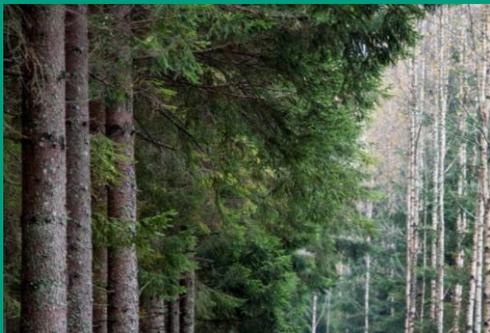


## Cross sectorial opportunities and challenges in addressing the SDGs - the green and the blue

How does Foods of Norway help reach these goals?

Prof. Margareth Øverland, Norwegian University of Life Sciences (NMBU)



# FOODS OF NORWAY

## Cross sectorial opportunities and challenges in addressing the SDGs - the green and the blue



- How does Foods of Norway help reach these goals?





**FOODS of NORWAY** aims to feed fish and farm animals using sustainable new ingredients

Three faculties at NMBU:

- Biosciences
- Chemistry, Biotechnology and Food Science
- Veterinary Medicine

## Academic partners



## Industrial partners



## Strategic partners



# Summer in Norway 2018

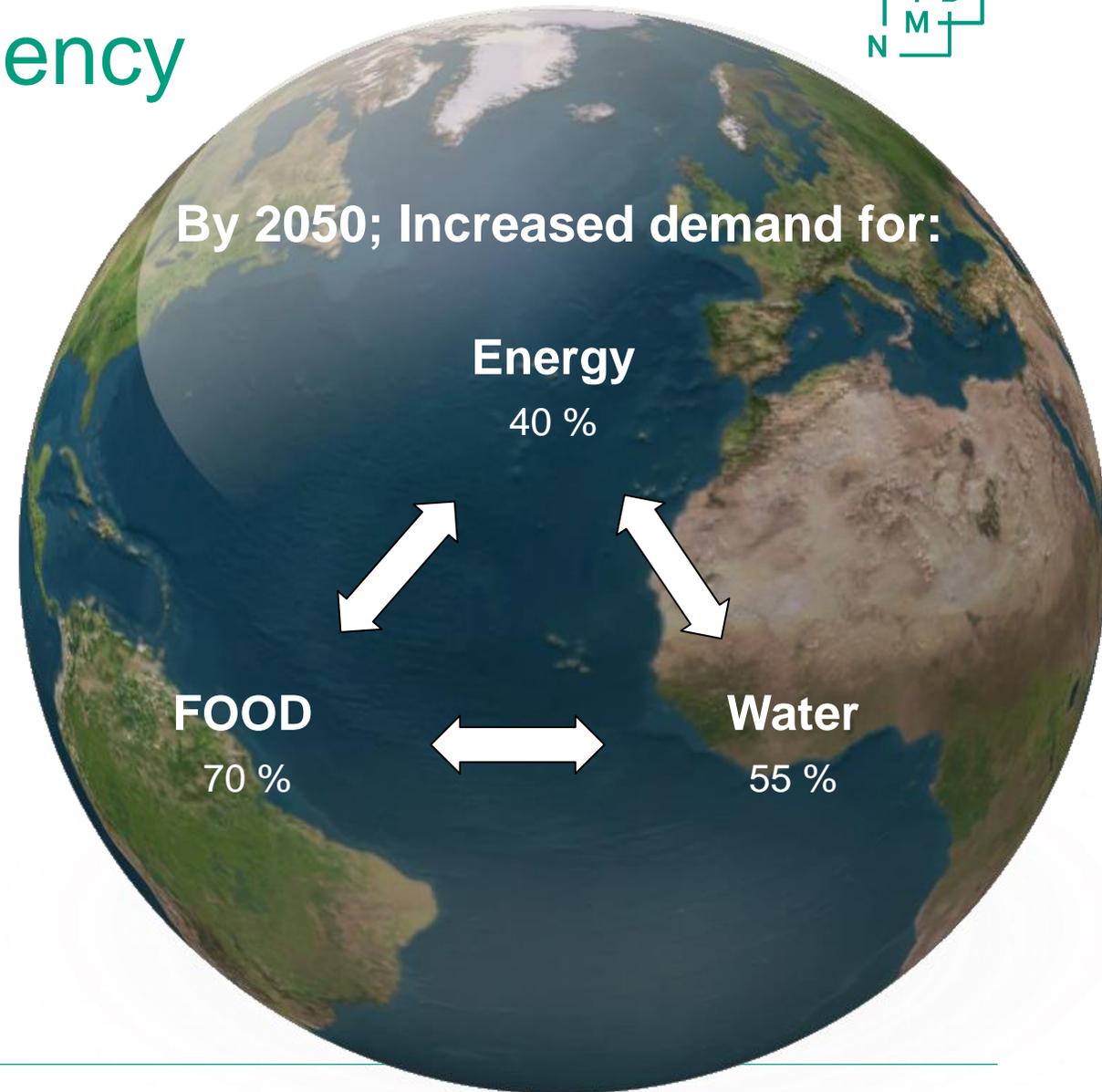
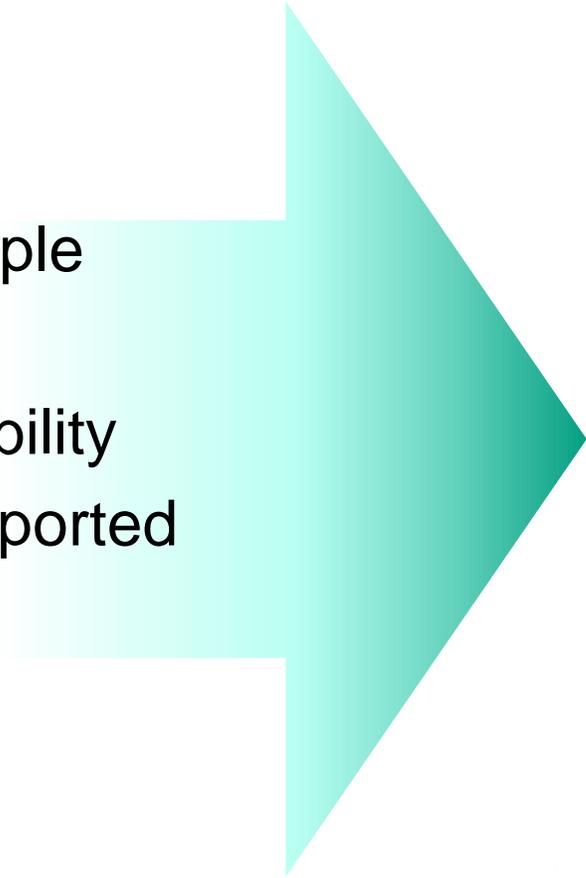
32°



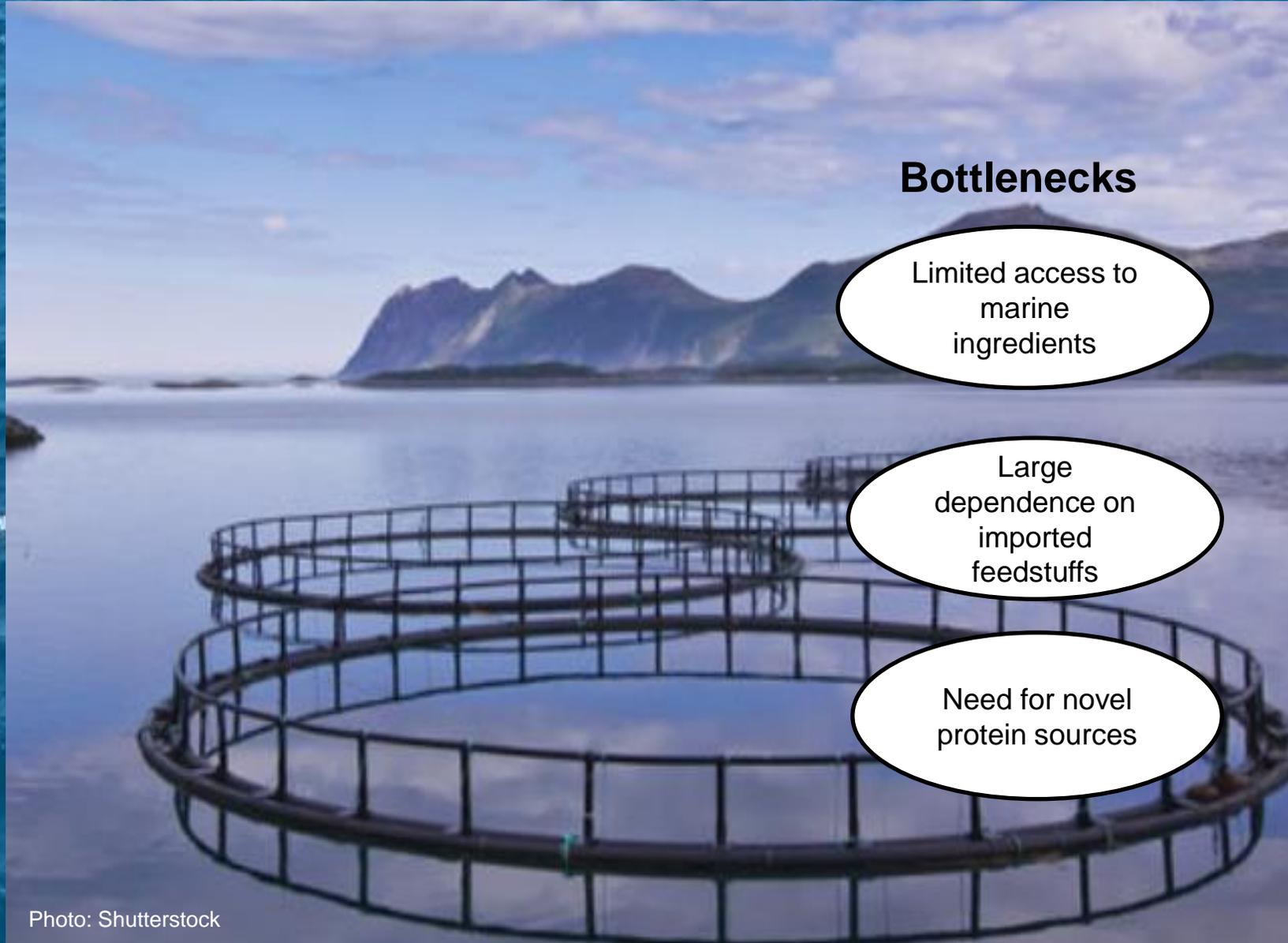
# Food security and self-sufficiency

## Challenges:

- 2050 ~9 billion people
- Climatic changes
- More political instability
- Overreliance on imported feed resources



# Constraints on the growth of the aquaculture industry



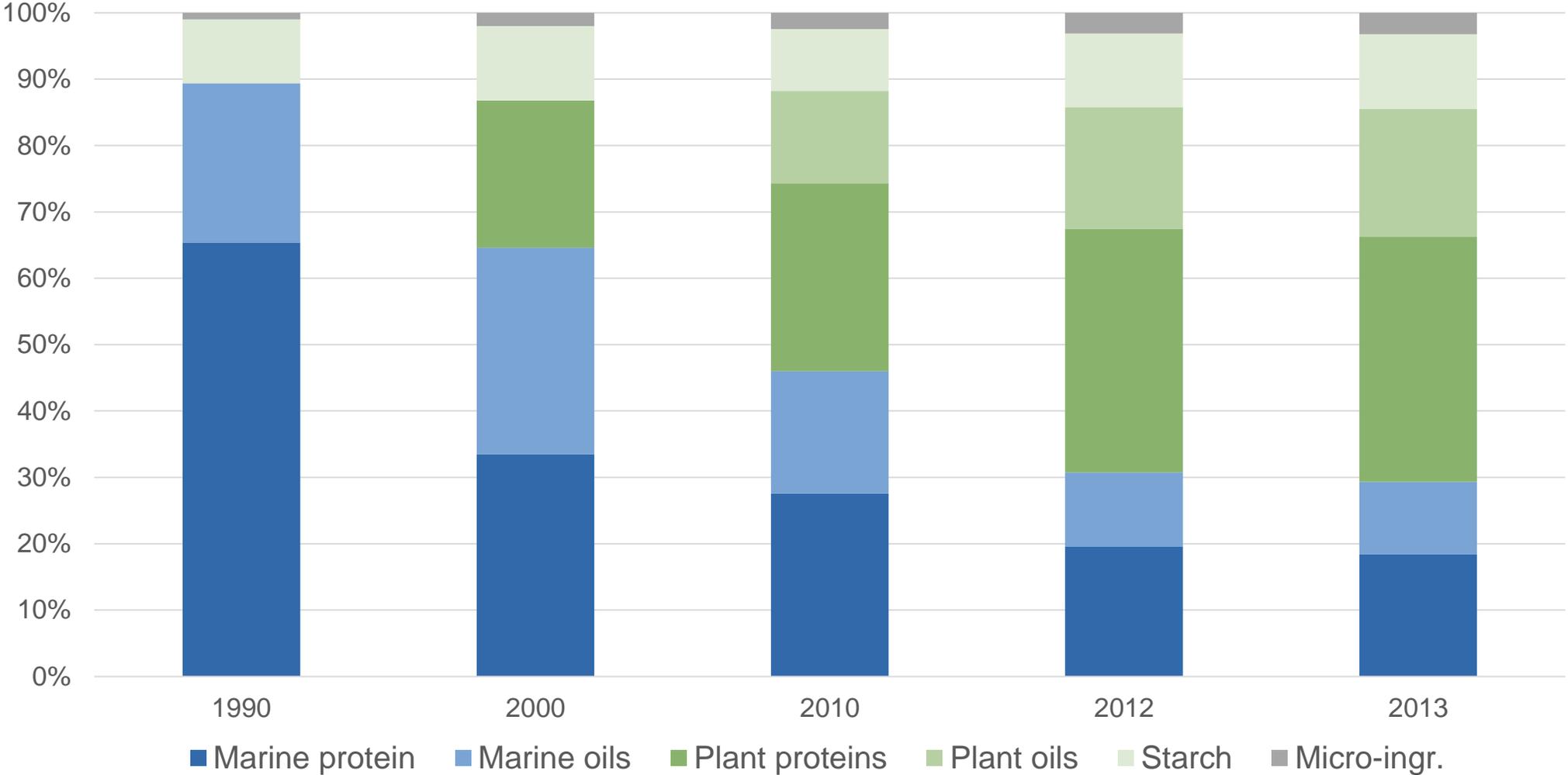
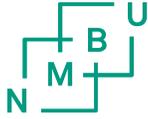
## Bottlenecks

Limited access to marine ingredients

Large dependence on imported feedstuffs

Need for novel protein sources

# Development of salmon feed composition (%)



Source: Ytrestøyl et al., 2015

# Looking ahead...



## Opportunities:

- Blue and green biomass
- Infrastructure & technology
- Unique interdisciplinary research team

# Biomass from the ocean

Harvesting



Cultivation

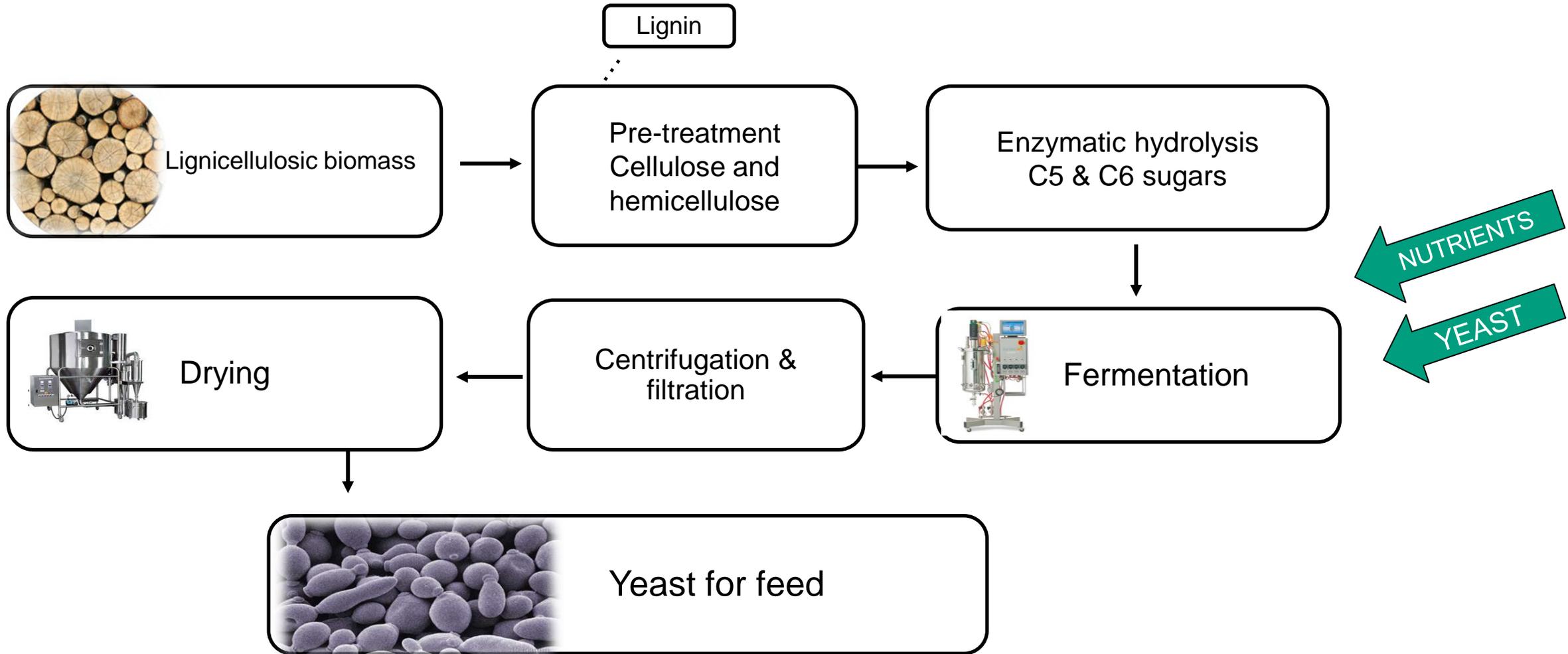


# Trees as a feed resource

The forest is Norway's largest bioresource



# Yeast production from lignocellulosic biomass



# Yeast fermentation on small scale Biorefinery laboratory at NMBU



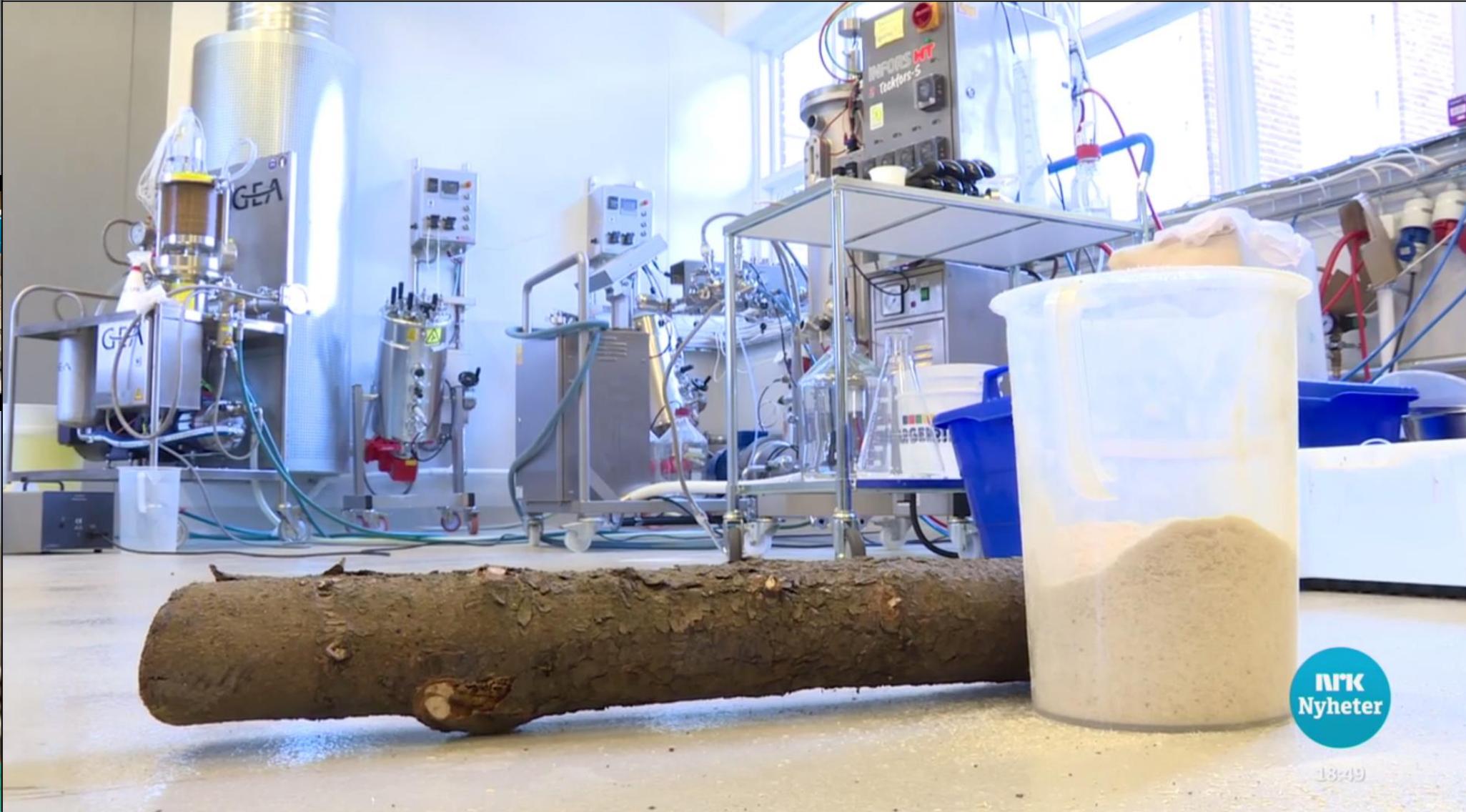
3 ml vesicles



150 ml flasks



3-30 L fermenters



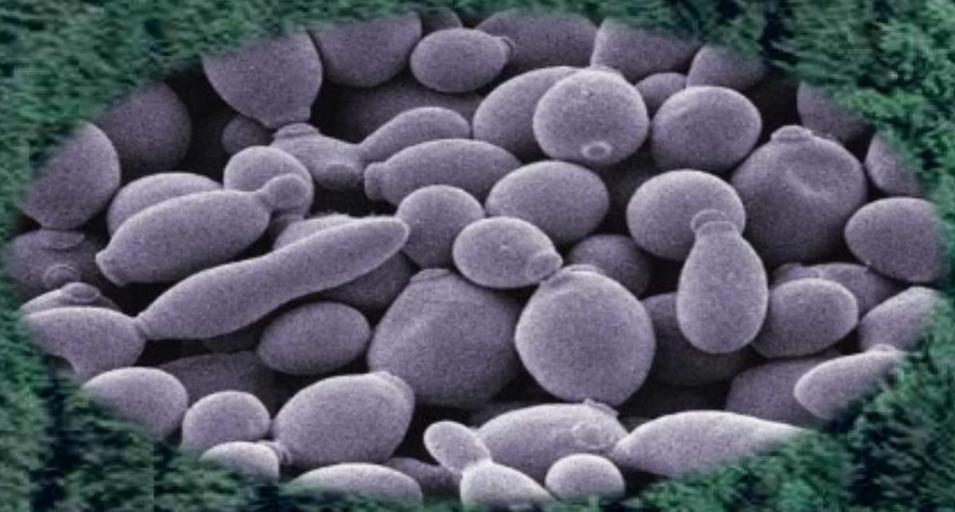
Yeast fermentation in large-scale  
Biorefinery factory, Borregaard, Norway



# Yeast from trees as a feed resource

Protein source

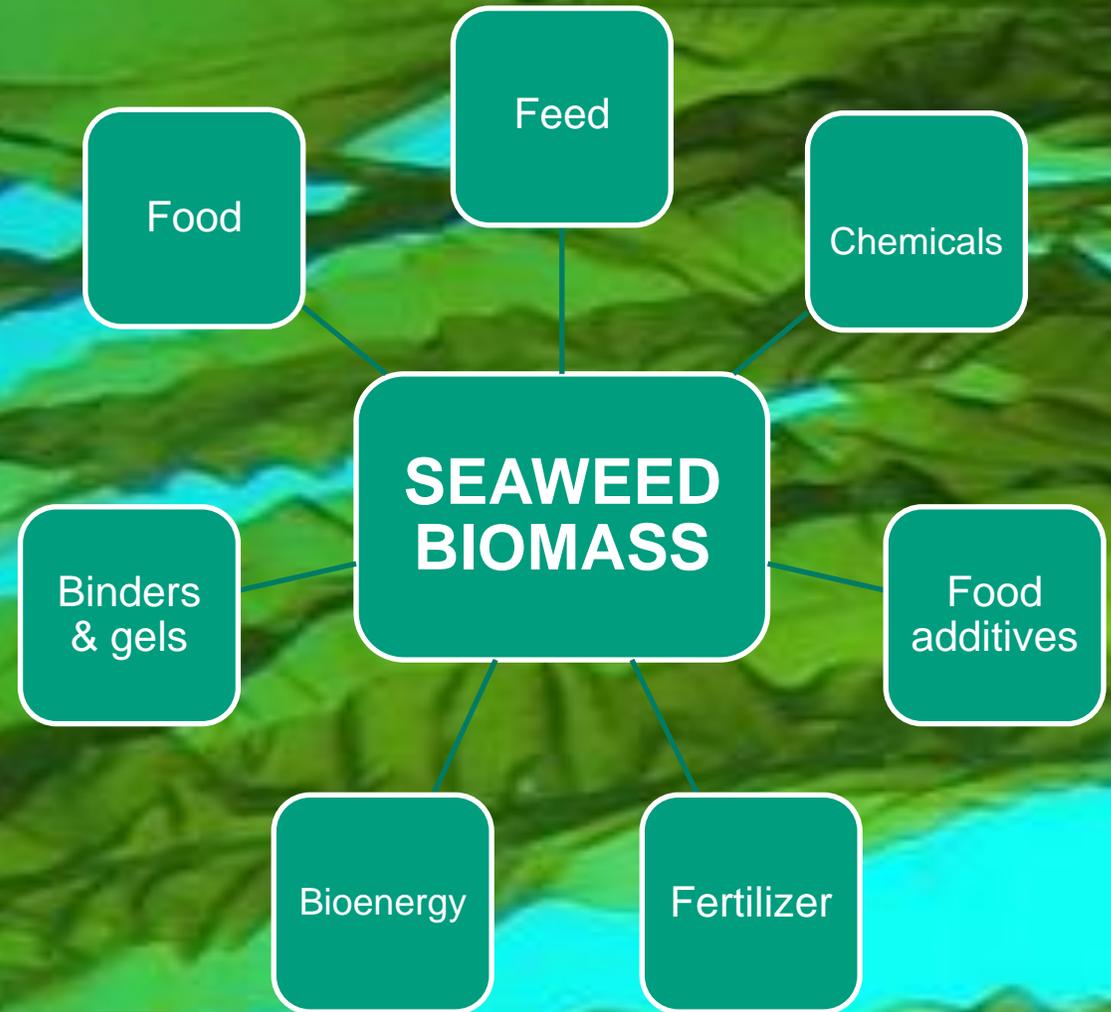
Sustainable feed resources  
Contains ~ 50-60% protein  
Favorable amino acid profile  
Good taste  
Positive health effect for fish  
GRAS



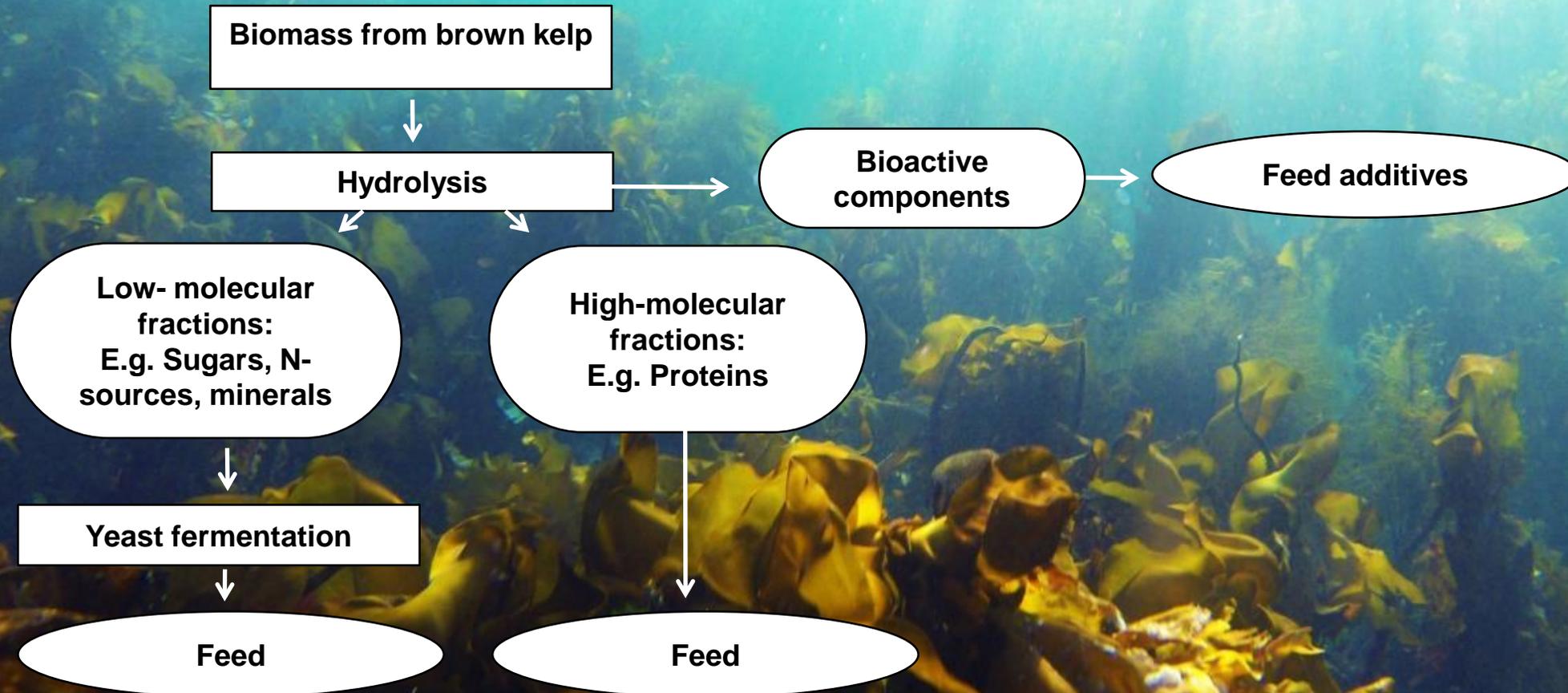
# Cultivated seaweeds - a potential feed resource

## Advantages:

- Large biomass production
- Don't require any agricultural land, fertilizers, or fresh water
- Can be cultivated in sea water
- Binds and recycles nutrients



# Processing of seaweeds to feed



# Use more local feed resources

FeedMileage, Efficient use of local resources for a sustainable Norwegian food production, 2015 – 2019



# Potential for increased feed efficiency



**1% increase in feed efficiency will increase annual value creation**

- In animal production by: 81 million NOK
- In salmon production by: 220 million NOK



Source: Dvergedal et al., 2018



# FOODS OF NORWAY

- Reduce competition with human food resources
- Non-food biomass → feed with limited dependence on arable land, water and changing climatic conditions
- Making farm animals more efficient = more fish and meat from our feed resources
- Novel biotechnology – state of the art “multiomics” technology:
  - Processing technology
  - Nutrition, health, product quality and safety
  - Genomic selection to improve feed efficiency

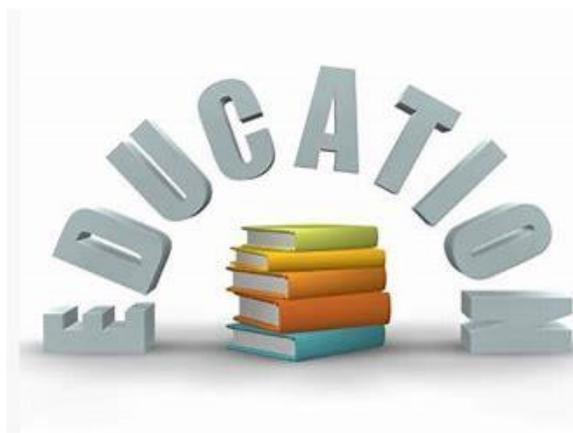


**FOOD SECURITY**

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# FOODS OF NORWAY

- Provide a unique opportunity to train scientists from Norway and around the world
- Promote MSc, PhD and post-doc candidates across the entire agriculture and aquaculture value chains for future positions in both academia and industry.



12 RESPONSIBLE  
CONSUMPTION  
AND PRODUCTION



# FOODS OF NORWAY

Increase food production while minimizing the environmental impact

- Ensure that the fish, meat, and milk they consume is sustainable and safe, and based on local value chains
  - Develop novel feeds that improve growth performance, health and welfare of the animals
  - Secure economical sustainability through development of cost efficient animal and aquaculture feed solutions and production efficiency
-

13 CLIMATE  
ACTION



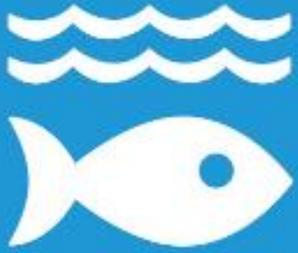
# FOODS OF NORWAY

Increase food production while minimizing environmental impact

- Increase value creation from tree biomass
- Reduce CO<sub>2</sub> from transport by developing local feed resources
- Increase feed efficiency of farm animals and fish to reduce GHG
- Move away from traditional value chains and towards a loop-based and zero-loss strategy through optimal use of bioresources



14 LIFE  
BELOW WATER



# FOODS OF NORWAY

- Develop sustainable feed solutions for aquaculture
- Reduce dependency on wild fish populations by replacing fish meal and fish oil with novel feed resources
- Reduced nitrogen and phosphorus excretion in the sea by improved feed efficiency of farmed fish
- Cultivate and facilitate development of seaweed as a sustainable feed resource



## Conclusion



SUSTAINABLE  
DEVELOPMENT

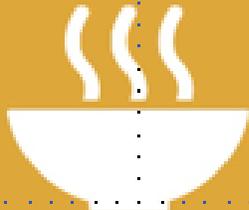
GOALS

- How Foods of Norway helps reach these goals

4 QUALITY  
EDUCATION



2 ZERO  
HUNGER



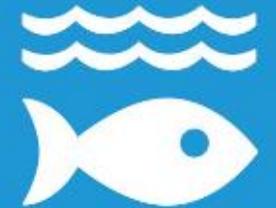
12 RESPONSIBLE  
CONSUMPTION  
AND PRODUCTION



13 CLIMATE  
ACTION



14 LIFE  
BELOW WATER



# FOODS OF NORWAY



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