

**ABTCP 2015**

48º CONGRESSO E EXPOSIÇÃO  
INTERNACIONAL DE CELULOSE E PAPEL

48º CONGRESSO INTERNACIONAL DE CELULOSE E PAPEL  
1ª CONFERÊNCIA IBEROAMERICANA SOBRE BIOECONOMIA



# NEW BIOREFINERY BUSINESS MODELS EMERGING IN SCANDINAVIA

Niklas Berglin & Anna von Schenck

NiNa Inn♥vation

REALIZAÇÃO



CORREALIZAÇÃO





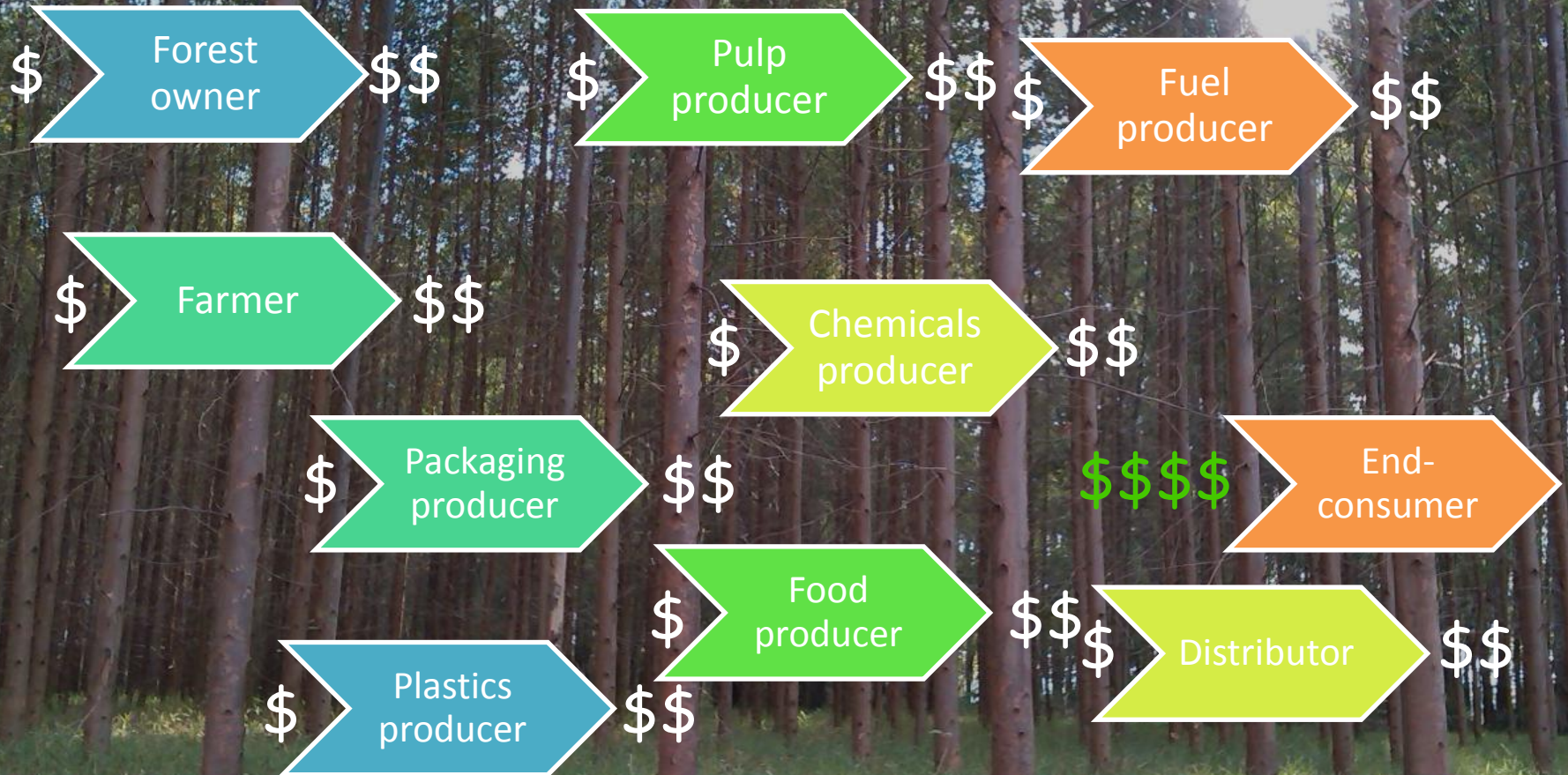
# Outline

- Challenges
- Solutions
- Examples





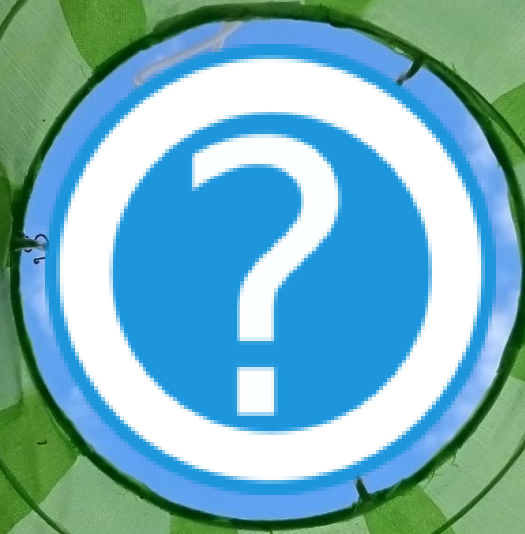
# How do we establish bio-based value chains?







# Challenges



- Who is your partner, who is your competitor?
- Bio-based value chains are "longer" than fossil-based
- Expectations are high in each part of the value chain
- Who pays the "green premium"?



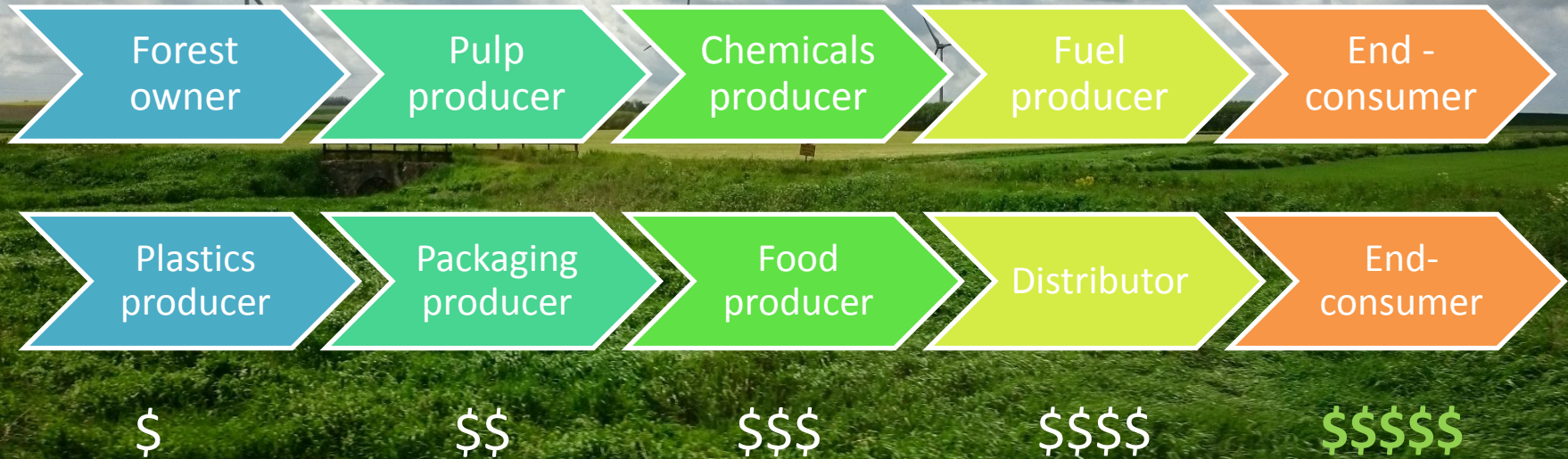
# Outline

- Challenges
- Solutions
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# Align expectations







# Use transparent business models and incentives

- B2B
- Joint ventures
- Integrate new companies
- Policy instruments
- Consumer initiatives





## Find the green premium

- Typically non-existent when discussing B2B
- Subsidies and other government incentives in place in some sectors
- Consumer awareness has great potential







# Outline

- Challenges
- Solutions
- Examples from Scandinavia
  - Bringing new actors together
  - Consumer initiatives
  - Joint ventures
  - Value chain projects



Green Heart of Scandinavia

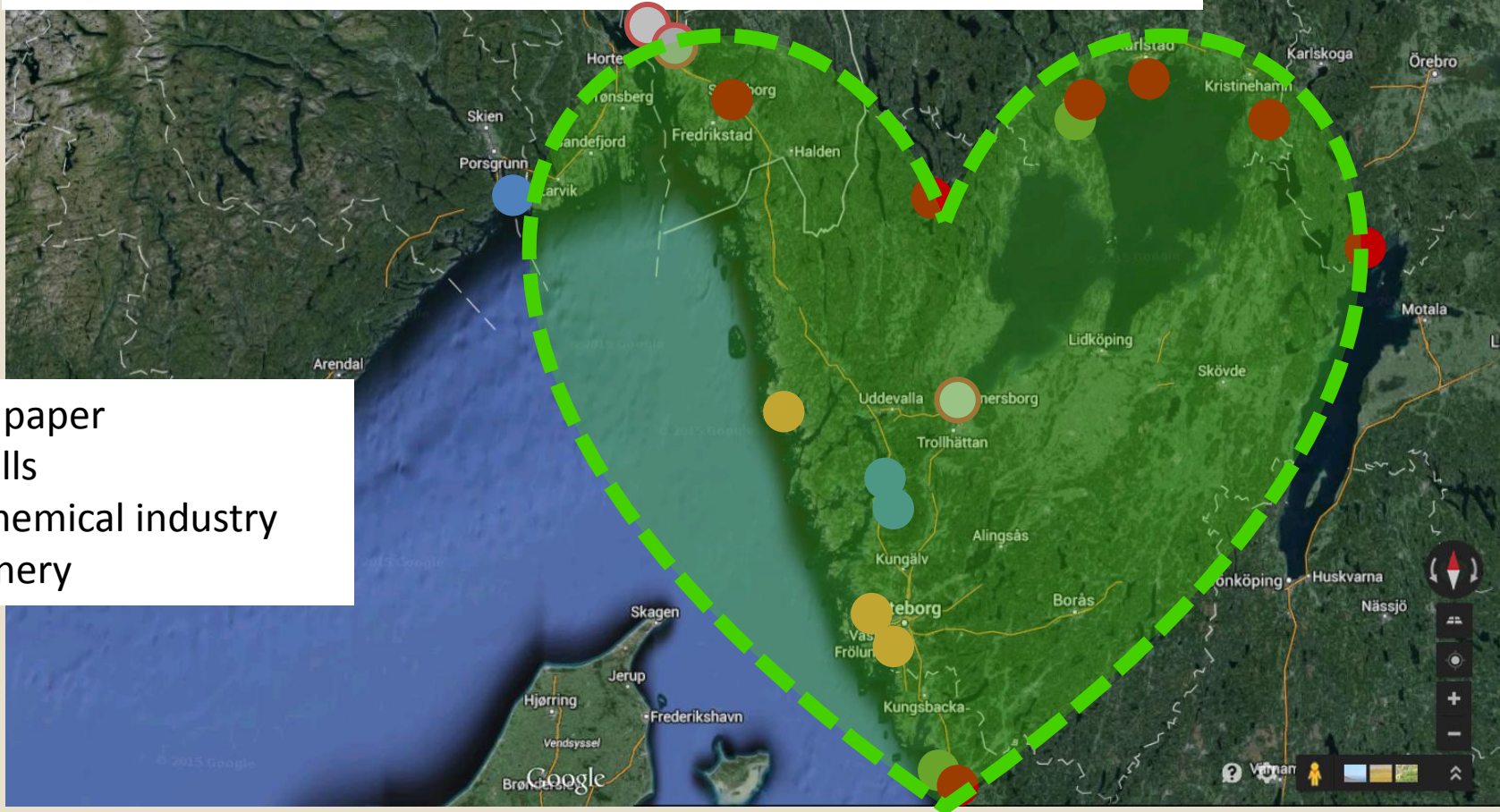
BioInnovation

## **EXAMPLE 1: BRINGING NEW ACTORS TOGETHER**





# The Green Heart of Scandinavia







A cross sectorial  
initiative

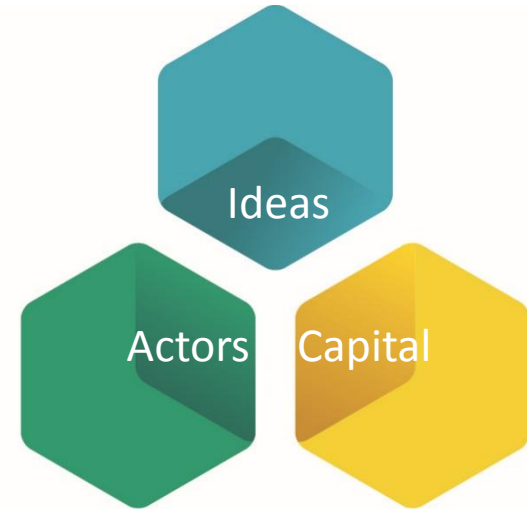
[www.bioinnovation.se](http://www.bioinnovation.se)

Fotograf: Erik Johansson  
erikjohanssonphoto.com





- BioInnovation aims to connect ideas, actors and capital to accelerate the development of economically feasible biobased innovations
- About 60 actors in Sweden
- Four focus areas



**Chemicals & Energy**



**Materials**



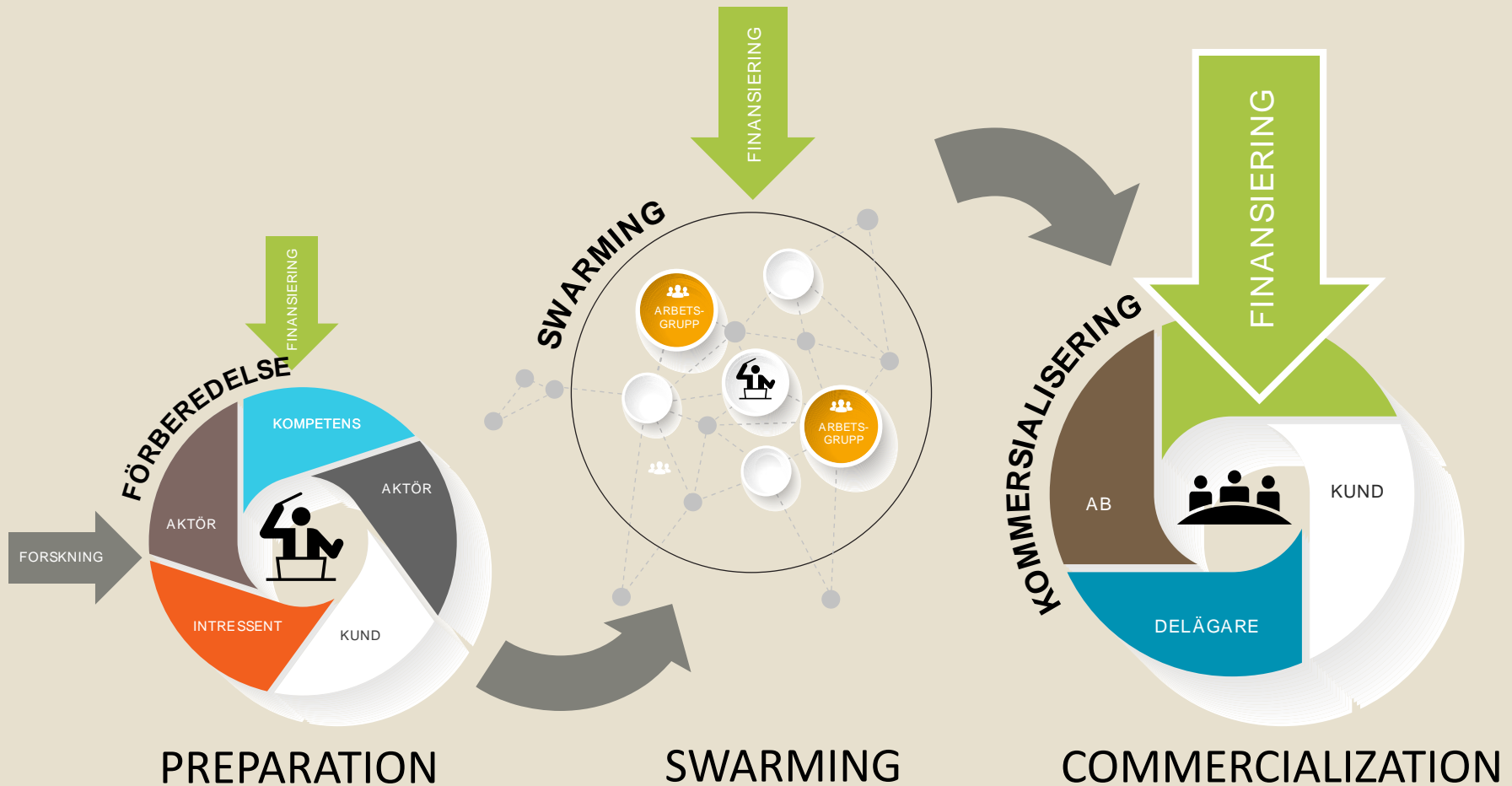
**Construction & Design**



**New Utilisation**



# Innovation Race!

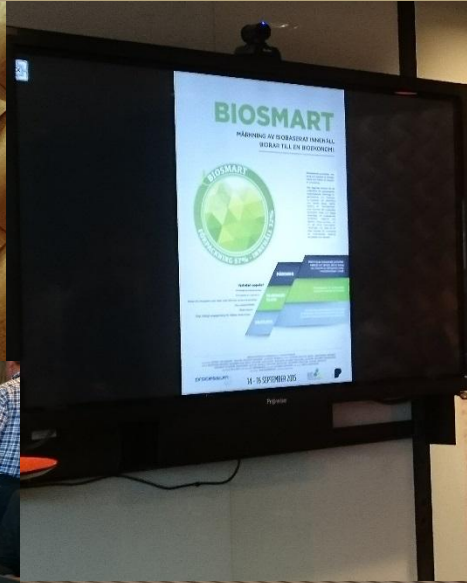




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56 hour Innovation Race!







# OUTCOME FROM A 56-HOUR INNOVATION RACE

The collage features seven posters, each representing a different innovation project:

- LIGNINRAFFINADERI**: OMVANDLING AV LIGNIN TILL BIODRIVMEDEL OCH KEMIKALIER. Features a golden trophy filled with dark granules.
- FOREST FISH™**: NY FODERKÄLLA MED DUBBEL MILJÖVÄRDE. Shows a white bag of product with a fish icon and a circular diagram.
- TRÄD TILL TRÄD**: MED SIN EGENA TRÖSKEL I EN GODSÖCH FÖRNYBAR FIBER. Includes a circular diagram with numbers 1-6.
- DEN LILLA KEMIFABRIKEN**: REINDUSTRIALISERING. Shows a factory structure.
- OPEN BIO PLANT**: ENTREPRENÖRSKAP RUNT BIOBASERAD UTVECKLING. Features a colorful hand icon with icons for different sectors.
- BIOSMART**: MÄRKNING AV BIOBASERAT INNEHÅLL BIDRAG TILL EN BIOEKONOMI. Includes a green circular logo with 'BIOSMART' and 'FÖRPACKNING 57% - INNEHÅLL 32%'.
- EN UNDERBAR MÖJLIGHET**: Shows a green bag of product.

Each poster includes text, diagrams, and logos, and is dated 14-16 SEPTEMBER 2015.

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FlyGreenFund

## **EXAMPLE 2: CONSUMER INITIATIVES**



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# Fly Green Fund



**Enabling organizations and individuals to fly more  
sustainably on bio jet fuel in the Nordics**





## Fly Green Fund

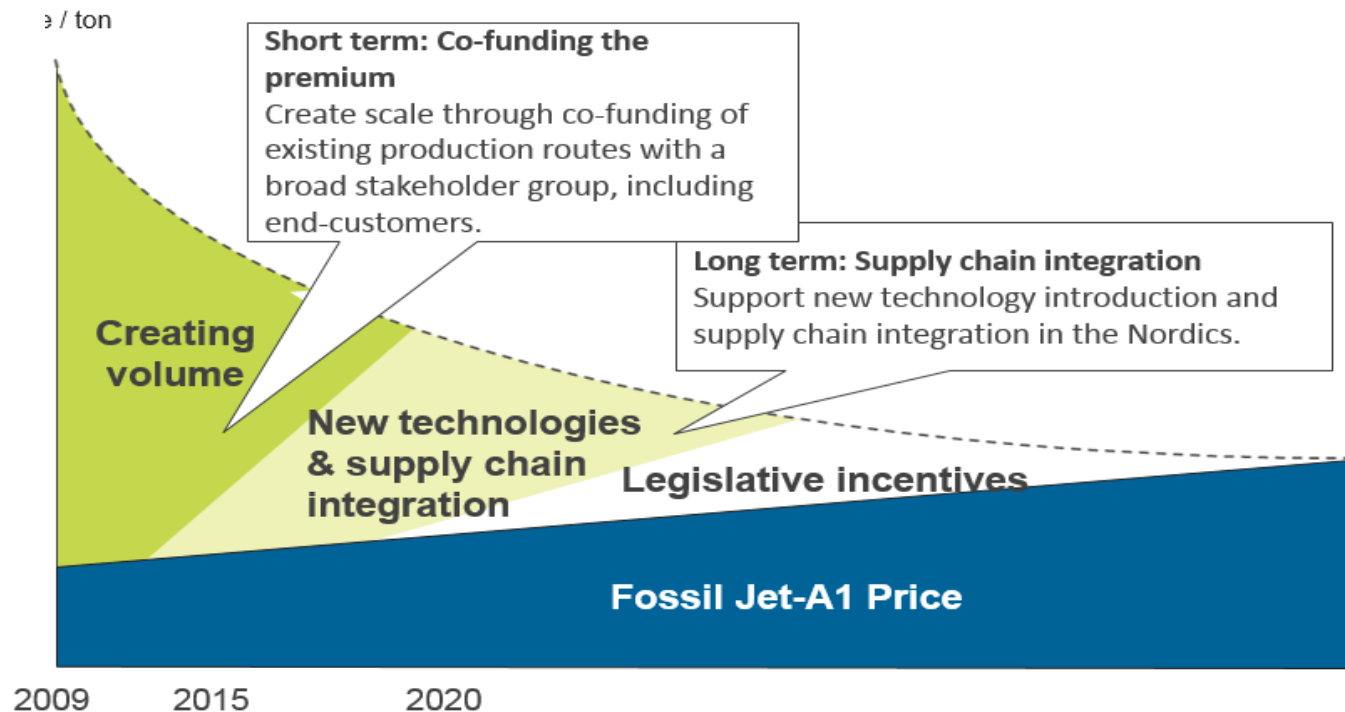
- ▶ Air transport is an integral part of every day life and demand grows about 3% annually
- ▶ Unlike other transport segments, aviation has for the foreseeable future no other alternative to liquid fuels
- ▶ Today fuel accounts for about 30% of the operating expenses of airlines





To make bio jet fuel commercially available in the Nordics we have developed the Fly Green Fund.

### Simplified break down and reduction potential of the bio jet fuel price





To build a more sustainable future for aviation, all stakeholders need to work together.

## The Fly Green Fund



Hagainitiativet  
Företag för aktivt klimatansvar







SunPine

Silva Green Fuel

Metsä Bioproduct Mill

## **EXAMPLE 3: JOINT VENTURES**



# SunPine – A joint venture for biodiesel production from tall oil

Feedstock: Crude Tall Oil

Products: Crude Tall Diesel (55%)

Tall Oil Pitch (45%)

Capacity: 100 000 m<sup>3</sup>/yr

(2.5% of the Swedish diesel volume)



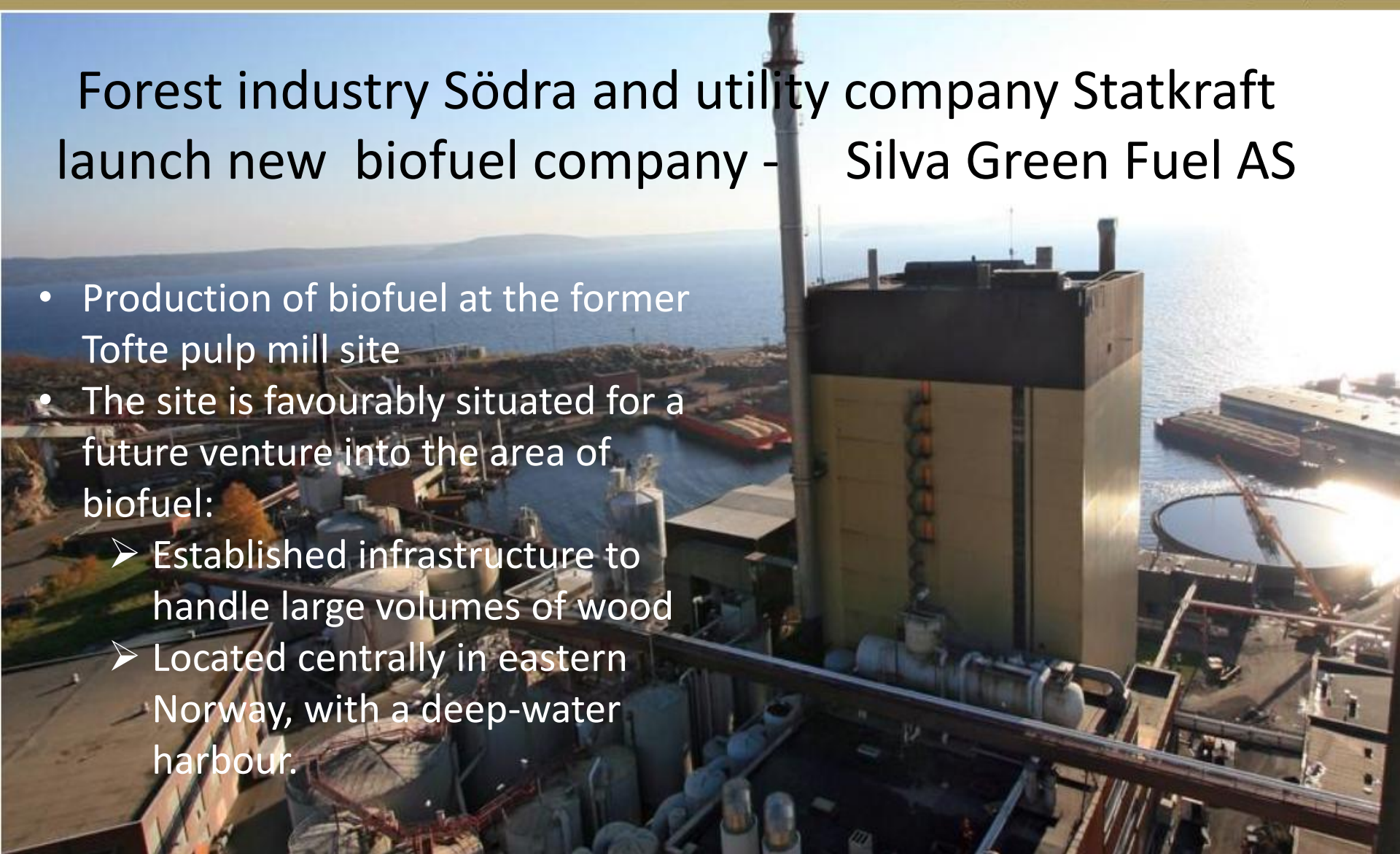
- Sveaskog (Forest owner)
- Södra (pulp producer)
- Preem (oil refinery)
- Kiram (technology supplier)
- NEW: Lawter (Chemical supplier)





## Forest industry Södra and utility company Statkraft launch new biofuel company - Silva Green Fuel AS

- Production of biofuel at the former Tofte pulp mill site
- The site is favourably situated for a future venture into the area of biofuel:
  - Established infrastructure to handle large volumes of wood
  - Located centrally in eastern Norway, with a deep-water harbour.







## Metsä Fibre has made the decision to build a bioproduct mill in Äänekoski, Finland

- Total investment about 1.2 billion euros
  - The mill is scheduled to be completed in late 2017
  - The bioproduct mill's annual pulp production will be approximately 1.3 million tonnes
  - In addition to pulp, the mill will produce
    - A surplus of electricity
    - Tall oil
    - Turpentine
    - All side streams from the bioproduct mill are planned to be utilized in the ecosystem that will be formed by various companies around the mill
- 
- An aerial photograph of a large industrial facility, likely a pulp mill, situated near a body of water. The facility features several large yellow storage piles, a dam, and various industrial structures. The surrounding area is lush with green trees and vegetation.





Wood to Food

Locally Grown Plastics

## **EXAMPLE 4: CONSUMER-ORIENTED VALUE CHAIN PROJECTS**

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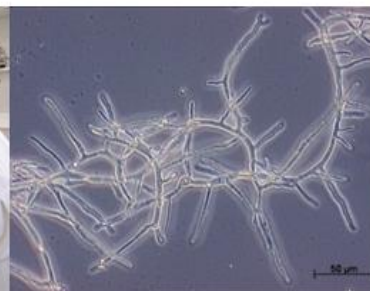


processum your Partner  
Science

# Wood to Food



En investering för framtiden



**RI  
SE**  
INSTITUTES





# From wood to food



**WOOD**



**FOOD**



**SCP**



**CULTIVATED FISH**





# Background

- The human population is projected to 9 billion in 2050
  - The demand for fish is estimated to increase with 300% within 40 years
  - 80% of the oceans are today fully exploited, overexploited or depleted
  - A considerable share of the fish must come from aquaculture in the future
- ➔ Fish production through aquaculture is projected to double within the next decades and so is the the demand for protein for feed

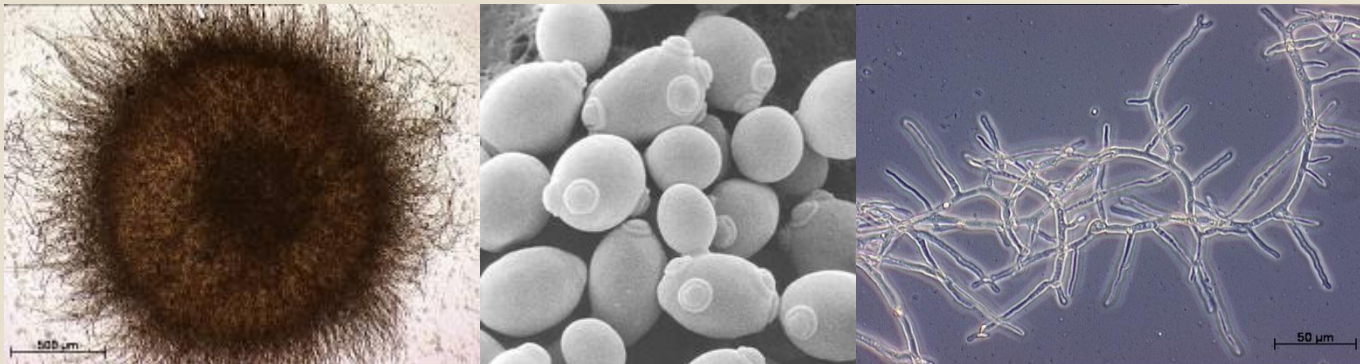




# Benefits of Single Cell Protein (SCP)

- Single cell protein consist of fast growing microorganisms (fungi, bacteria, algae)
- Rapid protein production (from kg to tons in 24h)
- Can be produced from residual process streams from the biorefinery industry

➔ A potential new co-product for the biorefinery industry





# Production of SCP from residual streams



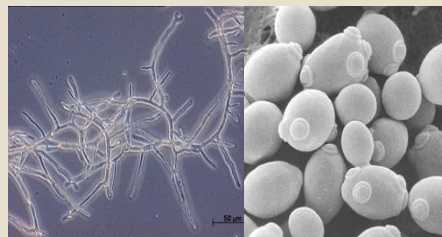
The Aditya Birla  
Biorefinery in  
Örnsköldsvik,  
Sweden



Fiber sludge

Spent lq

+



Filamentous  
Fungi

Yeast



SCP





# Production of SCP from Lab to Demo scale



**Laboratory bioreactor**



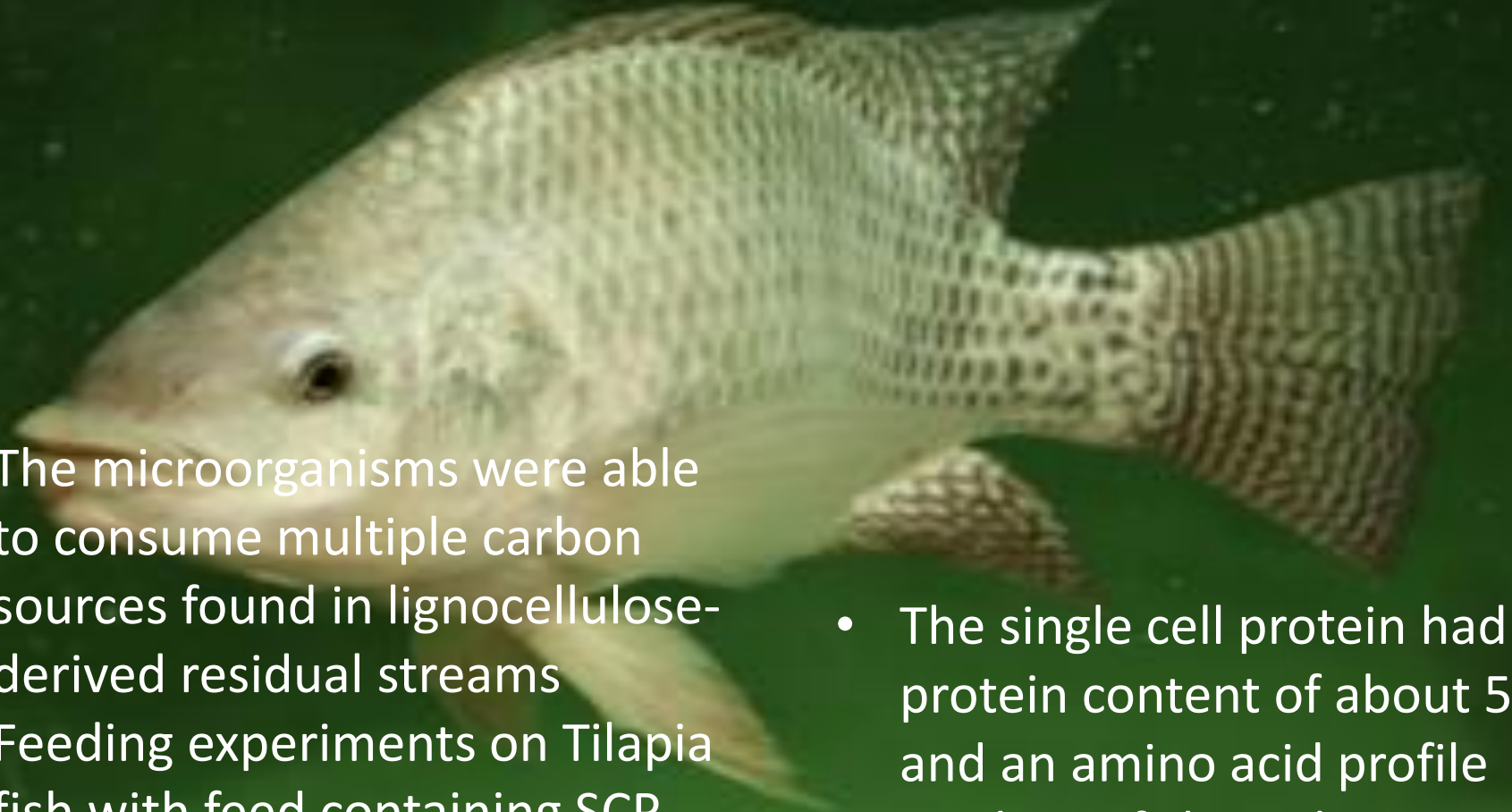
**Pilot bioreactor**



**The Swedish  
Biorefinery Demo Plant**



## Main results from the project

- 
- The microorganisms were able to consume multiple carbon sources found in lignocellulose-derived residual streams
  - Feeding experiments on Tilapia fish with feed containing SCP showed very promising results
  - The single cell protein had a protein content of about 50% and an amino acid profile similar to fishmeal



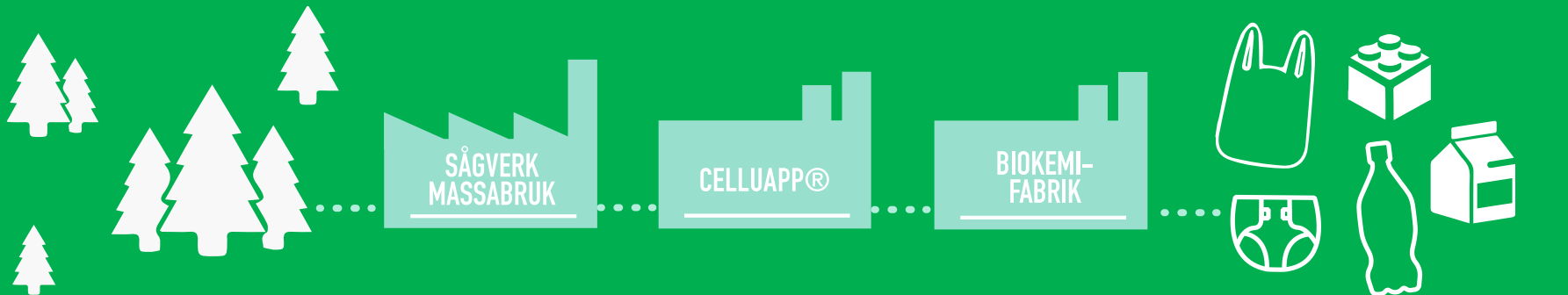


# Locally grown plastics





# To evaluate the possibility of having a value chain from forest to bio-plastics



  
**SVEASKOG**

**SEKAB**

 **BOREALIS**

  
**Tetra Pak**

  
**Norgesgruppen**

 **SÖDRA**

**processum**  
Jointly  
Science for  
Sustainable  
Production

  
**TRIOPLAST**

**ICA**

  
**POLARBRÖD**





Thank you for your attention!



NiNa Innovation do Brasil Ltda,  
São Paulo, Brazil



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Stockholm, Sweden

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