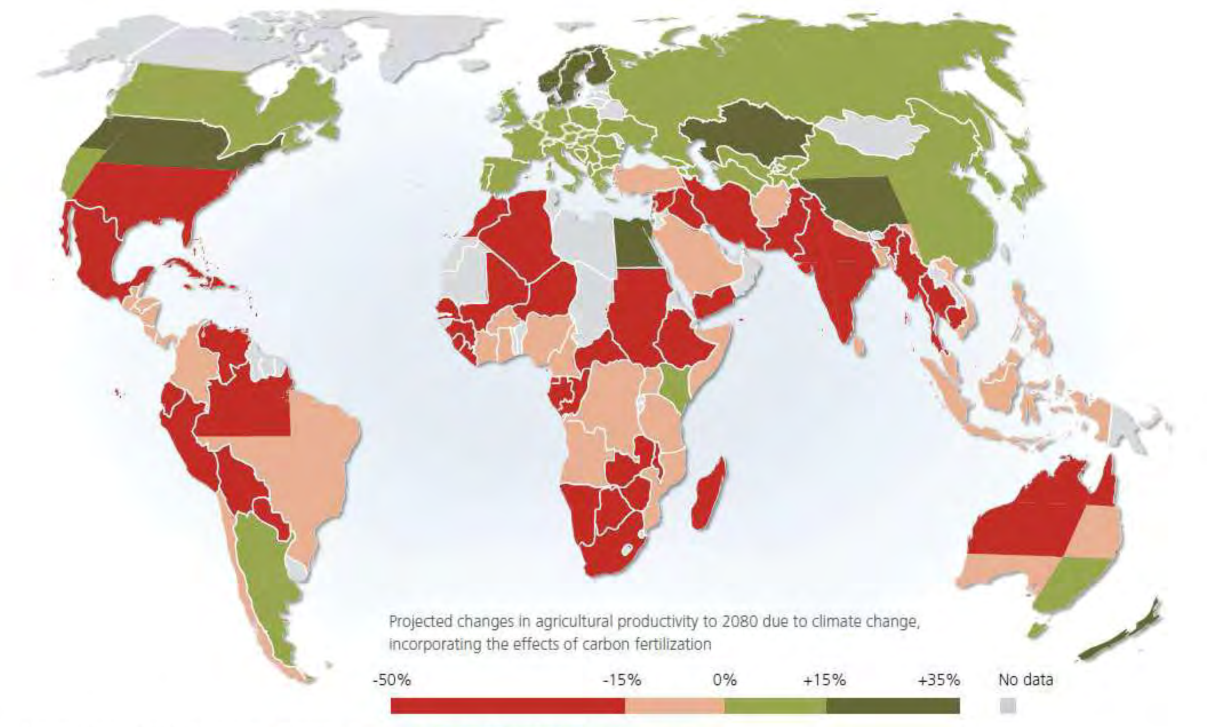
Challanges in N-Norway:

- Long distances
- Weak infrastructure
- Unstable winters – closed roads
- Increased amount of rented land
- Less quality of rented land

Crop production in the future – what to expect?

The northern areas are a global resource

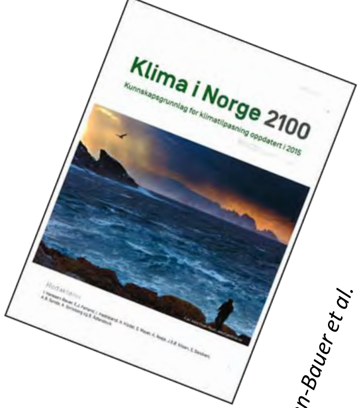
Potential for food production in 2050 compared to year 2000



Source: Cline et al., 2007; Food and Agriculture Organisation of the United Nations, 2009

NIBIO

Climate change in Norway until 2100 - scenarios



Hansen-Bauer et al. 2015

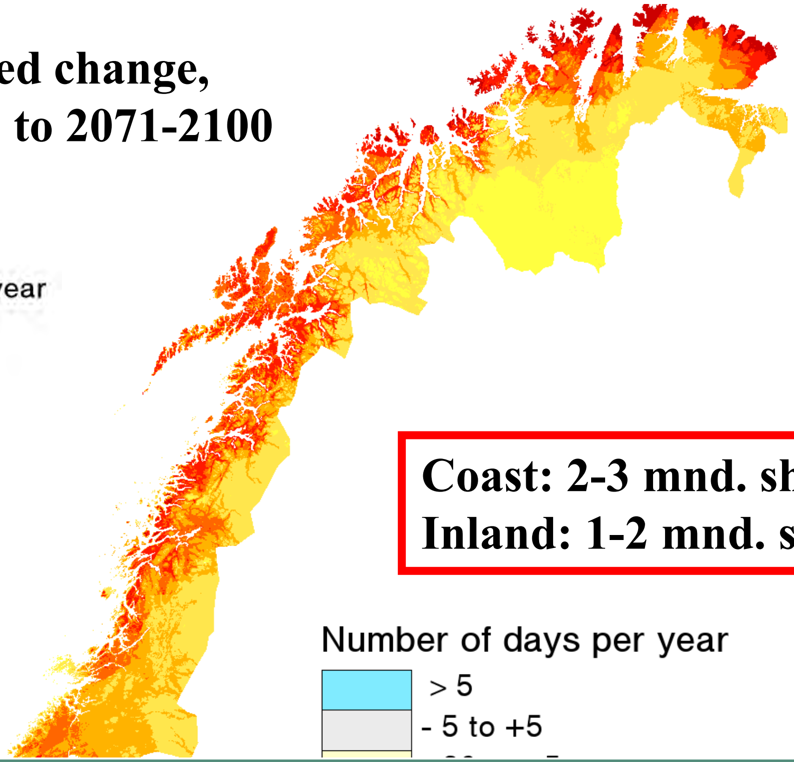
- Warmer (1.7-6.4°C, most in the north)
- Longer growing season
- More variable weather within and between years
- Fewer days in the year with snow cover
- More precipitation (18%) and change in precipitation patterns
- More frequent ”extreme weather”, flooding
- Increase in CO_2 concentration in the atmosphere

Example projection, length of snow season

Projected change,
1961-1990 to 2071-2100

Number of days per year

- > 5
- - 5 to +5
- - 20 to - 5
- - 35 to - 20
- - 50 to - 35
- - 65 to - 50
- - 80 to - 65
- -100 to - 80
- < -100



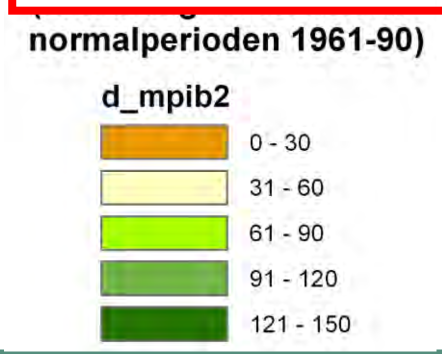
Coast: 2-3 mnd. shorter
Inland: 1-2 mnd. shorter

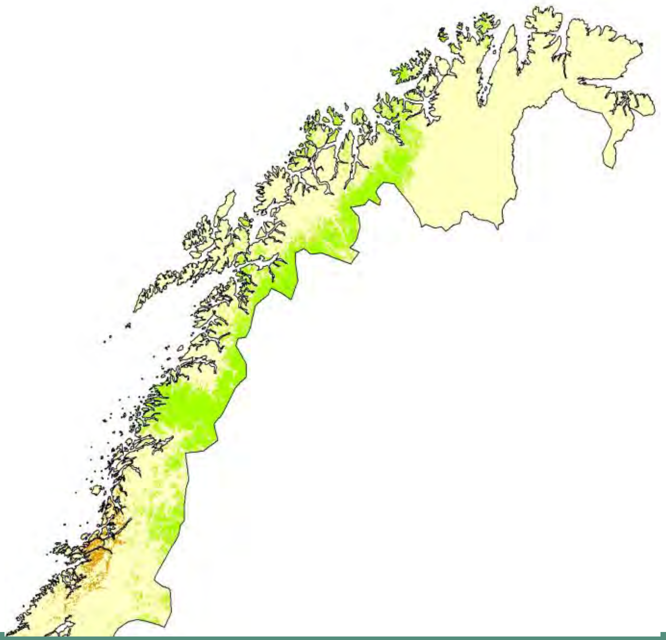
Number of days per year

- > 5
- - 5 to +5

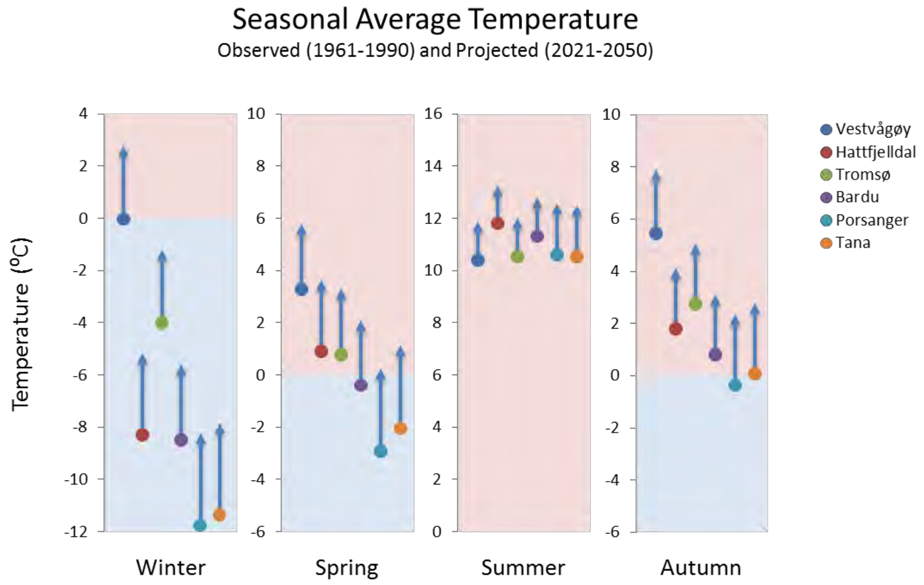
Example projection, Growing season

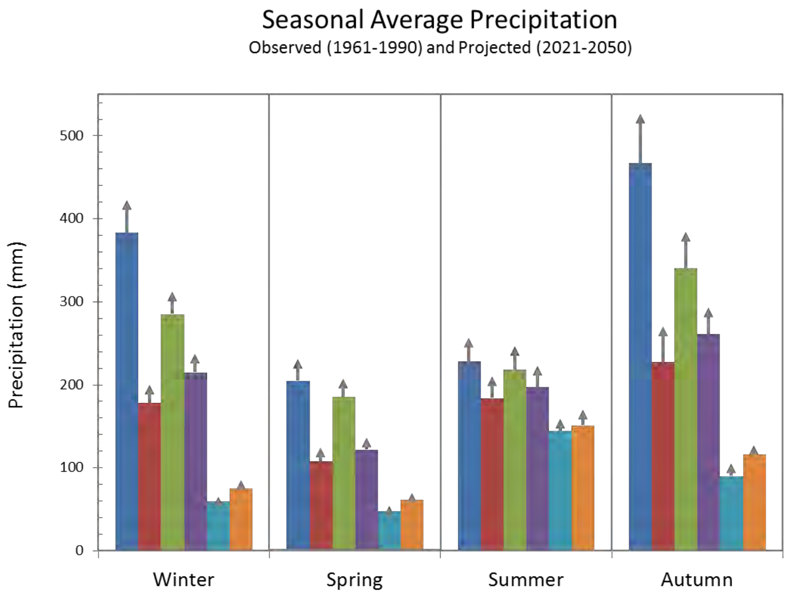
Coastal areas:
+1-2 mnd.
Inland:
+2-3 mnd.



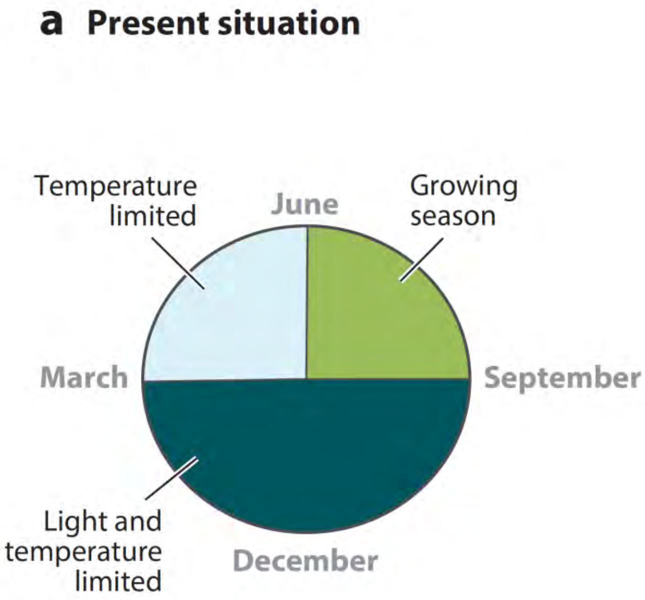


CLIMATE PROJECTIONS FOR NORTHERN NORWAY





Global warming - effects on growing season



Cooper, E.J. (2014) *Ann Rev Ecol Evol System* 45, 271-295

Opportunities and benefits

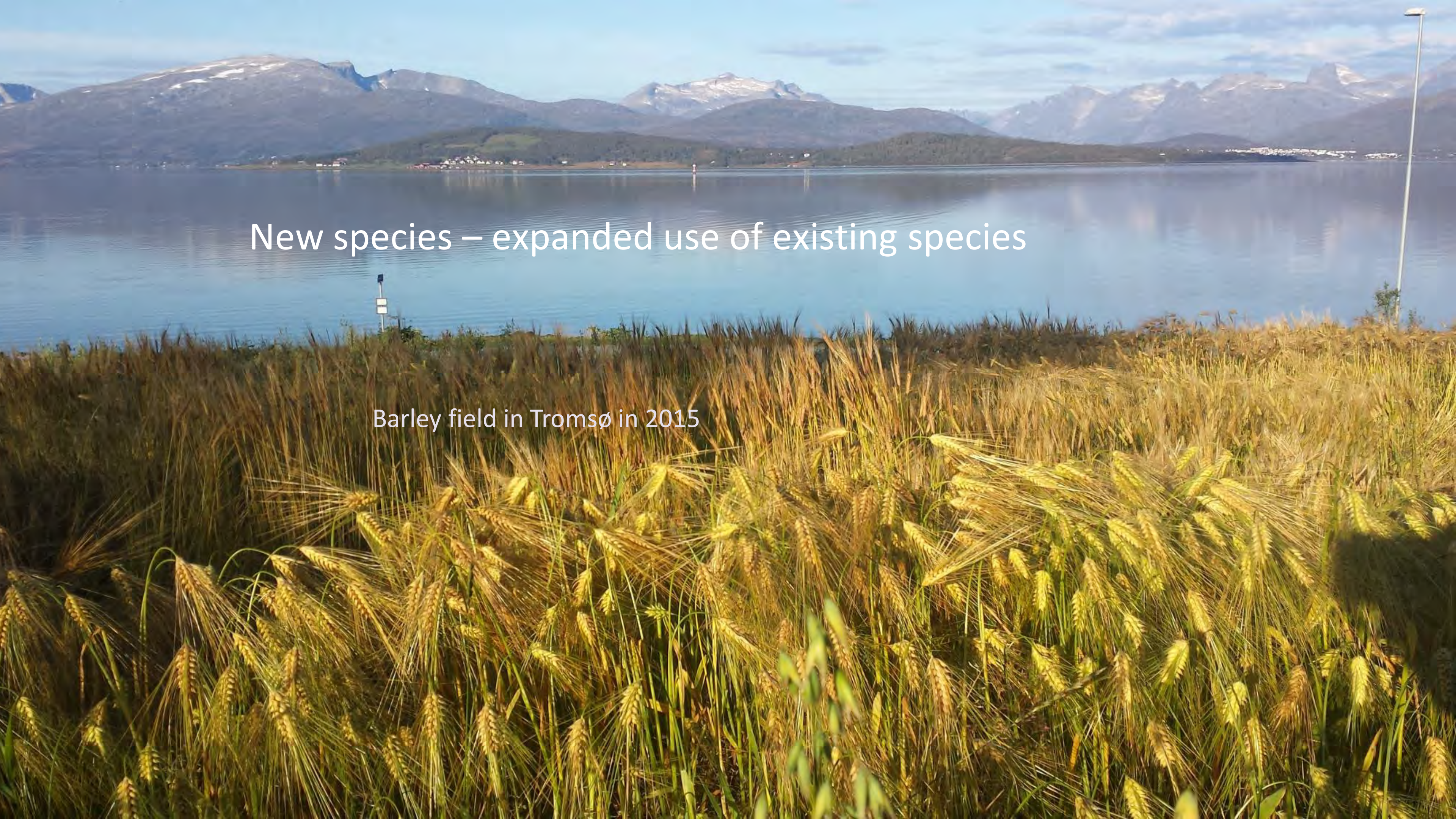
- Warmer and longer growing season
  - more yield potential
  - extra harvest of forage grasses
- New more productive crop species/cultivars and expanded use of existing species
  - Annual and perennial
  - Better forage quality?
  - possible more crop diversity
- Increased crop rotation
- Expanded grazing period
- New available land
- Higher CO_2 levels in atmosphere – higher yield

Introducing new species/expanding use of excisting species - 2050

- Perennial ryegrass and red clover expansion further north in the country
- Lucerne – winter hardy varieties available but need indigenous soil populations of *Sinorhizobium*
- Cereal and oilseed in expanded areas, barley up to the far north
- Maize up to mid-Norway

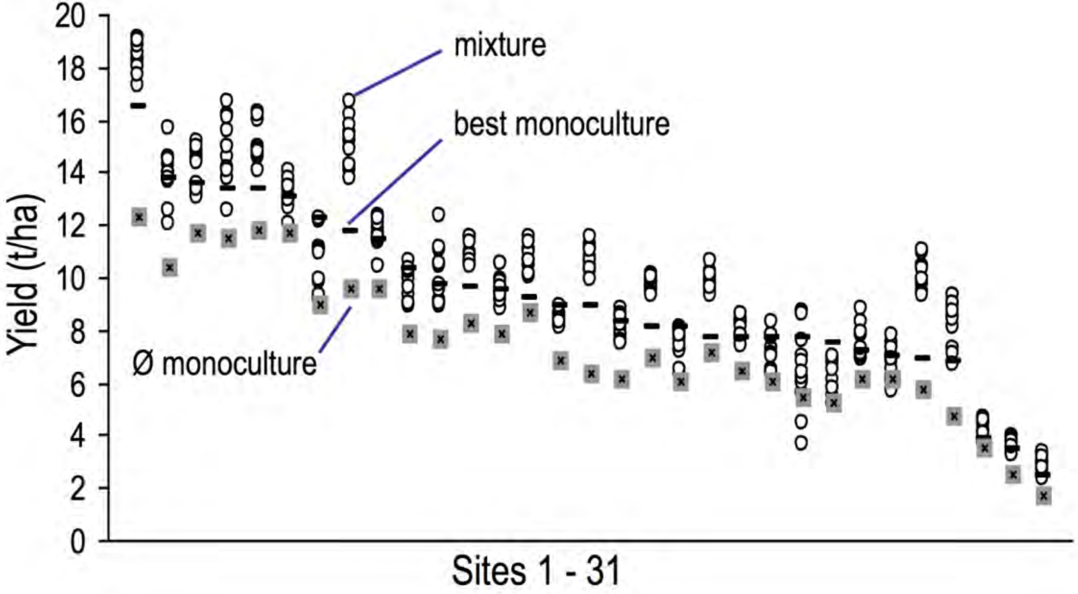


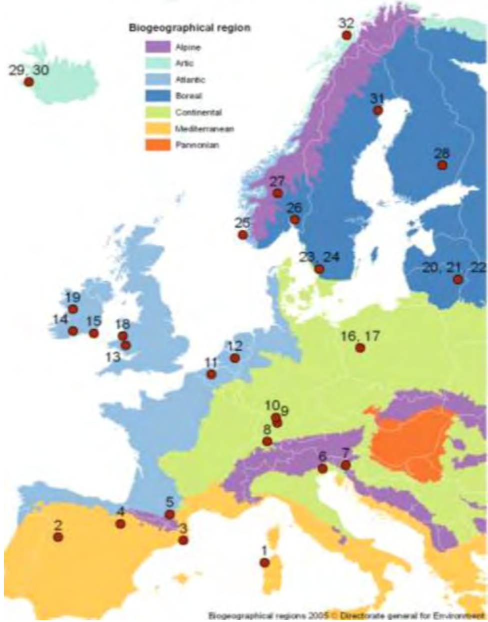
New species – expanded use of existing species



Barley field in Tromsø in 2015

More yield - species mixtures

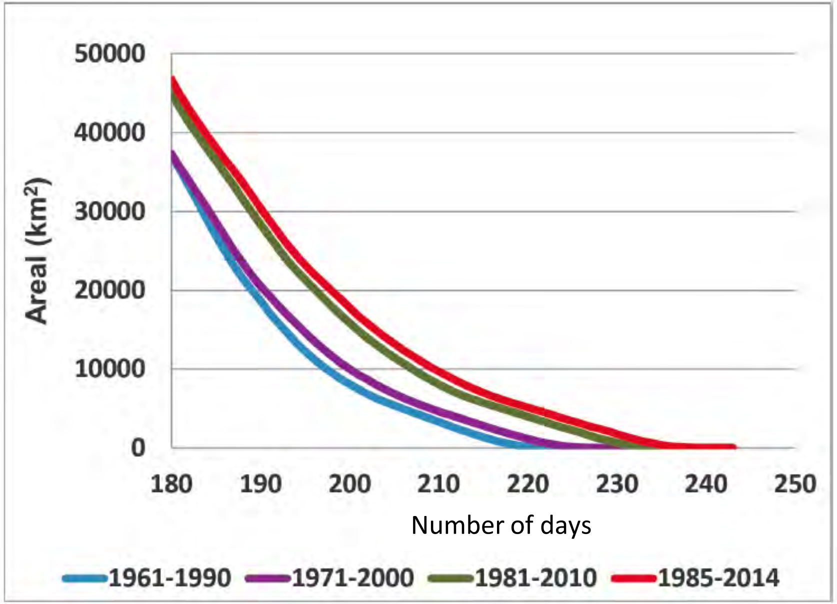




COST 852
Kirwan et al.

Will we have more available land?

Expansion of suitable areas for crop cultivation



Area (Km^2) with growing season longer than 180 days

Challenges and costs

- Increased winter stress – less snow cover and unstable winters
- Challenging hardening conditions for perennial crops
- More autumn/spring rain
  - Flooding and erosion
  - Soil compaction
  - Harvest failure (cereal, potato, vegetables)
- More weeds, pests and diseases
- Dry summers – summer drought, lower yield

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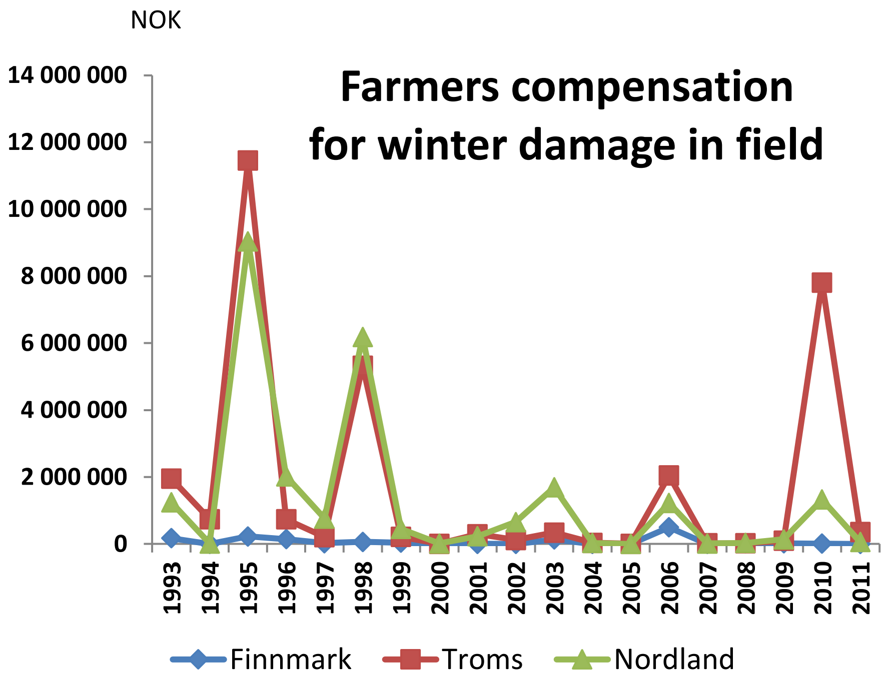
Winter damage



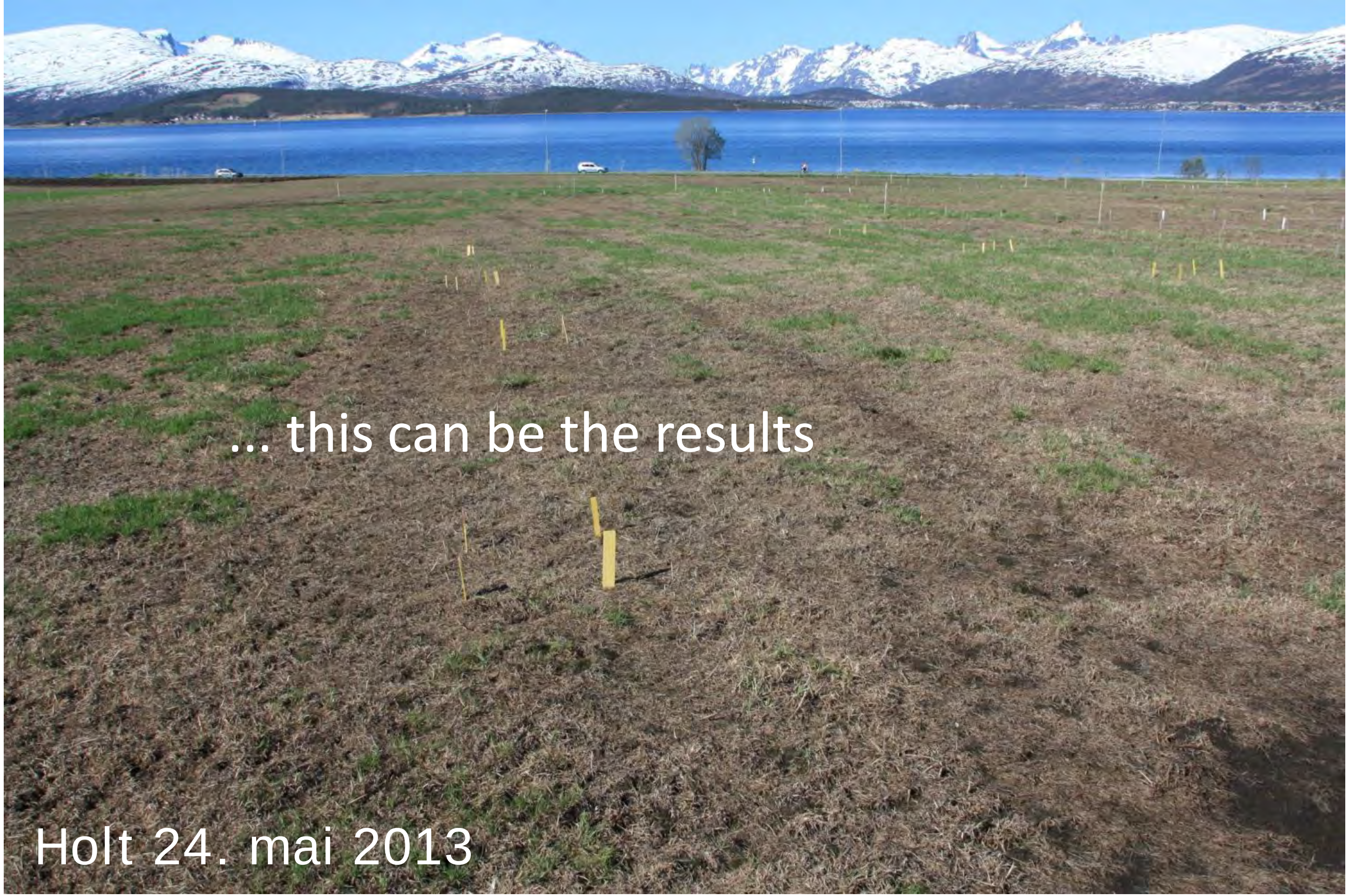
- Unstable winters
- More winterstress
- Costs to renew fields


Stable snow cover protects the
crop plants during winter

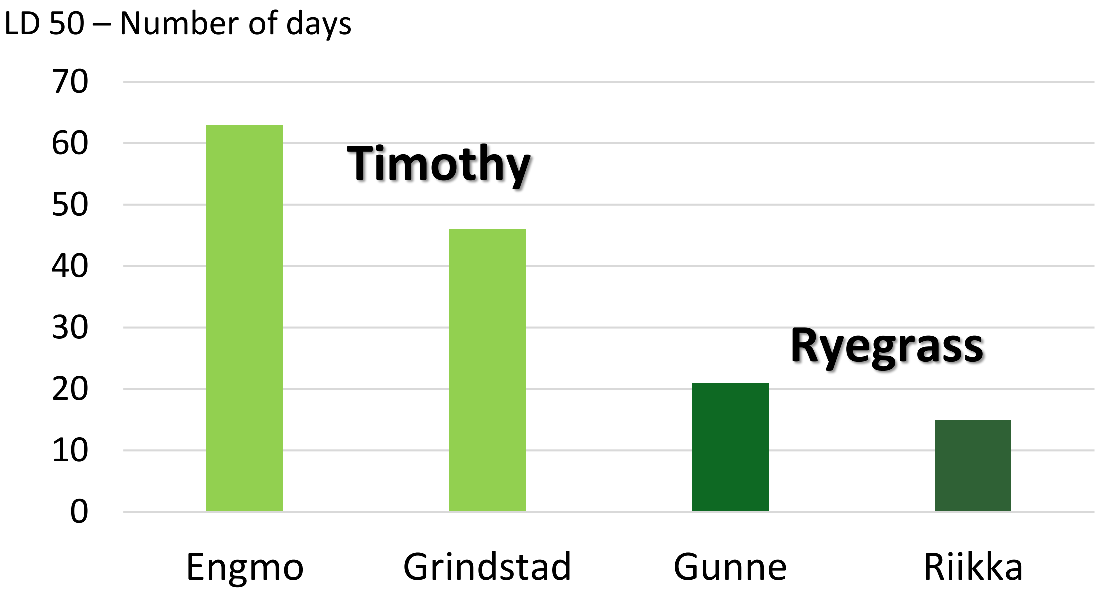
But if snow melts and forms ice cover the situation changes


Holt 28. februar 2013

Foto Ellen Elverland

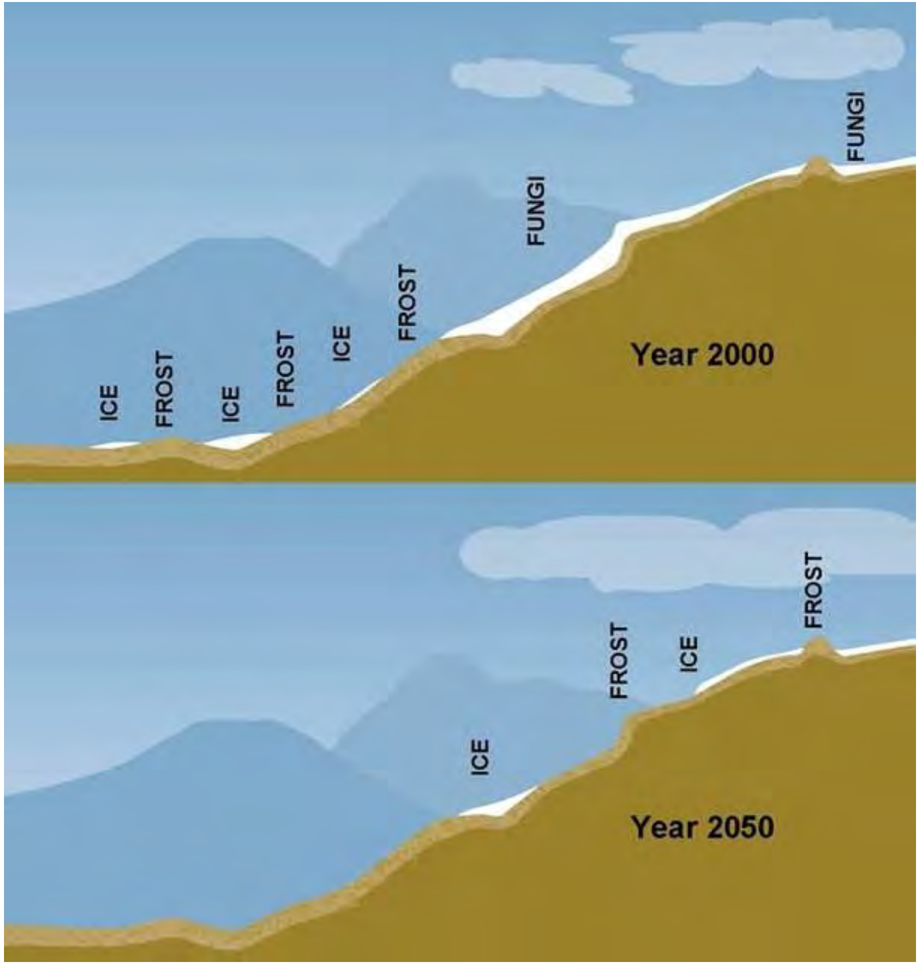

… this can be the results
Holt 24. mai 2013

ICE ENCASEMENT TOLERANCE – DIFFERENCE BETWEEN SPECIES/CULTIVARS



Höglind et al 2010

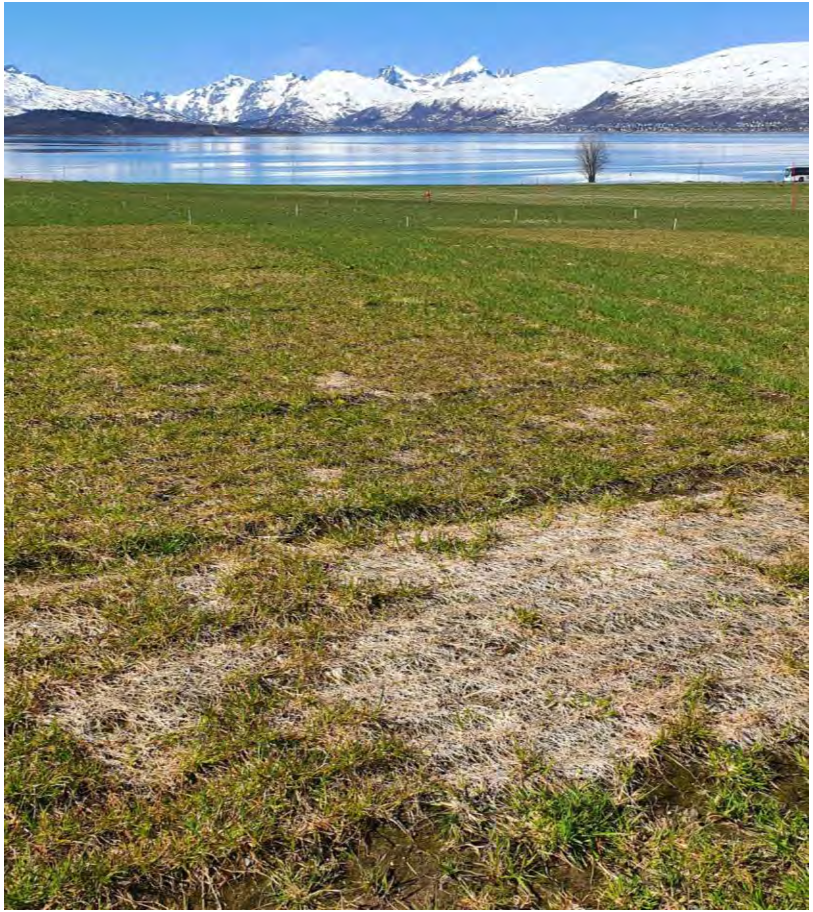
Expected change of winter stress to plants in the near future



Gudleifsson 2009

Snow mold

- We have experienced more snow mold in the spring the recent years, especially in timothy
- Probably because the soil is humid and not frozen when we get snow cover in the winter
- Important to select for more snow mold resistent species/cultivars



Climate change effect on reindeer

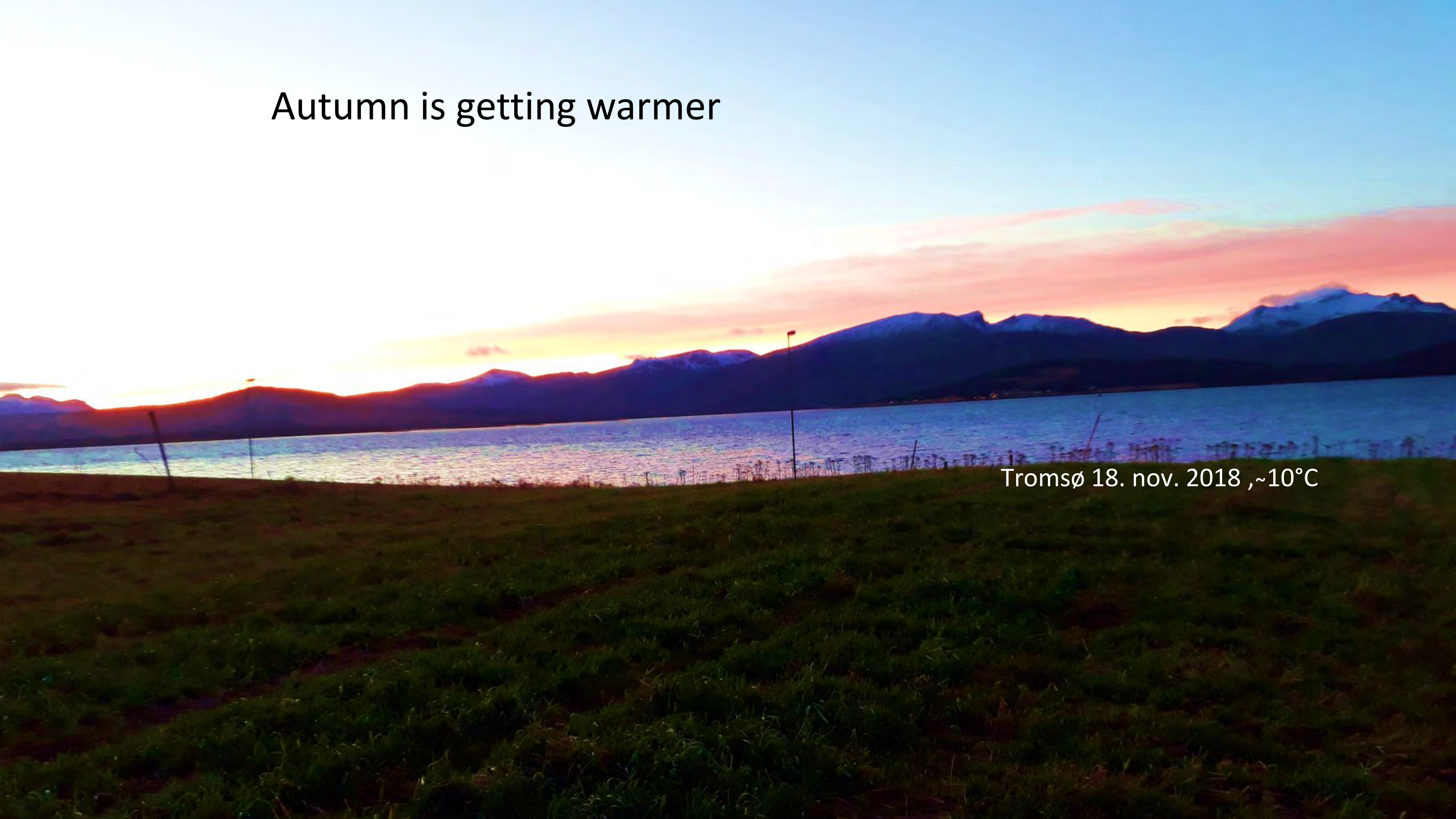
Experimenting with extra feed – grass pellets

Foto: Gabi Wagner

REIN FRAMTID NIBIO Veterinærinstituttet Norwegian Veterinary Institute

Nofima UiT Norges arktiske universitet

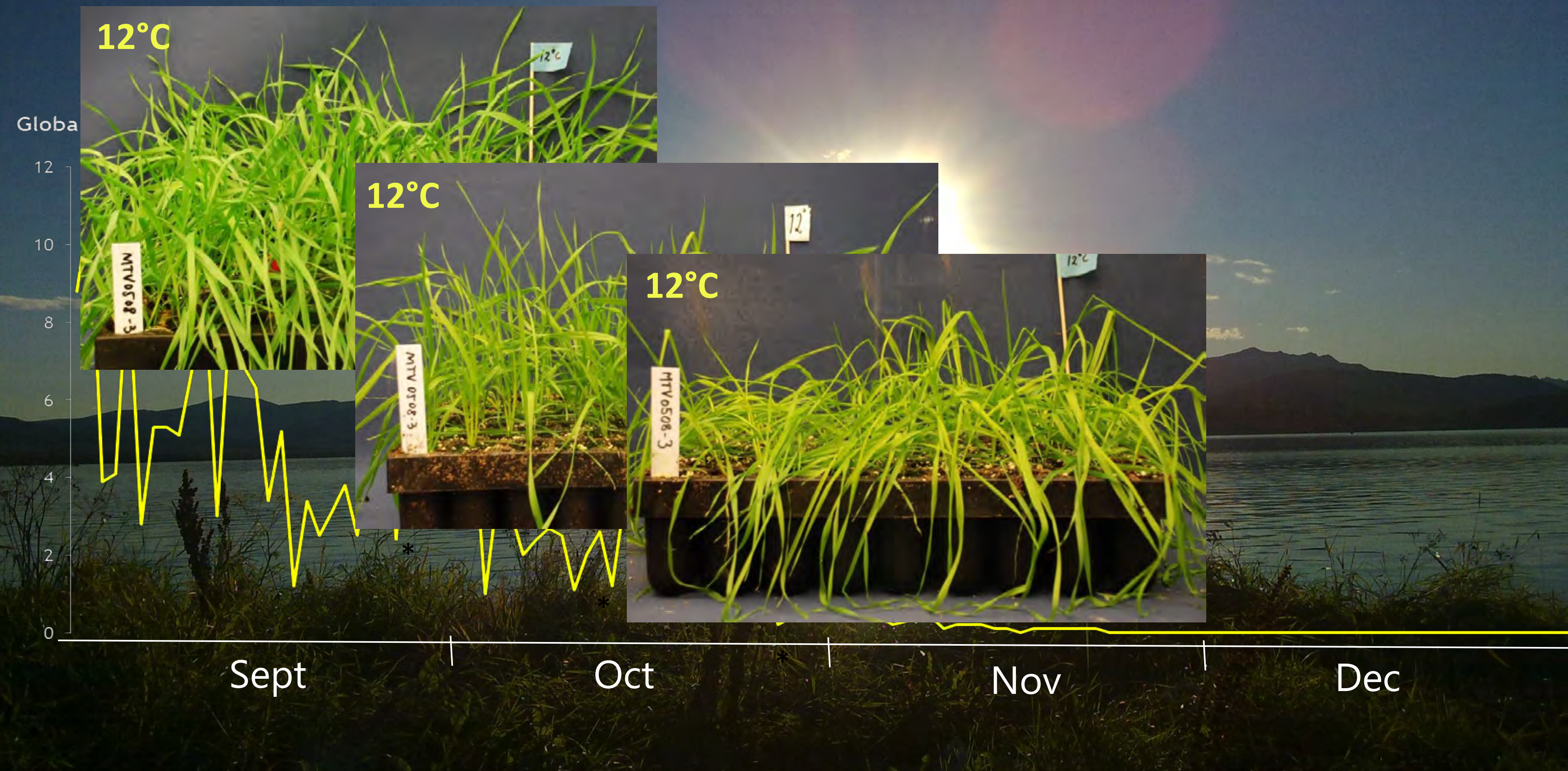
Autumn is getting warmer



The temperature increases but the daylength stays the same.

How does this affect the plant?

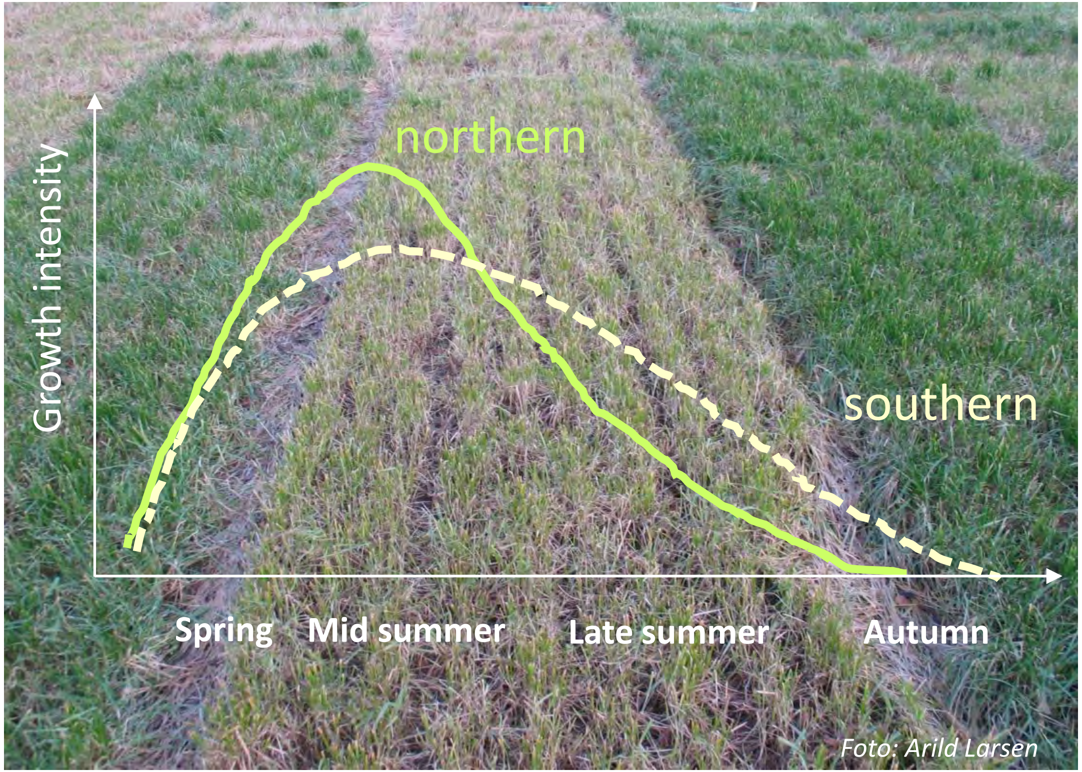
Increased autumn temperature – reduced freezing tolerance



Why cant we use varieties from more southern areas in the north when it gets warmer?

Southern-adapted varieties do not respond as strongly to day length and light intensity as do northen-adapted varieties

Plants which are adapted to northern areas have another seasonal growth pattern than plants adapted to conditions further south.



We need species/cultivars which:

- Can utilize the prolonged growing season
- Are winter hardy
- Keep photosynthetic activity late summer/autumn
- Have low respiration rate in darkness

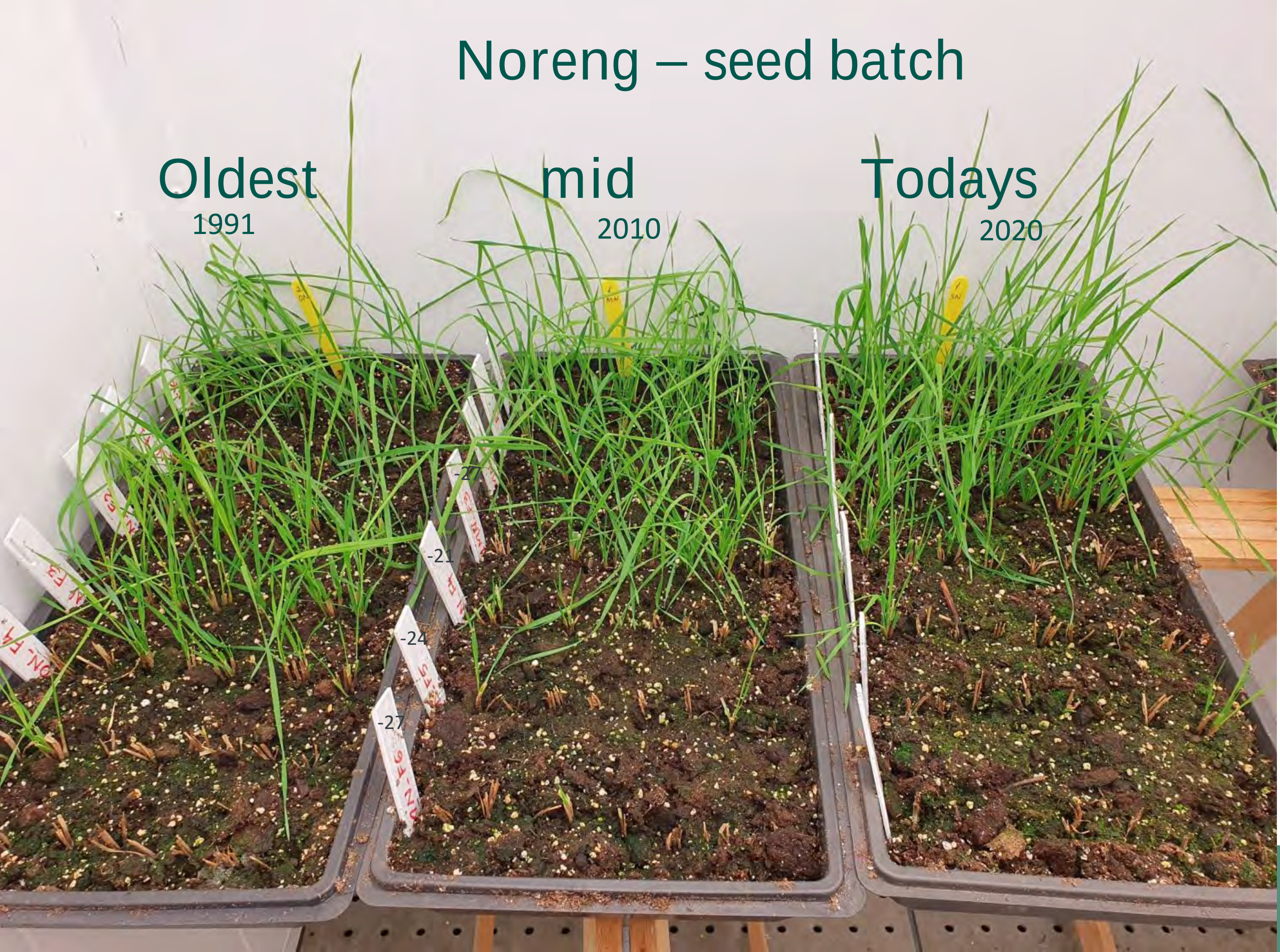
They have to be adapted
to the light conditions in the north

Farmers in the northernmost area have been complaining about bad wintersurvival of timothy

They wanted the winter hardy variety Engmo back in the market

- Noreng came in stead of Engmo in 2005
    - Engmo back on the market in 2019

Noreng – seed batch



Testing freezing tolerance

Controll (2°C)
-12°C
-15
-18
-21
-24
-27

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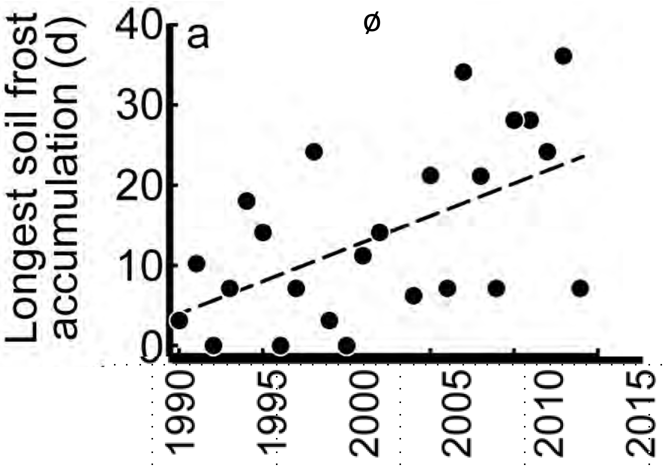
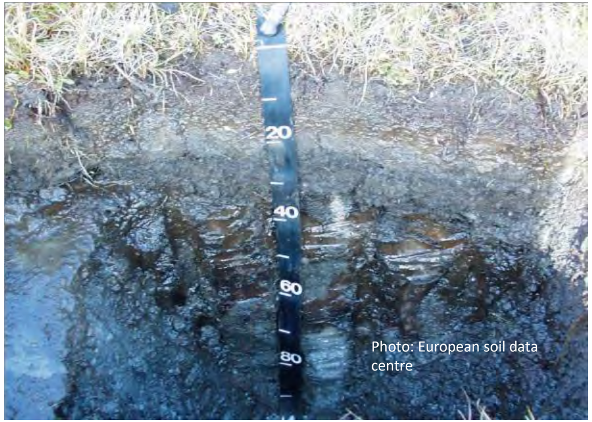
More and longer duration of soil frost

Troms
ø



From Bjerke et al. 2015



Fewer days with snow cover can increase soil frost

Summer drought

Summer drought is a challenge in some areas.

The climate projections indicate increased precipitation in the future, but not necessarily as a gradual rainfall in spring and summer when it is most needed.

Increased temperature combined with increased low precipitation can increase summer drought

Wet autumn

Flooding in Jarlsberg 2012, potato field

Finding necessary solutions!

50 tons carrots
300 000 NOK value
11 000 NOK to rent helicopter /hour

Utfordring: utstyret blir bare større og større…

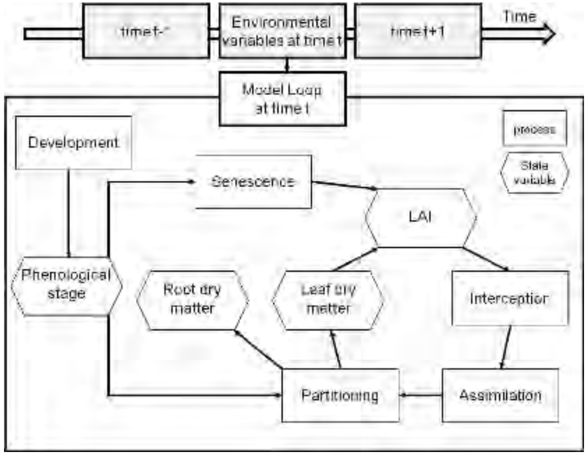
Soil compaction

Increased geeze grazing

New technology

Evolving tools to estimate and predict overvintering and yield of crops.

Satellittdata

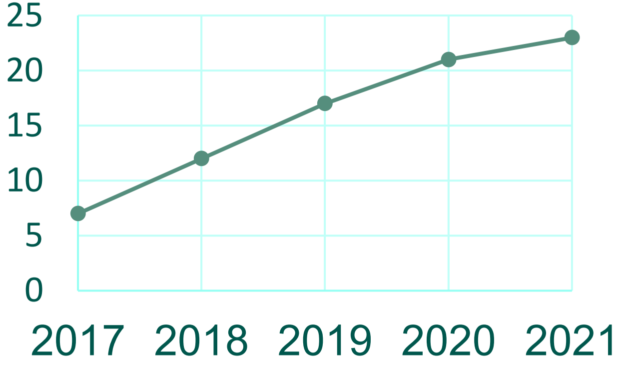


Prosessbasert modellering

Droner

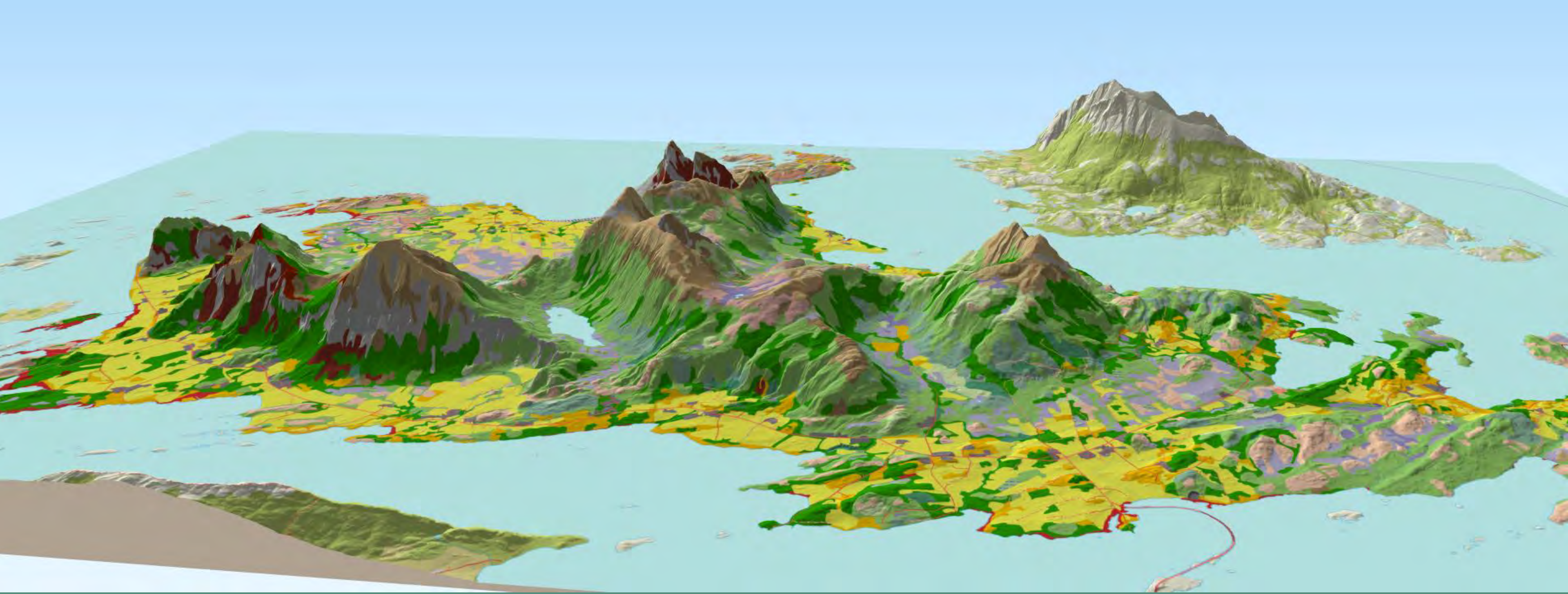
Bakkemålinger hos gårdbrukere

Growing strawberries in tunnels is the way to go in N-Norway



- Focus on quality
- Taste
- Plants ready for production the same year

Mapping of vegetation

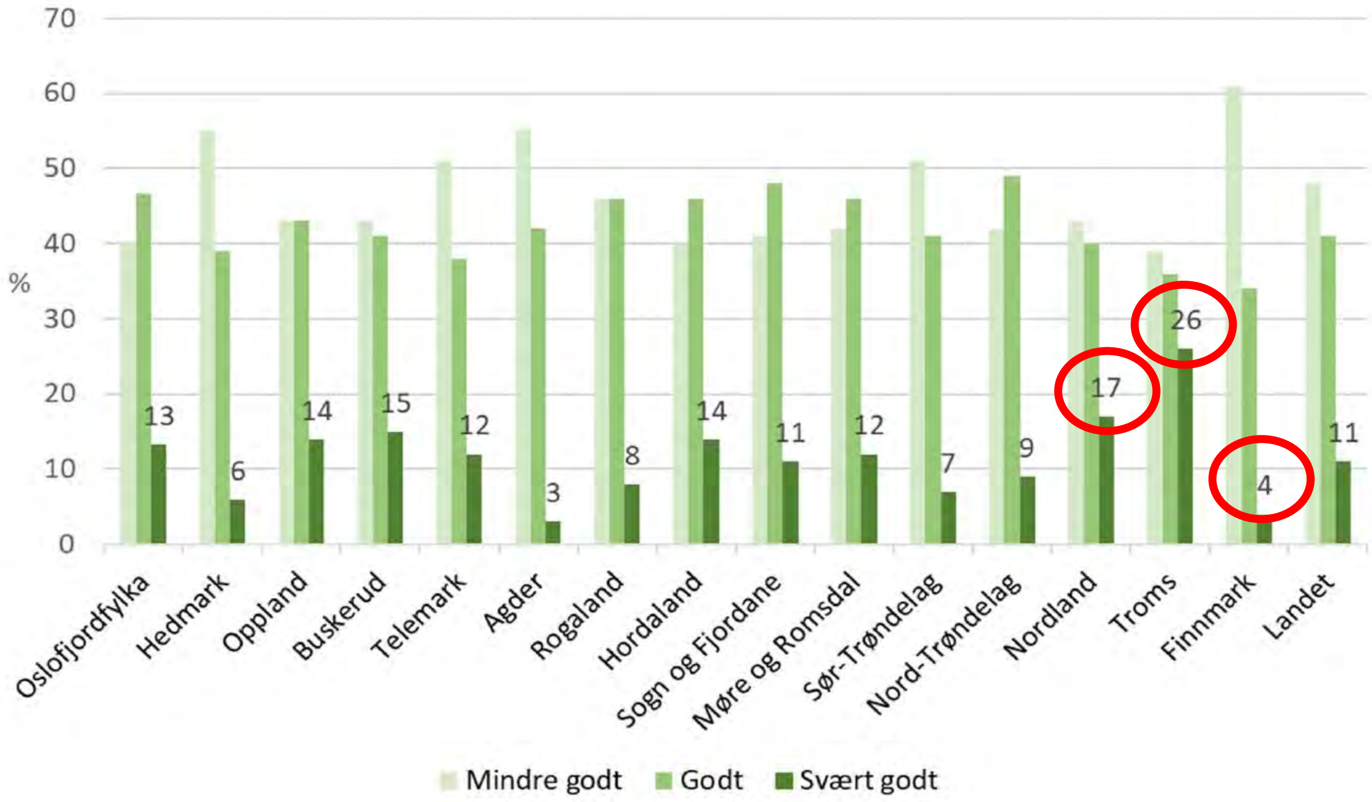


At work in the field

Foto: Anders Bryn

Foto: Finn-Arne Haugen

Quality of the rangeland in Norway



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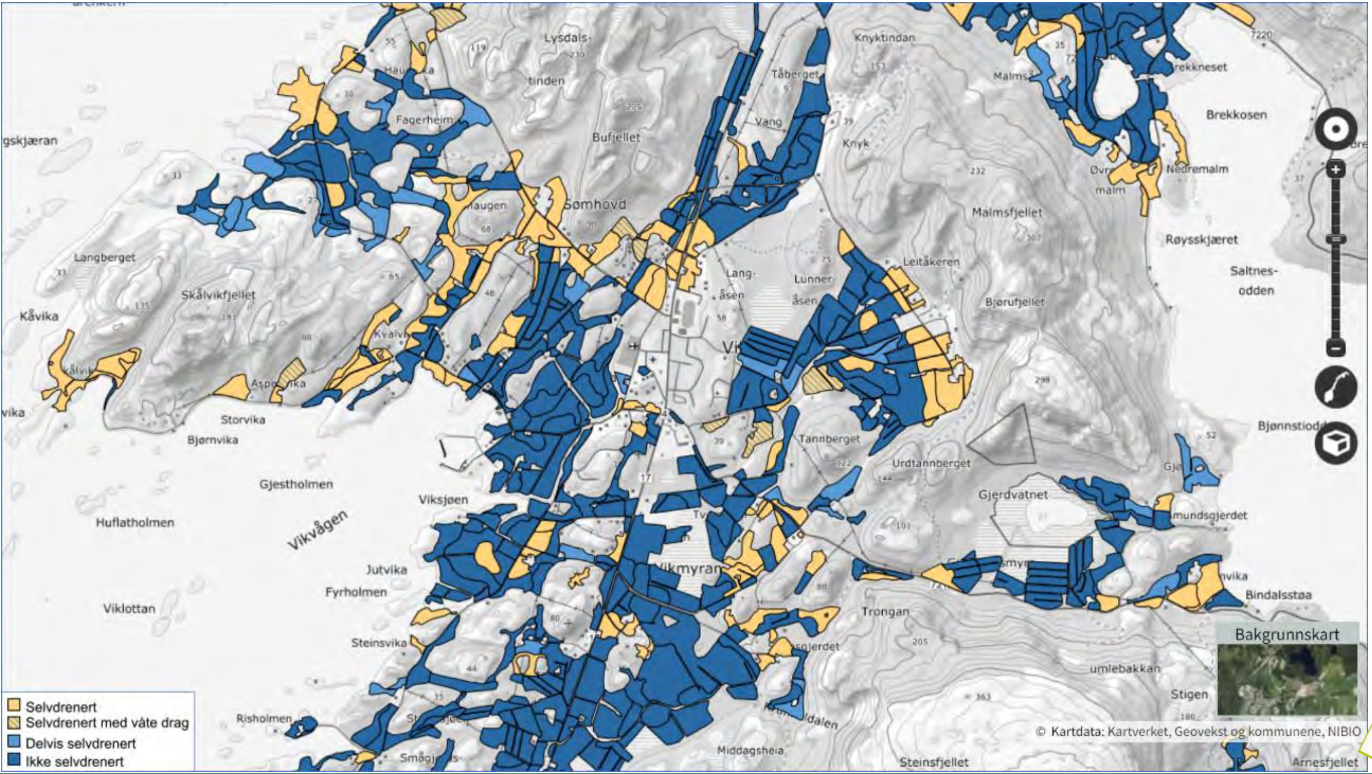
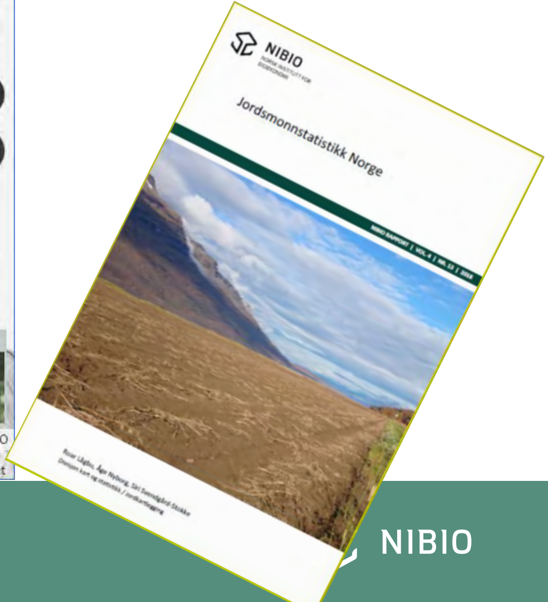
Mapping soil quality – degree of drainage

Sømna, Nordland:
¾ of the soil, is not self draining.
Important to drain the soil to avoid flooding, soil compaction and ice cover.



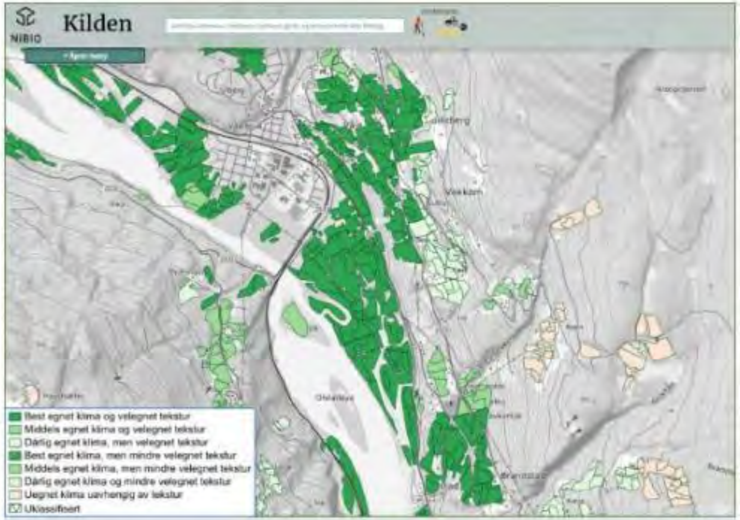


Kilden, NIBIO

NIBIO

Suitability map for vegetables, based on climate and soil data

kilden.nibio.no



Dette kartutsnittet viser potensialet for dyrking av gulrot i Ringebu. Skjermbilde fra kilden.nibio.no.

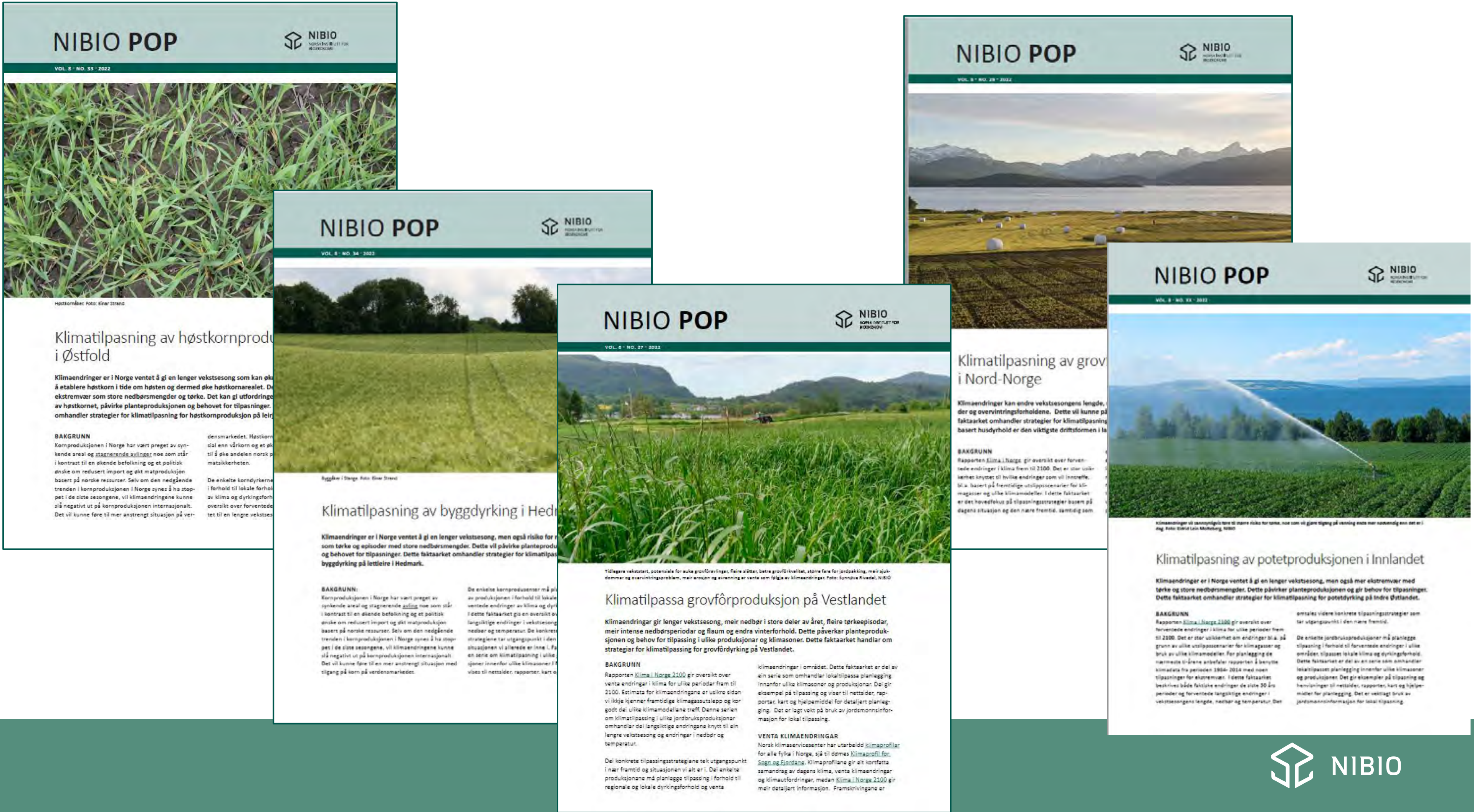
Nye grønnsakskart viser hvor det er best å dyrke

Nye kart viser potensialet for grønnsaksdyrking i ulike deler av landet, og kan bidra til å øke den norske grønnsaksproduksjonen. Brokkoli i vekst. Foto: Hilde Olsen.

PUBLISERT: 08.06.2020
AV: HEGE ULFENG

Norske forbrukere etterspør stadig mer grønnsaker. Nye kart viser potensialet for grønnsaksdyrking i ulike deler av landet. Kartene kan bidra til å øke den norske grønnsaksproduksjonen.

NIBIO


NIBIO POP
VOL. 8 - NO. 33 - 2022
Høstkornåker. Foto: Einar Strand
Klimatilpasning av høstkornprodu
i Østfold
BAKGRUNN
NIBIO POP
VOL. 8 - NO. 34 - 2022
Klimatilpasning av byggdyrking i Hedr
Klimaendringer er i Norge ventet å gi en lenger vekstsesong, men også risiko for
BAKGRUNN:
NIBIO POP
VOL. 8 - NO. 27 - 2022
Klimatilpassa grovfôrproduksjon på Vestlandet
Klimaendringar gir lenger vekstsesong, meir nedbør i store deler av året, fleire tørkeepisodar, meir intense nedbørsperiodar og flaum og endra vinterforhold. Dette påverkar planteproduksjonen og behov for tilpassing i ulike produksjonar og klimasoner. Dette faktaarket handlar om strategiar for klimatilpassing for grovfôrdyrking på Vestlandet.
BAKGRUNN
VENTA KLIMAENDRINGAR
NIBIO POP
VOL. 8 - NO. 29 - 2022
Klimatilpasning av grov
i Nord-Norge
BAKGRUNN
NIBIO POP
Klimatilpasning av potetproduksjonen i Innlandet
Klimaendringer er i Norge ventet å gi en lenger vekstsesong, men også mer ekstremvær med tørke og store nedbørsmengder. Dette påvirker planteproduksjonen og gir behov for tilpasninger. Dette faktaarket omhandler strategier for klimatilpasning for potetdyrking på indre Østlandet.
BAKGRUNN

Gradual adaptation to climate

- We have to adapt both to the challenges and the opportunities e.g. spend the cost to harvest the benefits. If not, the challenges will outweigh the opportunities
- Farmers are use to deal short term changes in season from year to year.

Sudden extreme events

- More challenging

Most important

Good agronomical practices

Enthusiastic farmers

Thank you for listening!

Sigridur.dalmannsdottir@nibio.no

Contribution from NIBIO colleagues:

Marianne Vileid Uleberg

Linda Aune-Lundberg

Finn Arne Haugen

Inger Martinussen

Erlend Winje

Gabi Wagner

NIBIO

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The New Nordic Food programmes: their ripple effects since 2005 on the ever growing appreciation for local food and cuisine in the region and the future of New Nordic Food

Sofie Andersson

Project coordinator

NKJ (Nordic Agri Research)

SNS (Nordic Forest Research

11th Circumpolar Agriculture Conference

Tórshavn, Faroe Islands, September 6, 2023

What is the New Nordic Food Manifesto?

- In 2004 Claus Meyer gathered chefs from all over Nordic region
- An ideological discussion on Nordic food
- Signing of the New Nordic Kitchen Manifesto

The Manifesto for the New Nordic Kitchen

- To express the purity, freshness, simplicity and ethics that we would like to associate with our region
- To reflect the different seasons in the meals
- To base cooking on raw materials which characteristics are especially excellent in our climate, landscape and waters
- To combine the demand for good taste in food with modern knowledge about health and well-being
- To promote the Nordic products and the variety of Nordic producers and to disseminate the knowledge of the cultures behind them
- To promote the welfare of the animals and a sound production in the sea and in the cultivated as well as wild landscapes
- To develop new possible applications of traditional Nordic food products
- To combine the best Nordic cooking procedures and culinary traditions with impulses from outside
- To combine local self-sufficiency with regional exchange of high-quality goods
- To cooperate with representatives of consumers, other cooking craftsmen, agriculture, fishing industry, food industry, retail and wholesale industry, researchers, teachers, politicians and authorities on this joint project to the benefit and advantage of all in the Nordic countries

New Nordic Food Programmes at the Nordic Council of Ministers

- Adoption of the manifesto in 2005
- New Nordic Food I 2007 – 2009
- New Nordic Food II 2010 – 2014
- New Nordic Food steering group

Activities in the New Nordic Food Programmes

- New Nordic Food I 2007 – 2009
  - ~ 30 financed projects focusing on innovation and visibility
  - Nordic event on Bocuse d'Or in 2008

- New Nordic Food II 2010 – 2014
  - Supported and managed projects that focused on bringing the Nordic cuisine ideology into homes and institutions, spurring innovative product development and local production, and showing how food can be used in Nordic representation and marketing
  - Extensive communication effort
  - Nordic Food Diplomacy

- New Nordic Food steering group
  - Creating meeting places, such as the financial support of Embla Food awards
  - Open calls to support projects that aim to support the continued development of a Nordic food culture

Effects: Changes in the Nordic food culture

- Catalyst for a small revolution in how we perceive our food
- Discovery, use and appreciation of more of what the Nordic terroir has to offer
- More restaurants and other businesses focusing on Nordic cuisine
- Skills and references when it comes to food has increased for the younger generation

Effects:
Changes in the image of Nordic food

- A strong and visible concept that attracted media attention
- New way for small and large food companies to communicate with ambitious consumers
- The Nordic region has become an exciting food destination

The ripple effects: encouragement of social entrepreneurs and the grassroot movement

- Political and financial support of a movement
- Chefs as change makers

The future of New Nordic Food

- Maintaining a brand and image as the world starts looking towards other regions

- A continued responsiveness to the social entrepreneurs within food in the Nordic region is necessary

- Continue to fill the gaps

Thank you!

Sofie Andersson
Project coordinator

NKJ (Nordic Agri Research)
SNS (Nordic Forest Research)

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Action plan for increased grain production in Iceland

Egill Gautason
Helgi Eyleifur Þorvaldsson
Hrannar Smári Hilmarsson

11th
CIRCUMPOLAR
AGRICULTURAL
CONFERENCE

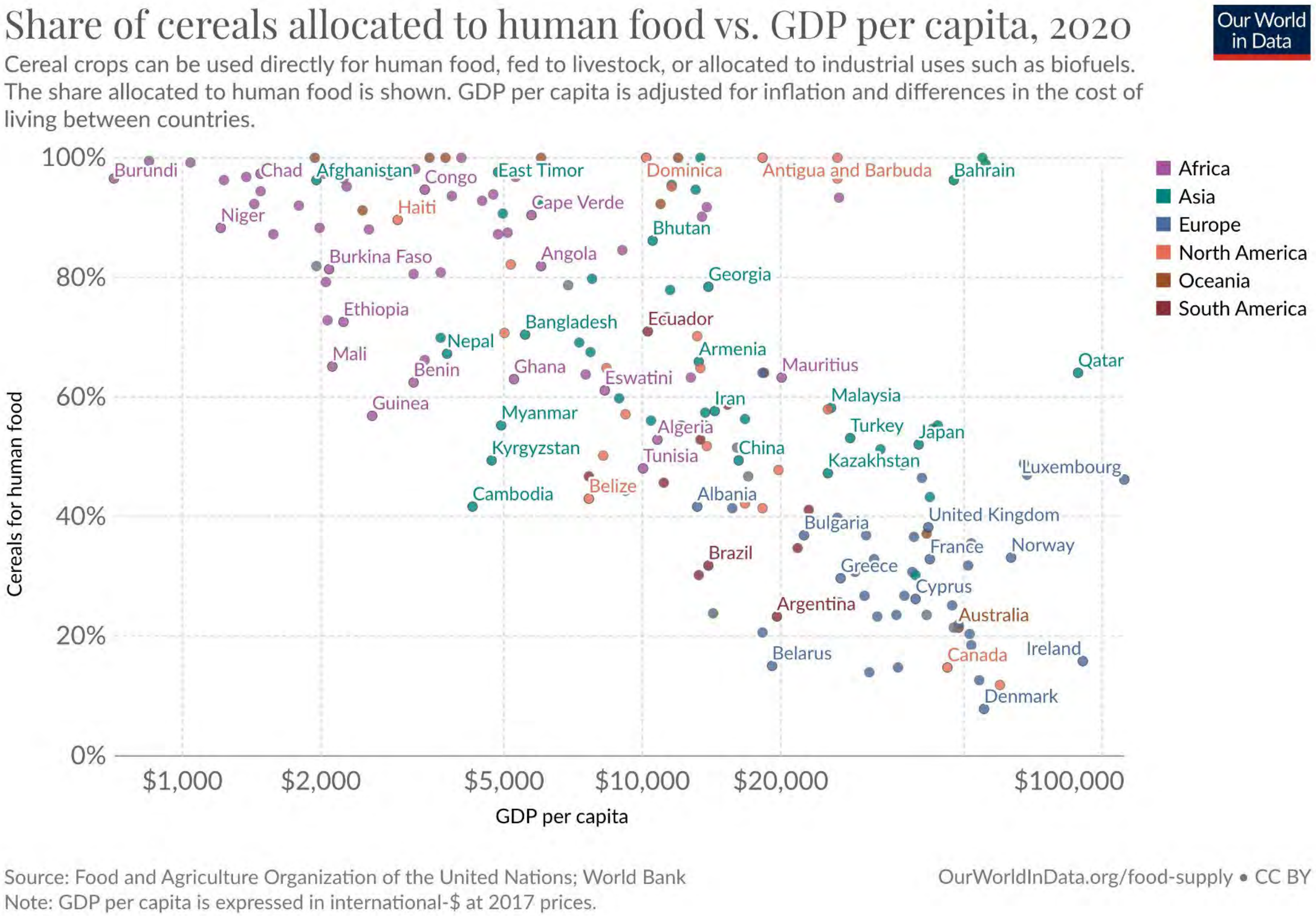
The project

Commissioned by the Icelandic
Ministry of Agriculture and Fisheries

Helgi Eyleifur Þorvaldsson
Egill Gautason

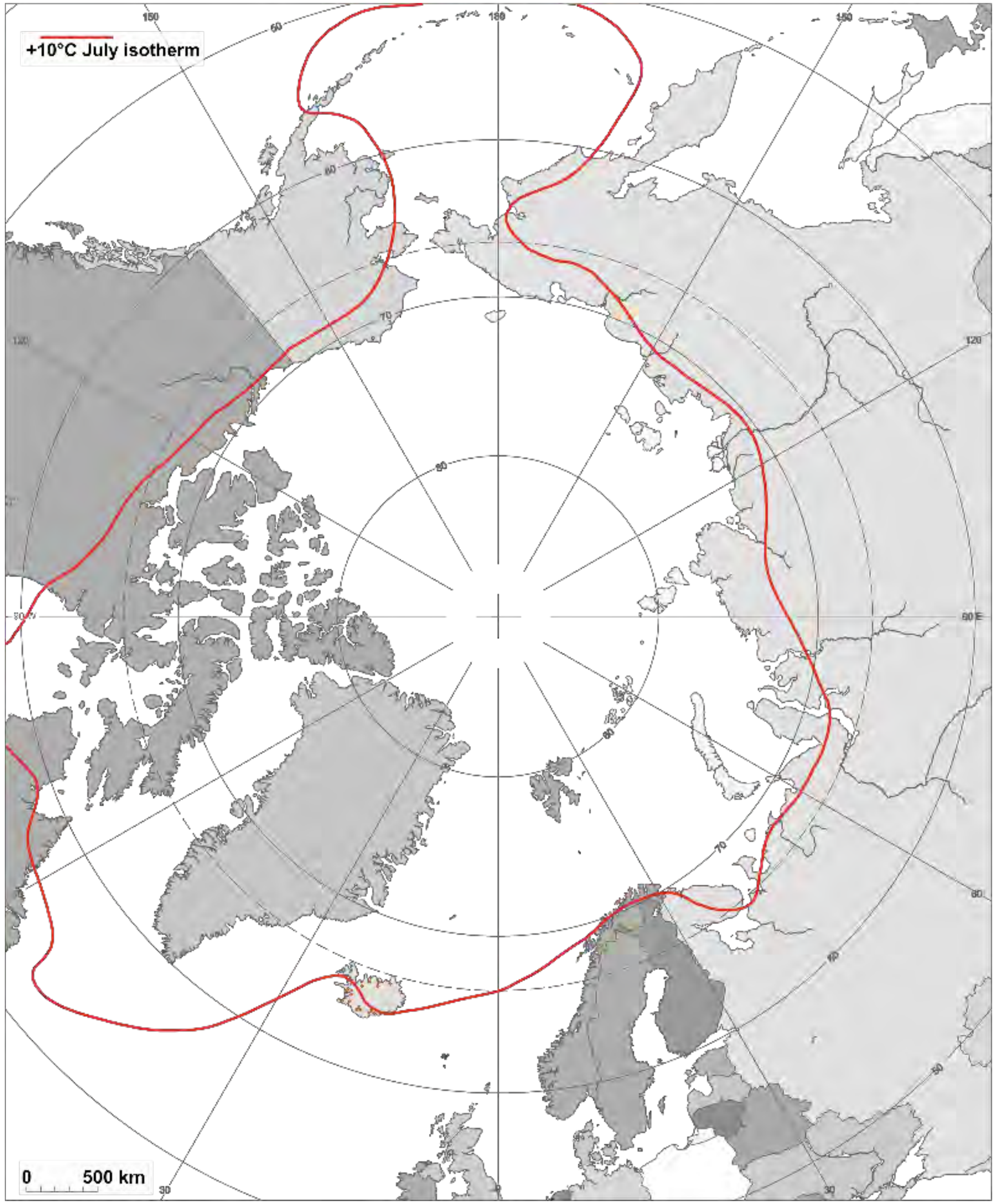
Þorsteinn Tómasson

Grains in agriculture



Icelandic conditions

- Colder than nearby countries
- But warmer during the winter
- Colder than Nordic regions at the same latitude
- Emphasis the need for a special breeding program



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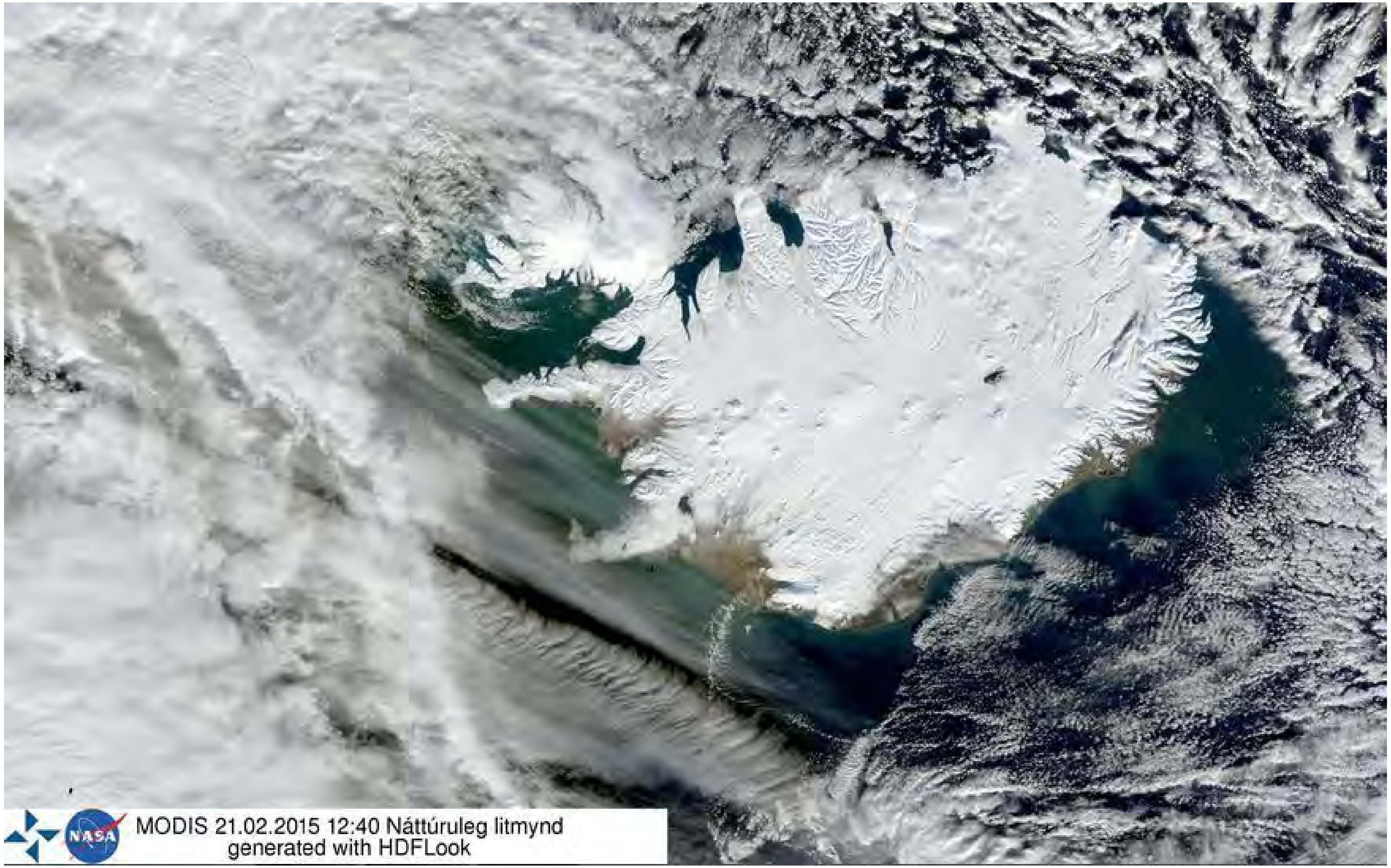
Iceland is a cool place



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Icelandic agriculture

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Icelandic agriculture

- Horses were not generally used in farming
- Fields were not plowed
- Agronomy was not practiced
- Grazing management
- Only in recent years agriculture has been changing

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Cereal cultivation abolished

- Settlers brought cereals but discontinued
  - Plague
  - Cold consecutive years
  - Cheap imports
- Continued vaguely until 18th century
- Restablished in the 20th century by Klemenz Kristjánsson (1923)
- No Icelandic landraces

Icelandic barley breeding program

Jónatan Hermannsson was the barley breeder for more than 30 years

Cultivars released:

Skegla	2r
Kría	2r
Skúmur	6r
Smyrill	6r
Valur	6r
Teista	2r
Haukur	6r

Icelandic ideotype

Short and early

Crossing Faroese landraces with Danish dwarf and later Nordic material from Sweden and Norway

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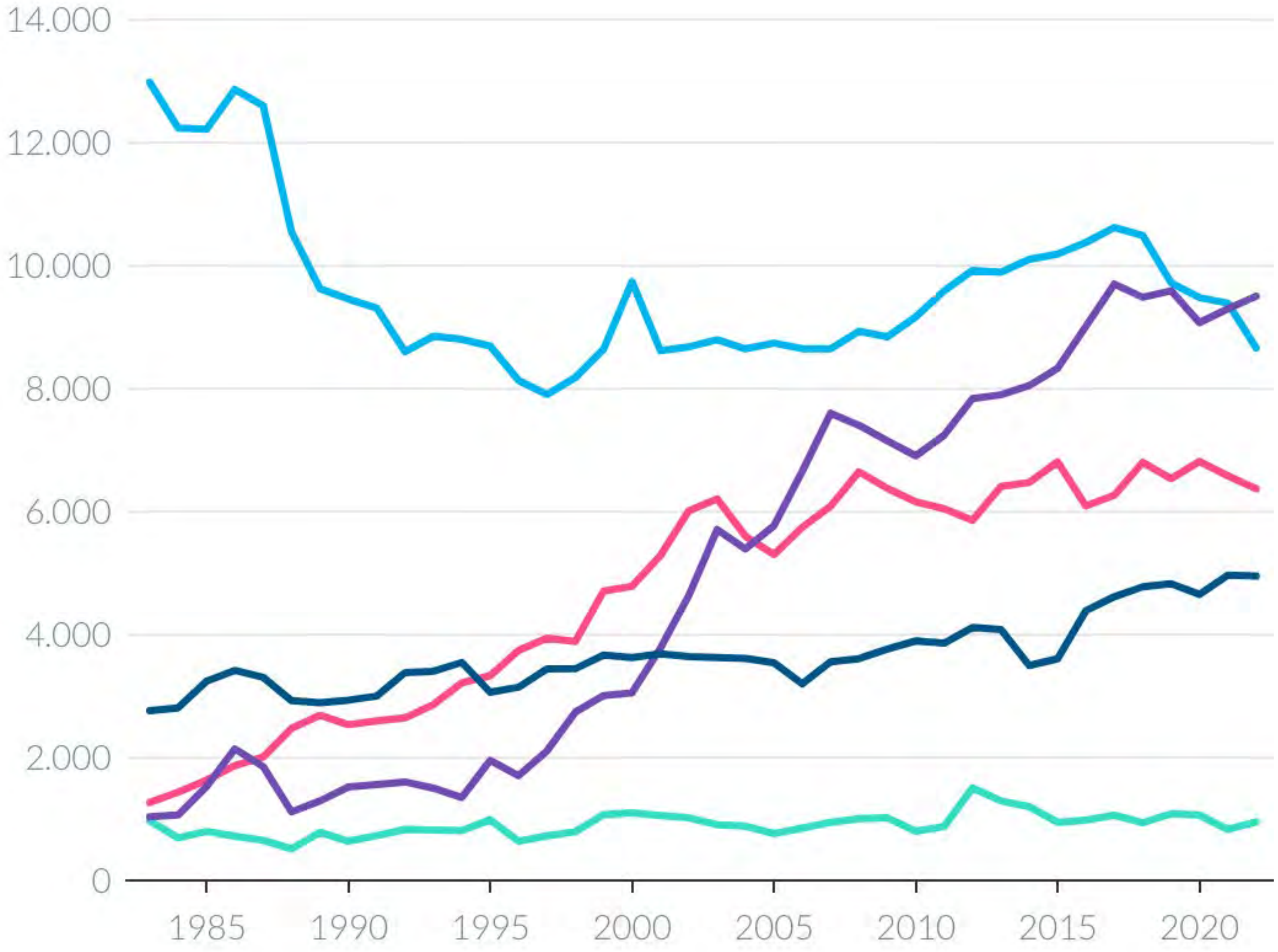
Agricultural development

Sheep production down

Poultry exceeds sheep

Pigs on the rise



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Icelands agriculture is sustained on 120 thousand hectares
480 thousand hectares available


Mynd: Magnus Göransson

Domestic market

- Consumption of white meat and dairy increasing ~2 - 4% annually
- Compound feed market growing ~1% á ári
- Fish farming could tribble the size of the compoun feed market

- Barley
    - Current feed – 12 thousand tonns
    - Possible feed amount – 35 thousand tonns
    - Malt – possibilities
- Wheat
    - Current feed -31 thousand tonns
    - Fish farms need another 30 thousand tonns

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Domestic production

- Cereal production was around 16 thousand tonnes
- But was 2022 around 10 thousand tonnes
- Cultivated on 3450 hectares
  - 12,1 hectare average size per farm
  - 90-95% used on farm
  - 40% dried
- Most in the south of Iceland

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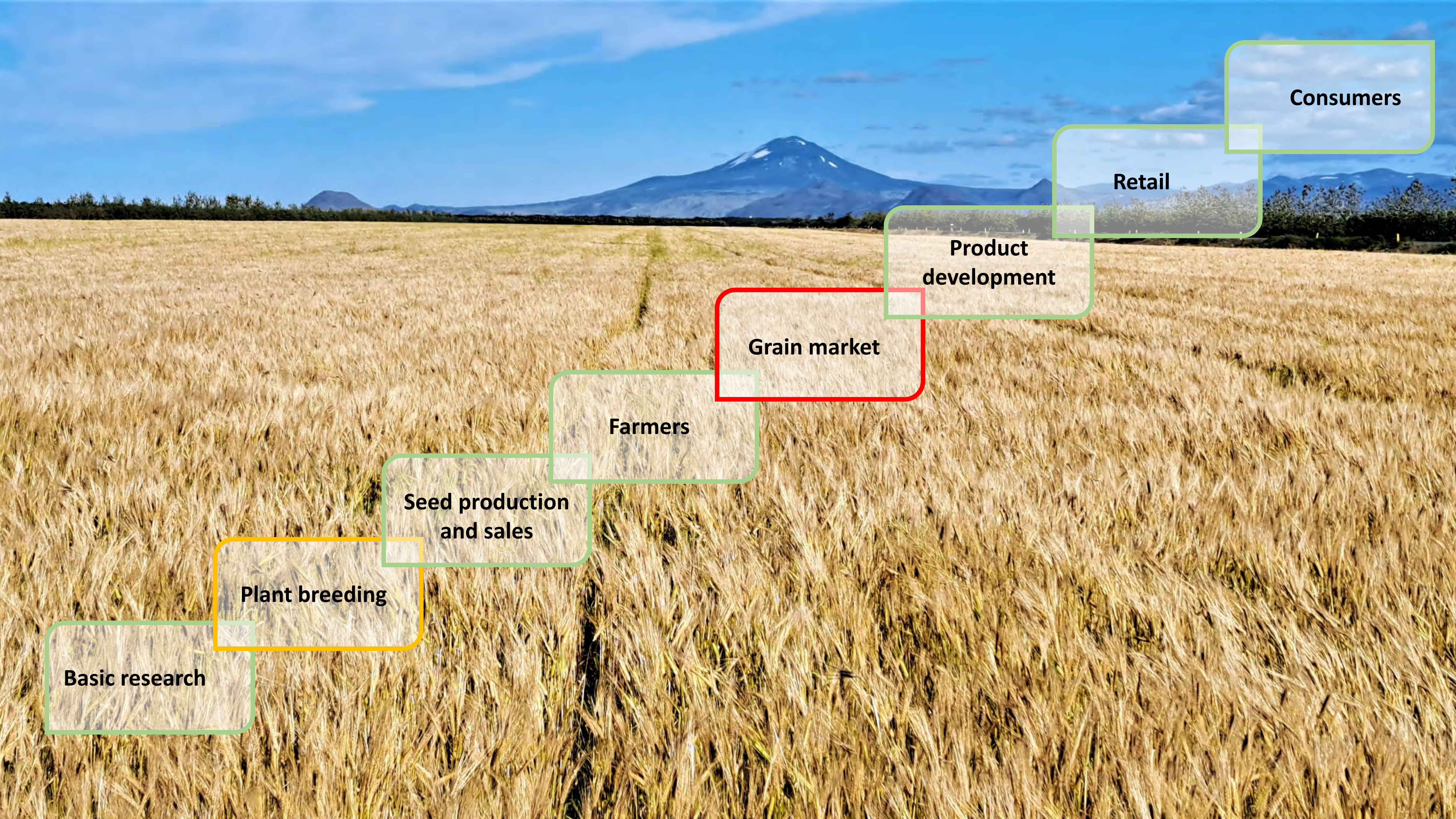
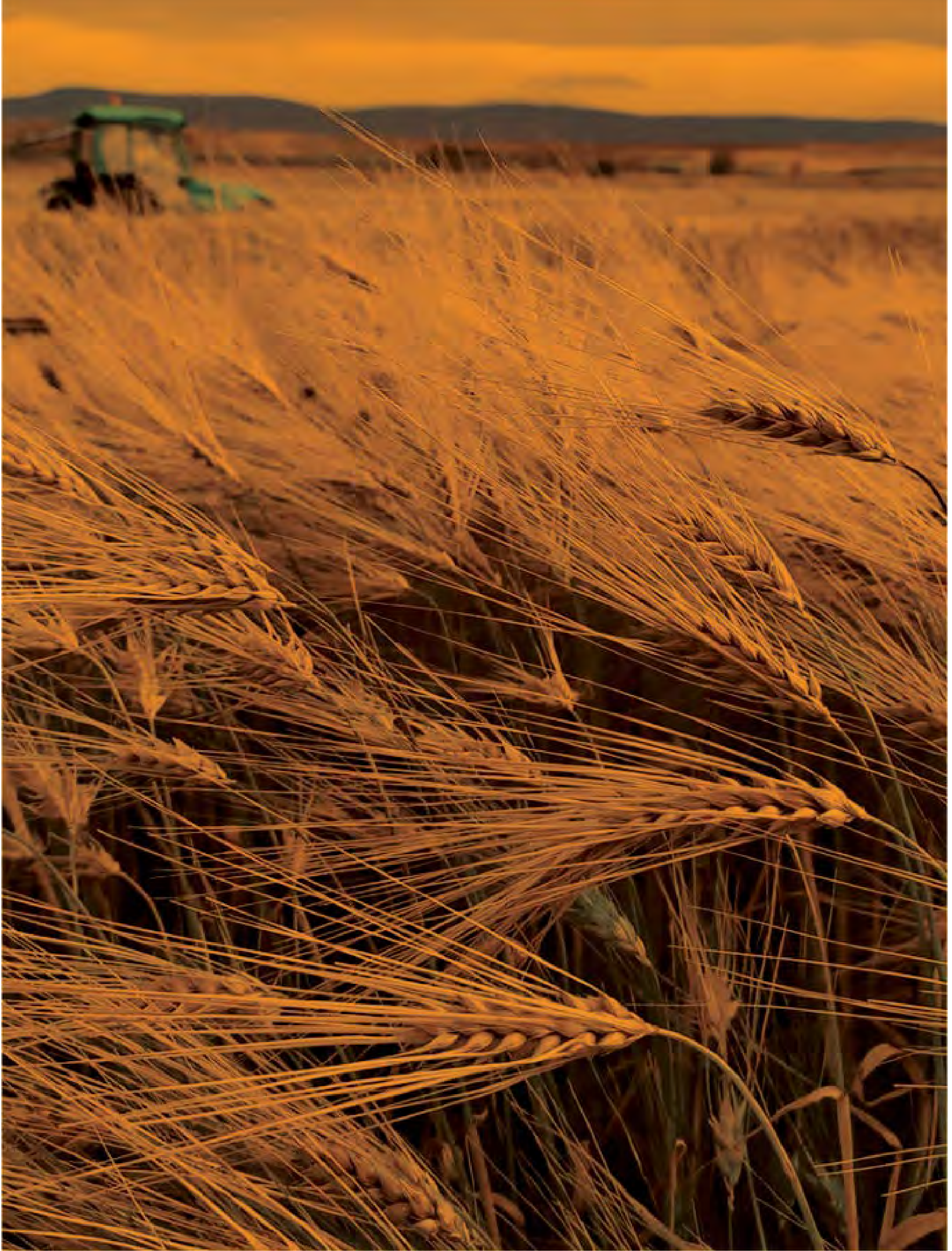

Basic research
Plant breeding
Seed production and sales
Farmers
Grain market
Product development
Retail
Consumers

Aims of the project

- The aim was to analyze the need for grain production in Iceland

- Make an action plan for policy making to reach increased self-sufficiency in grain production

- Assess the need and quantity of emergency supplies



Methods

- Expert inteviews
    - Answer saturation
- Grain coops and plant breeding companies visitit
- Assistance from Professor Daði Már Kristófersson for social economics and Verkís engeneering company on drying station and transport optimisation
- Brainstorm meetings in the group
- Collective meetings with farmers


Aðgerðaáætlun um eflingu
kornræktar á Íslandi

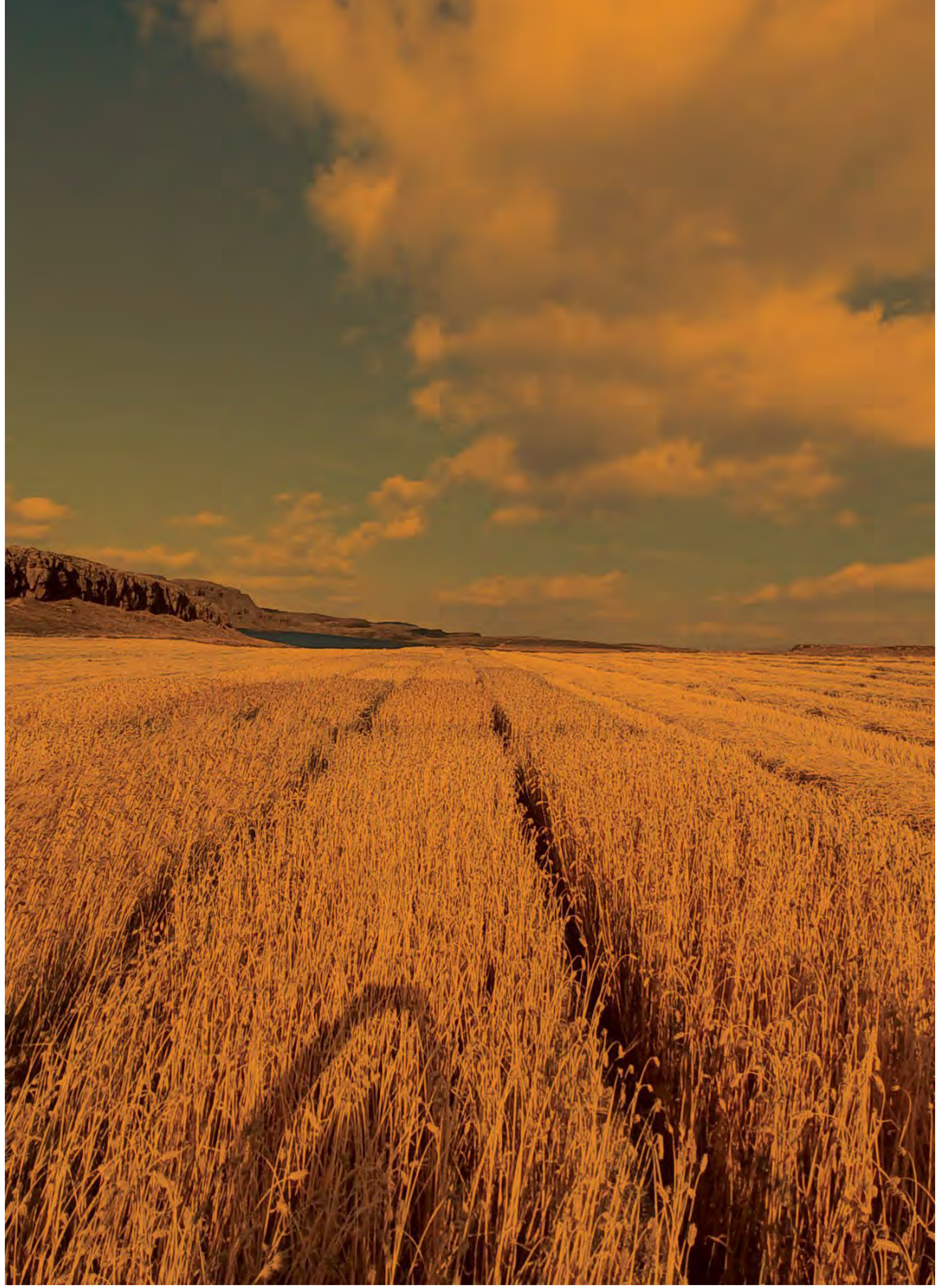
Macroeconomic efficiancy

- Cost of production per hectare comparable between Iceland and other N-European countries
  - Machine cost high in Iceland
  - Cost of land is low
  - Strenght: plenty of land, fertile soils and geothermal energy

- Domestic production could be competetive

Actions

- Plant breeding
- Farm practive
- Birds as pests
- Crop insurance
- Subsidies
- Grain coops
- Drying stations and transport
- Emergency supplies



Plant breeding

1. The government invests in a plant breeding program. Agricultural Univeristy of Iceland should breed barley and wheat and oats.

2. The government builds infrastructure for plantbreeding and applied agronomic research at the Agricultural University of Iceland

Agricultural managment

- Increased research, teaching and advice
- Found a advisory council of agronomy that alocates grants for applied research and for discussion of breeding goals
- Mapping pottential arable land in Iceland
- Research and support for shelterbelts and -forests
- Research on carbon sequestration on sandy soils
- Responsible use of pesticides
- Auditing seed import regulations

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Bird managment

- Increase research on the amount of damage and by which species and where
- Environmental agency to look into reducing population size
- Environmental aganecy authorized to allow temporary conditional exemption to hunt
- Survey the utility decoy fields

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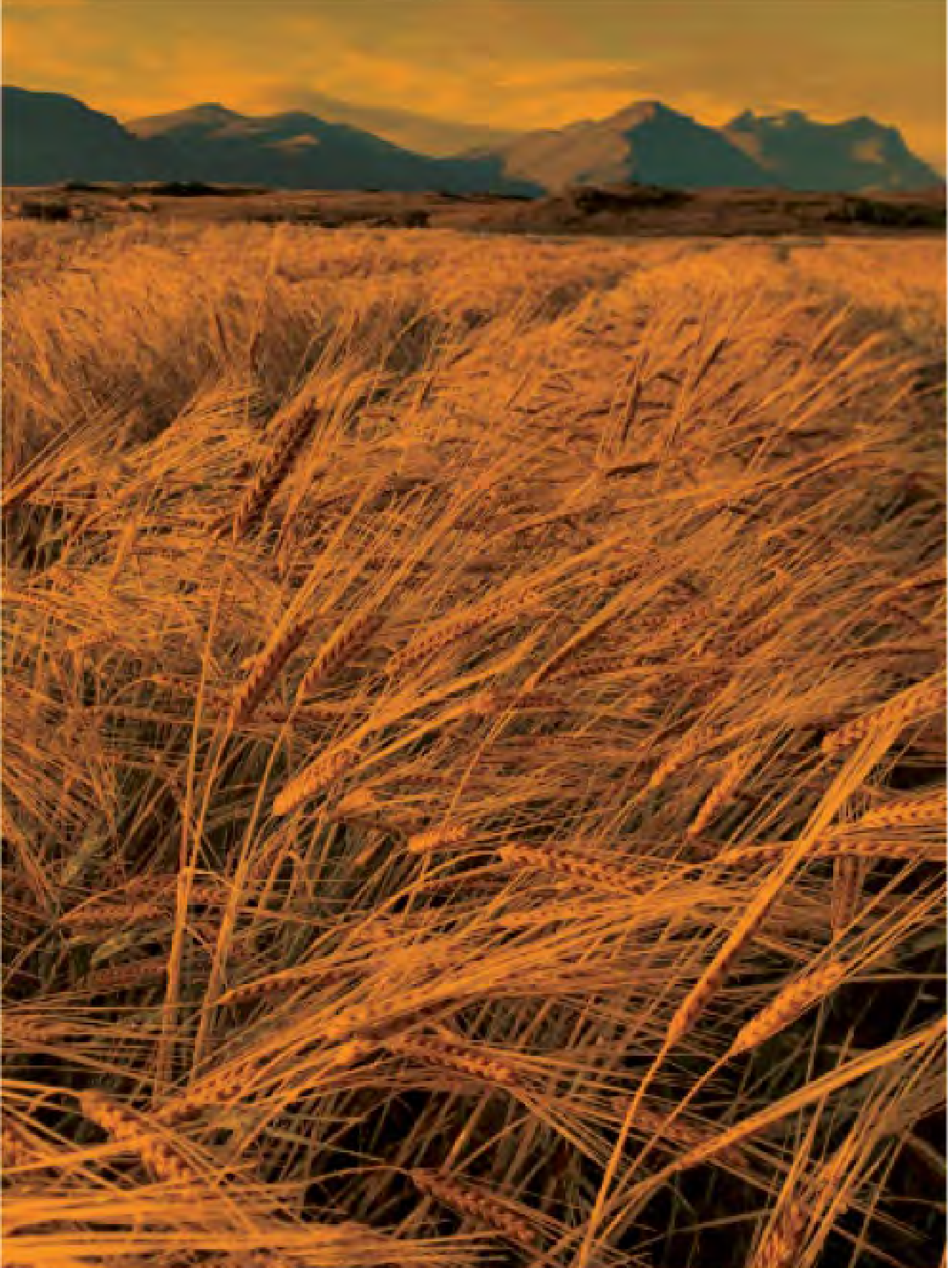


Crop insurance

- The government implies insurance companies to offer yield insurances
- Answer the need to analyse existing data in relation to yield and weather events
- The role of emergency funds should be expanded.
    - Yield loss for extreme weather events
- Emergency fund compansates only what insureance companies don‘t cover

Subsidies

Coupled production support

- Support per unit by minimum quality
- 15 kr/kg for barley and 20 kr/kg for wheat

Decoupled production support

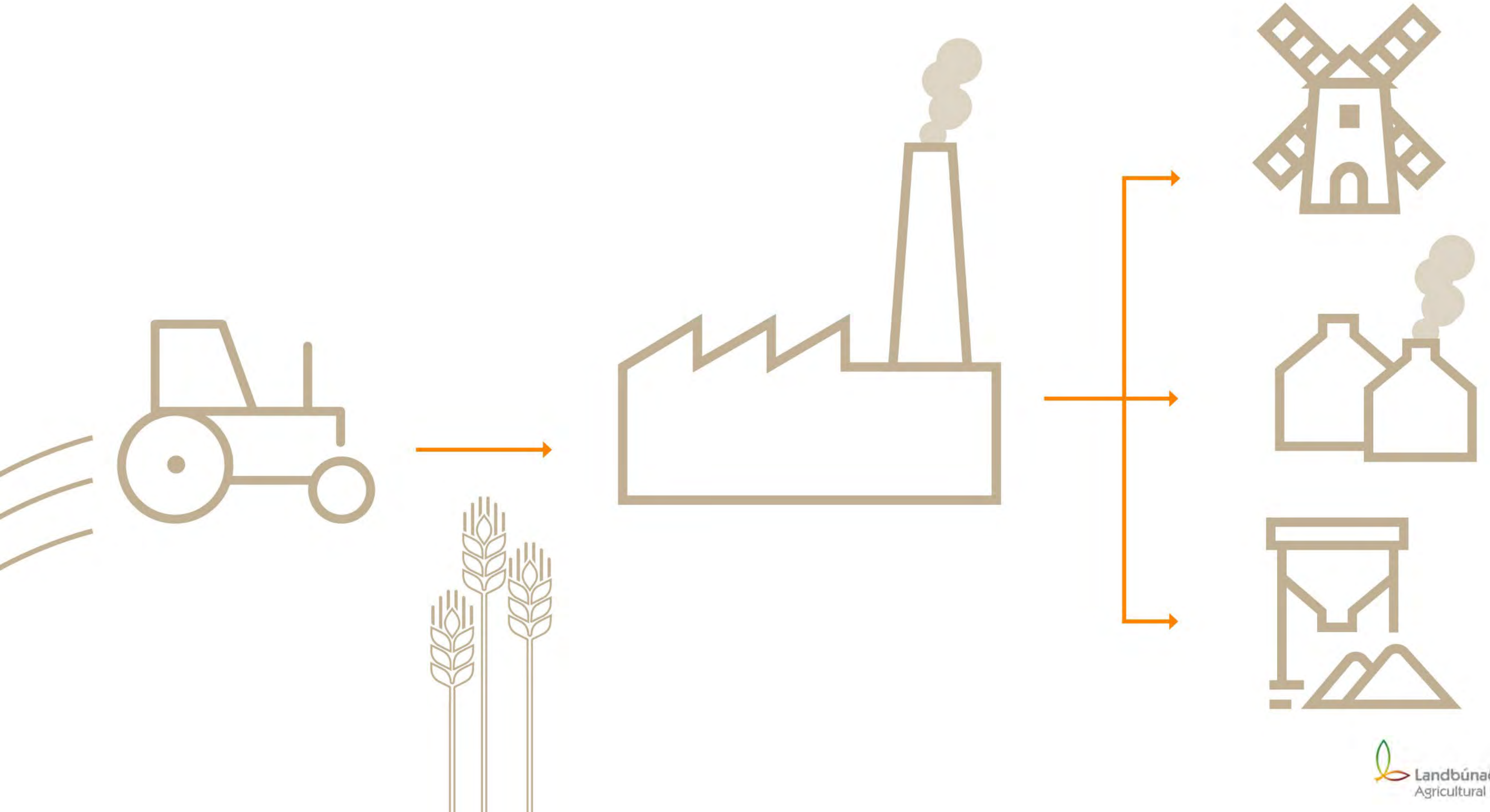
- Are not high in Iceland but should not be changed
- Payed out earlier in the year

Infrastucture support - 40% from state

1. Drying stations (minumum on thousand tonnes)
2. Grain transport
3. Combines

Cooperative

- Drying station recieve grain, assess quality and sell
- Inventory of quantity and quality
- Minimum admission
- Local units of production form a national organization
- Patiant investment
- Operational analysis stresses economic of scale



Economics of scale

- One big station
- Starting cost is multiple bigger for small stations
- Economical transport is key
- Geothermal power is economic and environmental

Geothermal energy

- Geothermal water: 1,5 kr/kg
- Electricity: 4,9 kr/kg
- Carbon fuel: 11,8 kr/kg

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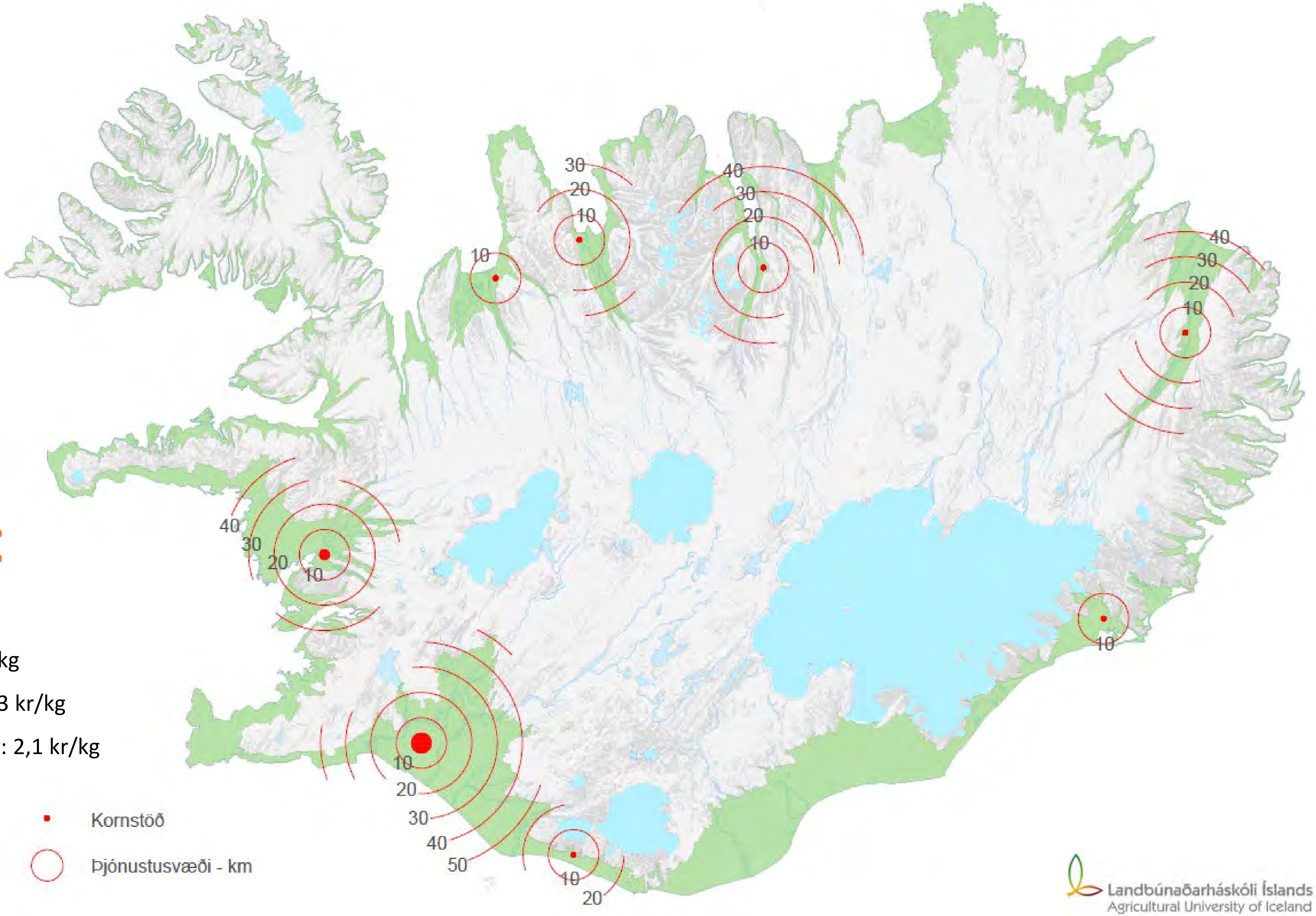
Transport

Example 50 km

- Transport on field: 6 kr/kg
- From farm to station: 2,3 kr/kg
- From station to enduser: 2,1 kr/kg
- Total: 10,4 kr/kg



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Food security

Rawmaterial inventory

- Soymeal, maize, wheat,
- Minerals, vitamins, melassis, oil, secondary materials

Feature vision

- Silos of barley and wheat will be in farming regions

Reserve stock of seed produce

- 12 month inventory 60% suffecient

Priatorisation

Create an economic agricultural sector that mLeiðarljós að byggja upp hagkvæma atvinnugrein sem fjölgar stoðum landbúnaðar á sjálfbæran hátt

1. Plant breeding
2. SubsidiesFramleiðslu- og fjárfestingastuðningur
3. Accessable advise and instructions for managment
4. Applied resarch and teaching
5. Crop insurance
6. Shelterbelts
7. Defence against bird pest

Conclusion

Realistic and economically viable for Iceland to increase grain production.

Inclusion of all stake holders imperative to enforce policy change.

Kærar þakkir – Thank you for your attention

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"Farming in the High North – Contributions to a Sustainable Local Bioeconomy & Secure Food Systems."

Day #1 Arranged as a plenum session under the main theme.

Day #2: Arranged as until four parallel sessions selected from these respective headlines:

- Arable plants for the High North; potentials within plant breeding and the gain from Crop Wild Relatives.
- Future farming options in the High North as a consequence of the predicted land releases due to climate change
- Contributions from farming and affiliated economic activities to more resilient local communities and stronger local economy in the High North
- Digitization as a motorway for wider market access for the products and services deriving from resources in the High North
- Gender equality and demographic distribution in the High North region, prospects, challenges and remedies.

Day # 3: A field excursion.

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"Food For Thought"

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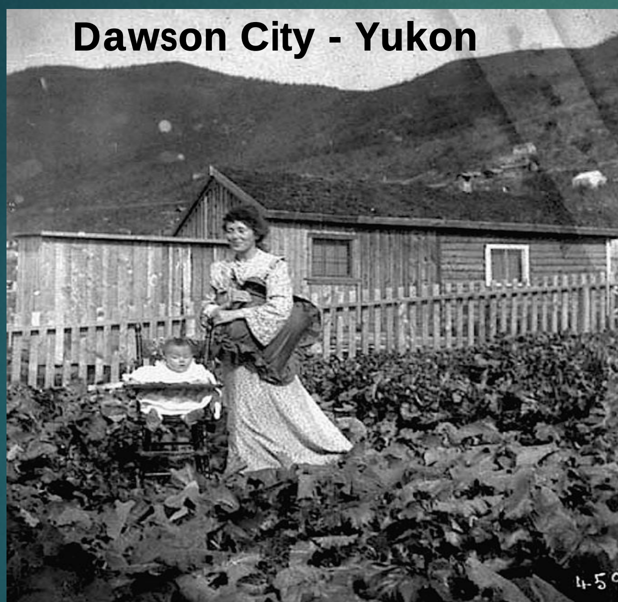
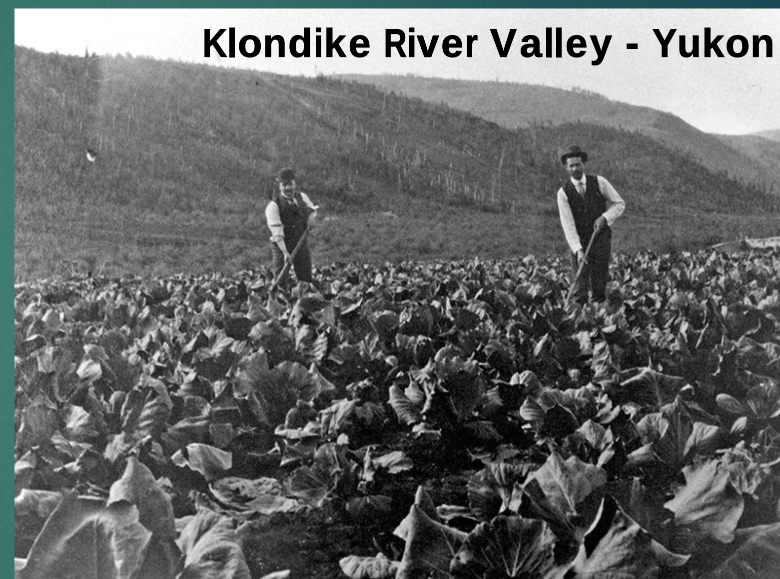
Food Security History - Klondike Gold Rush (1898 to 1920)



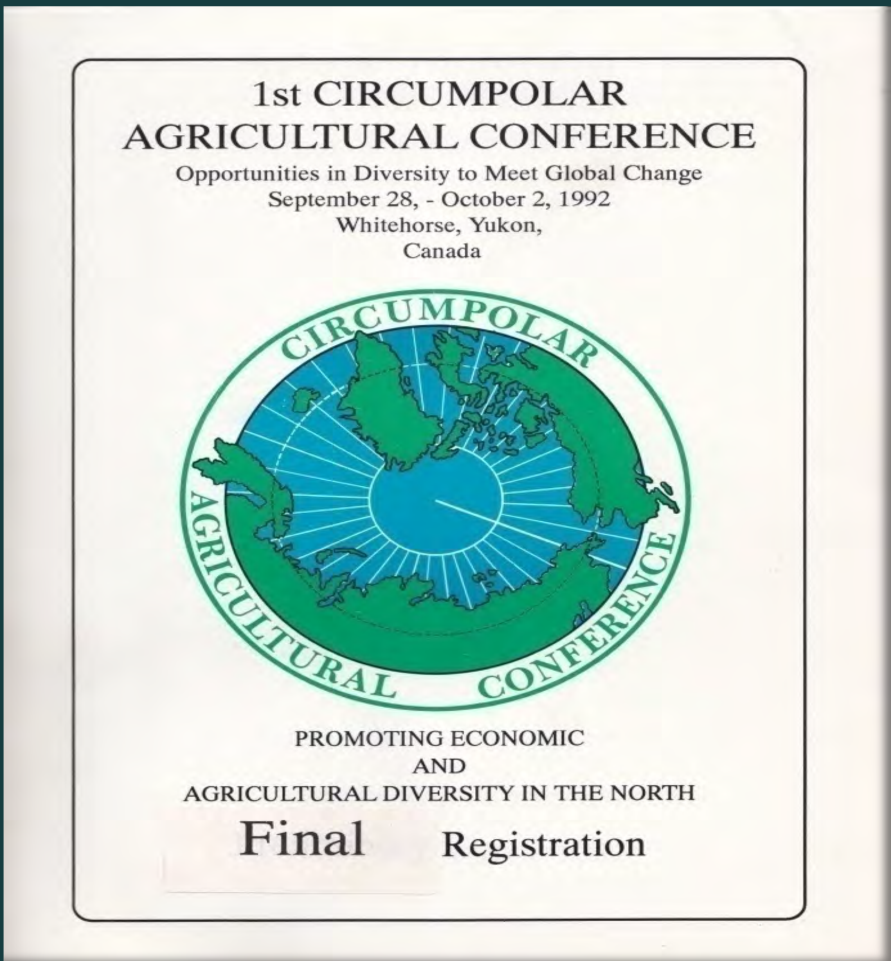


The Klondike River Valley & Dawson City Local Food Producers were reported to be delivering about 80+% of the Local Food

Needs & Provide Locally Grown Products:

Feeding an Estimated 30,000 People

"Food For Thought"



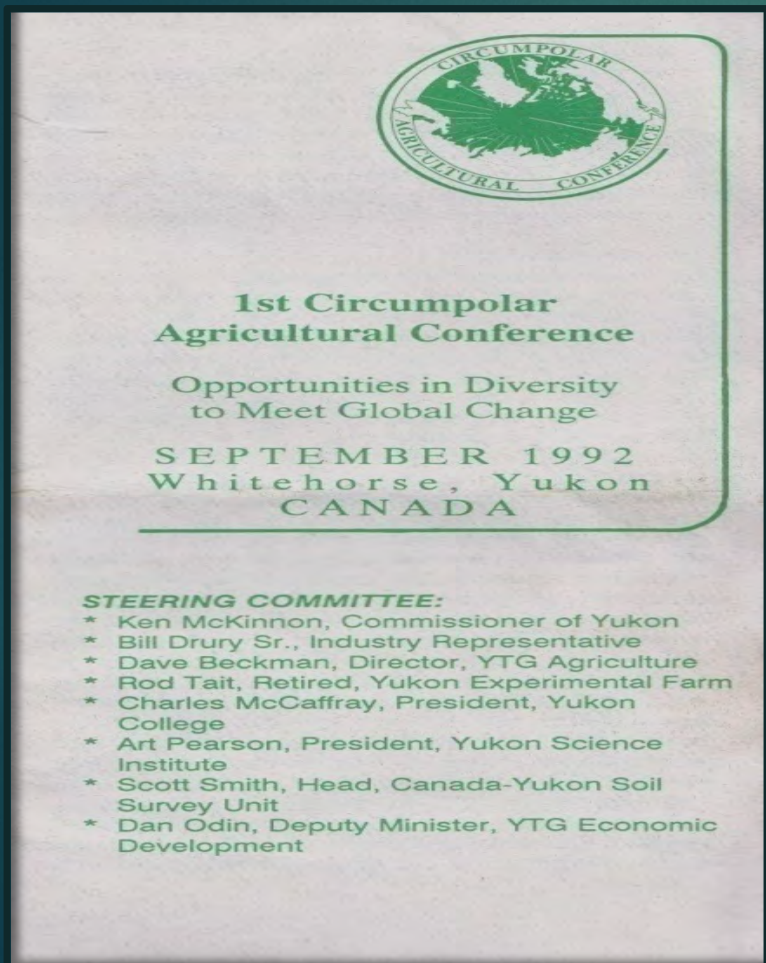
70 Years Later

In 1992:

YUKON was estimated to be producing about 8% of Yukon's / Local Food Needs With Yukon Grown Products For 30,000+ People

INSPIRE / ENCOURAGE & EMPOWER DEVELOPMENT OF CIRCUMPOLAR AGRICULTURAL CONFERENCE'S & EXPAND ASSOCIATION MEMBERSHIP

1st Circumpolar Agricultural Conference - 1992


1st Circumpolar Agricultural Conference

Opportunities in Diversity to Meet Global Change

SEPTEMBER 1992
Whitehorse, Yukon
CANADA

STEERING COMMITTEE:
* Ken McKinnon, Commissioner of Yukon
* Bill Drury Sr., Industry Representative
* Dave Beckman, Director, YTG Agriculture
* Rod Tait, Retired, Yukon Experimental Farm
* Charles McCaffray, President, Yukon College
* Art Pearson, President, Yukon Science Institute
* Scott Smith, Head, Canada-Yukon Soil Survey Unit
* Dan Odin, Deputy Minister, YTG Economic Development

"Opportunities in Diversity to Meet Global Change"

Whitehorse, Yukon, Canada
September 28 to October 2, 1992

PROMOTING ECONOMIC AND AGRICULTURAL DIVERSITY IN THE NORTH

"Food For Thought"

In 1992 – People Traveled & Gathered

1st Circumpolar Agricultural Conference

HOST: Yukon, Canada

- 220+ Representatives from
- 9 Circumpolar Countries

"Opportunities in Diversity to Meet Global Change"

Circumpolar Food Production Industry Representatives

Senior Agriculture Research Representatives

Agriculture & Food Industry Professionals & Academic Ag Professor's

Discussions on Arctic Food Production & The Range of Diversity In the Existing

Local & Regional Governance

Land Use Models for Farming

Circumpolar Innovation

OPPORTUNITIES IN DIVERSITY TO MEET GLOBAL CHANGE

Canada's northern regions are the focus of full-scale review by federal, territorial and municipal governments alike in an effort to achieve sustainable development while protecting the northern environment. Major initiatives include:

* The Green Plan
* The Northern Forum
* Yukon Conservation Strategy
* The Arctic Environmental Strategy
* Northern Scientific Training Program (NSTP)
* The Directory of Arctic Science and Technology in Canada

The trend towards a global economy has created new social and economic alliances which transcend the traditional boundaries between countries. Developments such as;

* The New Canadian Polar Commission.
* 8th International Congress on Circumpolar Health.
* International Symposium on Cold Region Development (ISCORD '91).
* Canada-U.S.S.R. Agreement on Cooperation in the Arctic and the North.
* The 1990 Arctic Winter Games expanded to include USSR and Greenland.
* PolarTech '92; International Conference on Development and Commercial Utilization of Technologies in Polar Regions.

These developments are indicative of a newly defined Circumpolar Community which shares common social and economic challenges. Alaska, NWT, Yukon, USSR, Denmark, Finland, Sweden, Greenland, Iceland, Norway and Canada are all circumpolar jurisdictions. The 1990's will be the decade of cooperation to address global northern problems and solutions. The 1992 Conference will provide an opportunity for;

Economic Development Through Diversification In Circumpolar Agriculture.

The Conference will do more than increase awareness, it will provide a focus and profile of agriculture in the North, it will be a formal step towards northern agricultural development through research, production and marketing. Agricultural development in the north will rely heavily on the educational community and the agriculture industry to pursue scientific and economic research. The pursuit and development of northern agricultural technology will provide highly marketable knowledge to a domestic and international industry. The resultant academic and educational development will be proven in the international marketplace by improved renewable resource management, decreased importation, enhanced economic viability and increased circumpolar agricultural marketing.

1st CIRCUMPOLAR AGRICULTURE CONFERENCE
Opportunities in Diversity to Meet Global Change
September 1992 Whitehorse, Yukon, CANADA

Randy A. Lewis
PROGRAM DIRECTOR
Phone: (403) 668-7065
Fax: (403) 633-3567

“Food For Thought”
For Our Road Ahead

Inspire Circumpolar Connections & Collaboration

Support & Develop the Implementation for

Local FOOD Products & Production Systems

Identify “boots on the ground”

Effective Food Security Delivery Models

Local Workforce Development &

Maximize Use of All of the Local Resources

- Human / Land / Plant / Animal /Mineral

Maximize Benefits that Meet These Local Needs

& Adapt Locally to the Changing Climate

Sustain Local Cultural & Heritage Traditions

Sustain Traditional Food Sources & Citizen Access

That Meets the Local Cultural Needs

"FOOD FOR THOUGHT"

Circumpolar Agricultural Association connects & collaborates on activities organized within the Arctic Council

Developing & Delivering Projects & Collaborations

Share Our Knowledge & Our Research

- Circumpolar Food Security & Sustainable Practices

"WHAT IF"

Grow & Teach Locally & Develop Circumpolar Partnerships?

Tr'ondëk Hwëch'in - Teaching & Working Farm 2016

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CIRCUMPOLAR AGRICULTURAL CONFERENCE

Sharing of Knowledge & Practices

Local Projects with Local Priorities That Focus and Maximize the Use of Local Resources

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Local Food Confidence

Develop Our Working Models For

Circumpolar Focused & Locally Delivered Food Supplies & Abilities

Meet the Needs for the Local Community’s New &

Traditional Food Priorities

“WHAT IF?”

Develop the Management Practices for Subsistence Food Harvesting as a Component of Northern Production

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"FOOD FOR THOUGHT"

Work Together & Change

Circumpolar <u>*Food Security*</u>

is Defined, Researched

Developed & Funded

Grow Local

Think Circumpolar

"Arctic Climate Change"

(Circumpolar Governance)

#1 Food Delivery & Change Required

(changing current agricultural policies)

Our Current / Colonial Agricultural Supply Systems (shipping)

Defined, Directed & Determined for Us by International Trade Agreements, Differing Financial Priorities & Policies

And SUBJECTED TO Political Change

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Grow OUR Circumpolar Food Sustainability

&

ENCOURAGE Diversity

Maximize Local Benefit

INSPIRE & SUPPORT
Participation
in
Community &
Farmer's Markets
Buy Local & Support
Traditional Food Products

Get to Know
Your Food ?

Tr'ondëk Hwëch'in - Teaching & Working Farm 2016
RESERCH GARDEN

11th CIRCUMPOLAR AGRICULTURAL CONFERENCE

"DEVELOP LOCAL"

Develop Food SUSTAINABILITY

Working & LEARNING

Exchange Programs

Multi-cultural Community Economic Security and Sustainability

#1 Goal:

<u>Invest in Our Future</u>

The Local Economies,

People & the Health &

Wellness of the Community

Tr'ondëk Hwëch'in
Teaching & Working Farm 2016
"First Planting"

Circumpolar Agricultural Association Membership
Cooperation & Collaboration Opportunities

"WHAT IF" ?

Share our Circumpolar Food Systems
& Traditional Sustainability Plans & Projects

Cooperate & Collaborate

Circumpolar Food Research

Food Security & Product Production

Product Development

Collaborate on Food Security &
Tourism Attraction to Your Farm

Coordinate Youth Exchanges &
Training Programs

Coordinate Education and
Career Opportunities

Share Traditional & Scientific Knowledge

Tr'ondëk Hwëch'in - Teaching & Working Farm 2016 "On the Land Learning Program'

Traditional and local food production knowledge from circumpolar citizens & their farms is a boundless storehouse of land stewardship knowledge and food sustainability information

CAC & CAA

Meet with Arctic Council &

Arctic Circle Assembly

Food Security / Sustainable Practices

& Programs for the Development

of Future Food Production Policies

Developed For and By our Youth &

What They Want for Their Future?

How Do "We"?

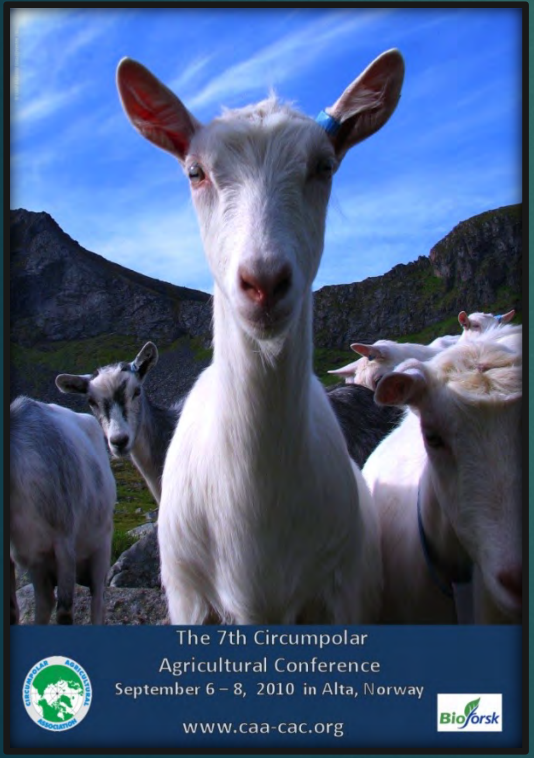
Engage & Empower

Everyone?

Circumpolar Cooperation & Collaboration

Encourage People To:

- Grow Their Own Food
- Develop Local Products & Share



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"FOOD FOR THOUGHT"

Start Planning Local Food Strategies

"STARTT TODAY"
Locally, Regionally
GROWING LOCAL FOOD
Local Groups, Societies, Associations, CO-OP's
& WORKING With
Circumpolar Agricultural Association
Circumpolar Partners
Arctic Council
Arctic Circle Assembly etc.

Circumpolar Agricultural Conferences (CAC) & Circumpolar Agricultural Association (CAA)

"Building FOR OUR Future"

Strengthen the CAC & CAA potential with increased Membership & Participation &
A Communication Strategy
Coordinate OUR Approach
for Circumpolar Research
& Circumpolar Youth Exchanges
&
Climate Change Programs

Joss - Potatoes from his Research Plot

Local / Regional / National & International Projects

Projects to Connect & Cooperate On:

- Cold Storage Facility Research
  Community Based
- Abattoirs - Regionally Based

Develop Teaching & Mentoring Guides

Circumpolar and Community Food Security

Elementary School Level Materials & Exercises

Grow Your Own & Take Home & Plant

Colleges & Universities Collaboration on

Graduate Study – Exchanges for Food Security

Technology Development Funding

Maximize Local Resources, Expertise

Share our Success's and Challenges

11th CIRCUMPOLAR AGRICULTURAL CONFERENCE

CAC & CAA Communications & Project Development

CIRCUMPOLAR AGRICULTURAL CONFERENCE

"FOOD FOR THOUGHT"

Coordinated Economic Diversity
Initiatives & Funding AGREEMENTS

Promote CAC & CAA Food Security Success Stories
Partnerships & Cooperatives

Circumpolar Tourism Attraction
Promote the Projects
Work Together
GROW TOGETHER

Circumpolar Agricultural Association
&
Circumpolar Agricultural Conference's

"Growing Food Secure Communities"

"FOOD FOR THOUGHT"

"Plant the Seeds"

PLANT THE IDEA & CARE FOR IT

GROW & BUILD FOOD SECURITY

& LOCAL WORKFORCE CAPACITY

CULTURALLY & RESPECTFULLY

TH Farm – George
First Watering -2016

11th
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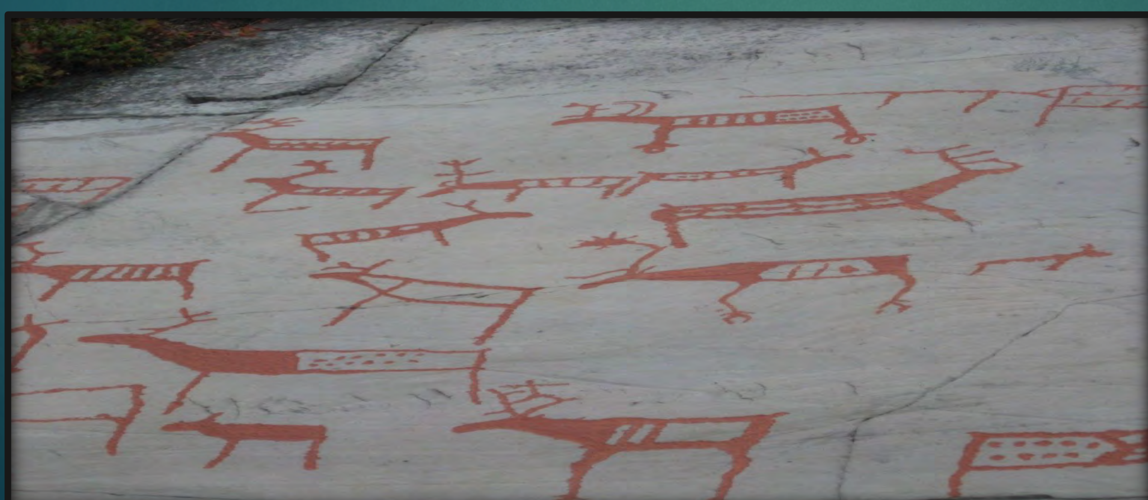
"THANK YOU"
31 YEARS OF SHARING AMAZING STORIES PLACES, PROJECTS & Research



Randy Lewis – CAC Founder