

EXPANDFIBRE

Accelerating the development of sustainable bioproducts

Katariina Kemppainen & Heli Virkki
Telaketju 5th open R&D webinar
Seminar 1.2.2021

What is ExpandFibre?



ExpandFibre (2020-2024) is a 50 M€ R&D collaboration and an Ecosystem launched by Fortum and Metsä Group and co-funded by Business Finland. It focuses on upgrading pulp fibre, hemicellulose and lignin from renewable and sustainable sources of straw and northern wood into new bioproducts. Its ambition is to meet the growing demands for sustainable textile fibres and other added value biomaterials.

The **research and development in ExpandFibre**, aiming at producing new ground-breaking technologies and smart business concepts, is divided into **seven research themes**:



Textiles



Biocomposites



Packaging



Lignin products



Hemicellulose products



Sourcing & fractionation of straw



Other fibre products



ExpandFibre invites actors in these value chains to join in building a world-leading innovation ecosystem to eventually commercialize new bioproducts and green businesses

ExpandFibre Programmes & Ecosystem

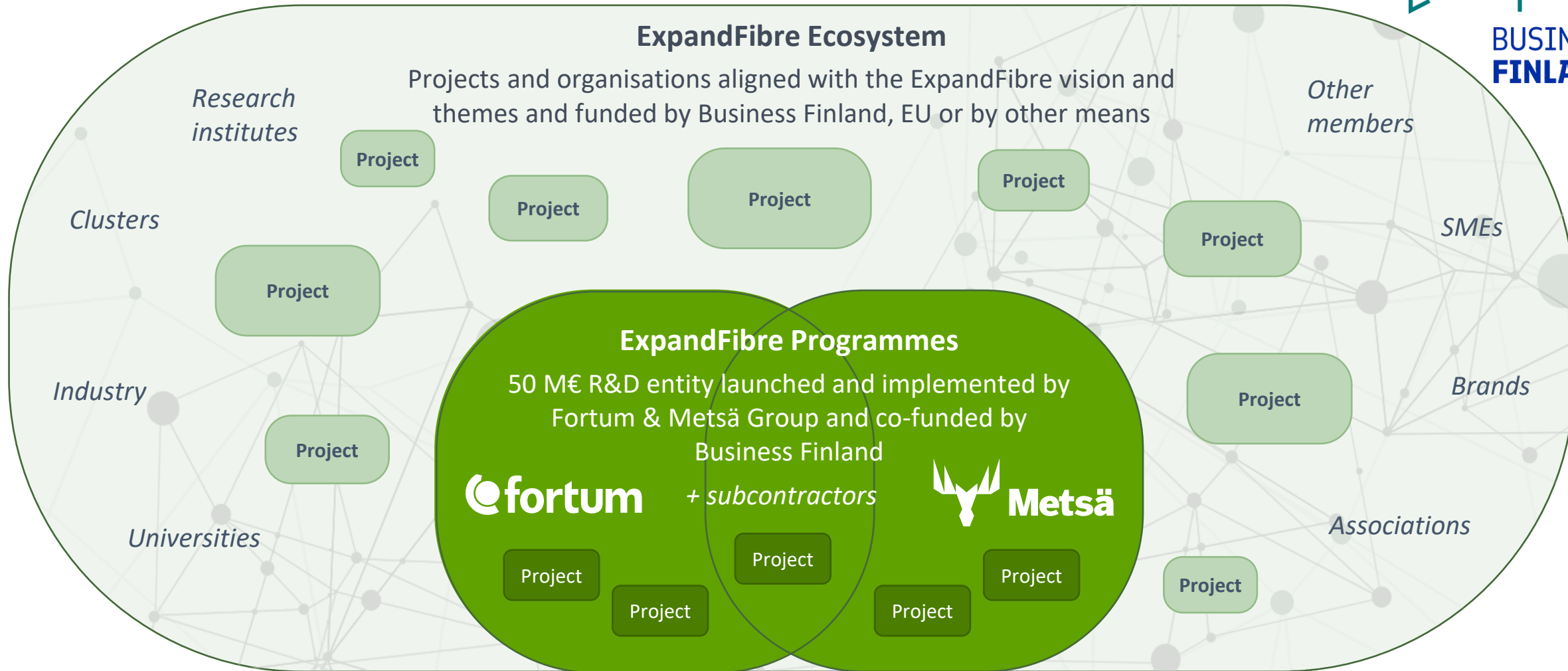
Ecosystem Steering Group



Aalto University



BUSINESS FINLAND



ExpandFibre Ecosystem aims at developing novel bioproducts with a reduced environmental impact

Vision	New bioproducts based on sustainable biomass contribute significantly to the reduction of the negative environmental impact of our everyday lives
Mission	ExpandFibre Ecosystem strives to meet the growing demand for sustainable bioproducts by developing ground-breaking materials and technologies and smart business concepts

Short term objectives (2020-2024)

- Build knowledge-based **competitive advantage** among the ecosystem members
- Create/strengthen **test-beds for piloting** and proof-of-concept validations in the theme areas
- **Identify and fill in gaps** in the R&D landscape within ExpandFibre themes
- Create a thriving **business-driven innovation ecosystem for new biomass-based textile fibres**

Long-term objectives (2030 and beyond)

- Provide markets with new bioproducts that have **less than 20% of the carbon footprint** of the current products
- **Bring new revenue to ecosystem partners** through the increasing production and sale of new value-added bioproducts and technologies.
- Significantly **increase investments** into biomass-based value chains

Fortum in brief

Our core
Hydro and nuclear
Combined heat and
power production
Circular economy
Energy-related
products and expert
services

8300
professionals
in the Nordics,
the Baltics,
Russia, Poland
and India

We are the largest
electricity retailer in
the Nordics and one of
the leading heat
producers globally.
We have
2.5 million
customers.

2/3 of our
power
production is
**hydro and
nuclear**

96% of our
electricity
production is CO₂
free in Europe,
61% in all
operations

Fortum Bio2X: mitigating climate change

Phases to reduce CO₂ emissions

1.

**Electricity from solar and wind
Hydro and nuclear power**

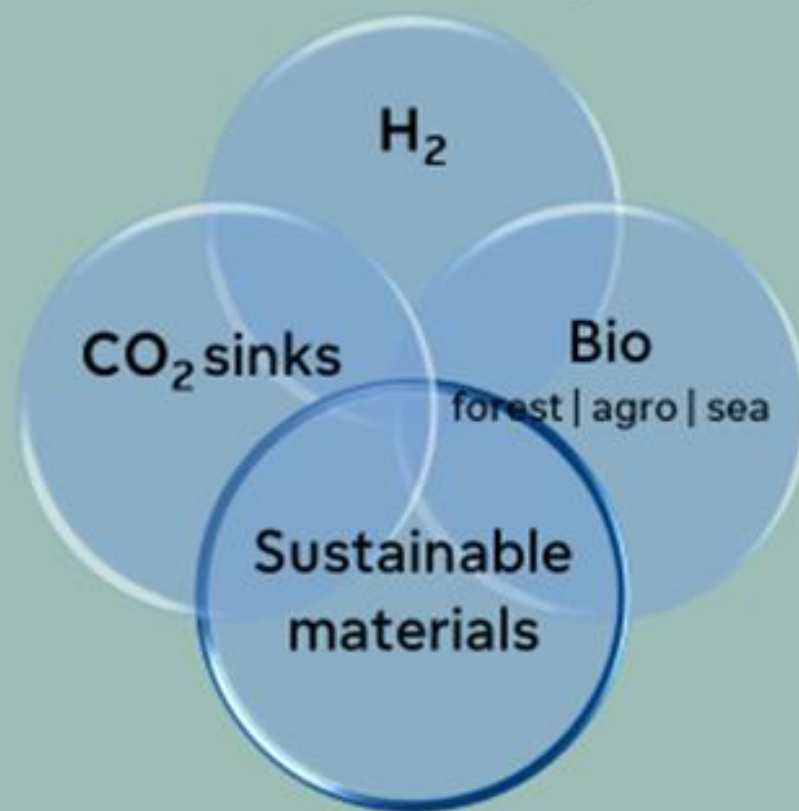


- Power production moving towards renewables
- Electrification of traffic
- Electrification of households



2.

Focus on industry



Metsä Group

Purpose

Advancing bio-economy and circular economy by efficiently processing northern wood into first-class products

Vision

The preferred partner in developing sustainable business



* 2019, internal sales included
** Electricity and heat in total
*** Shares listed on the Nasdaq Helsinki

Metsä Group | Sales* EUR 5.5 billion | Personnel 9,300 | Renewable energy** 27.7 TWh

Metsäliitto Cooperative | The Group's parent company | Owned by appr. 100,000 Finnish forest owners



METSÄ FOREST
Wood Supply and Forest Services

Sales:
EUR 2.0 billion
Personnel:
840



METSÄ WOOD
Wood products

Sales:
EUR 0.4 billion
Personnel:
1,500



METSÄ FIBRE
Pulp and sawn timber

Sales:
EUR 2.2 billion
Personnel:
1,300



METSÄ BOARD***
Paperboard

Sales:
EUR 1.9 billion
Personnel:
2,400

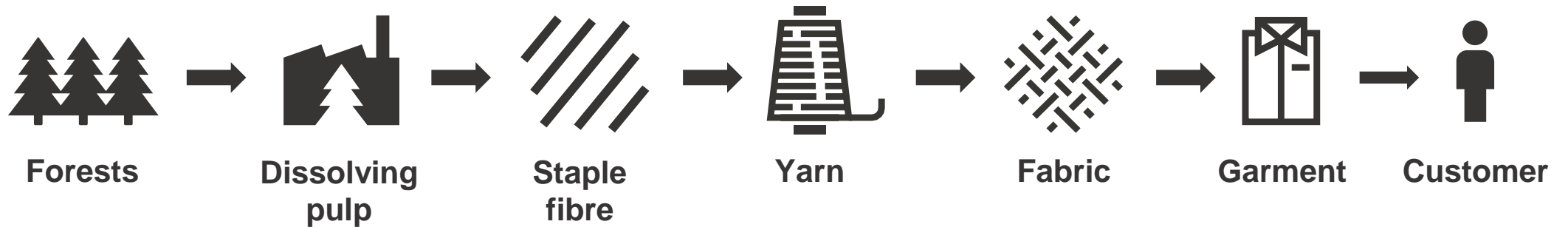


METSÄ TISSUE
Tissue and greaseproof papers

Sales:
EUR 1.0 billion
Personnel:
2,700

METSÄ SPRING | Innovation company

Trends with MMCF



1. Virgin MMCF: In 2019, only 40-50% of wood used in MMCF production came from PEFC/FSC certified forests
 - Paper-grade pulp instead of dissolving pulp?
2. “Recycled” MMCF: In 2019, still less than 1% of all MMCF was based on recycled raw materials
 - Challenge: Typical textiles a blend of various fibres
3. Straw as a third feedstock platform
 - Agro residue to be used for fibre production, largely available globally (wheat, rice etc.)
 - Huge impact to CO₂ emissions, if collected and not burned in countries like India: If all agro biomass in the fields in the Delhi region’s **three states** could be used as raw material, we could replace **over 50%** of the global cotton production.

Metsä's textile fibre technology

- Wood comes from certified, sustainably managed Finnish forests.
- Raw material is not dissolving but paper-grade pulp, made in the completely fossil-free bioproduct mill in Äänekoski, Finland.
- Textile fibre plant is integrated to the bioproduct mill using never-dried pulp, fully fossil-free energy and other utilities from the site.
- Unique green solvent, so-called ionic liquid (2nd gen), is used with over 99% targeted recycling rate.
- Product is a new Lyocell staple fibre.

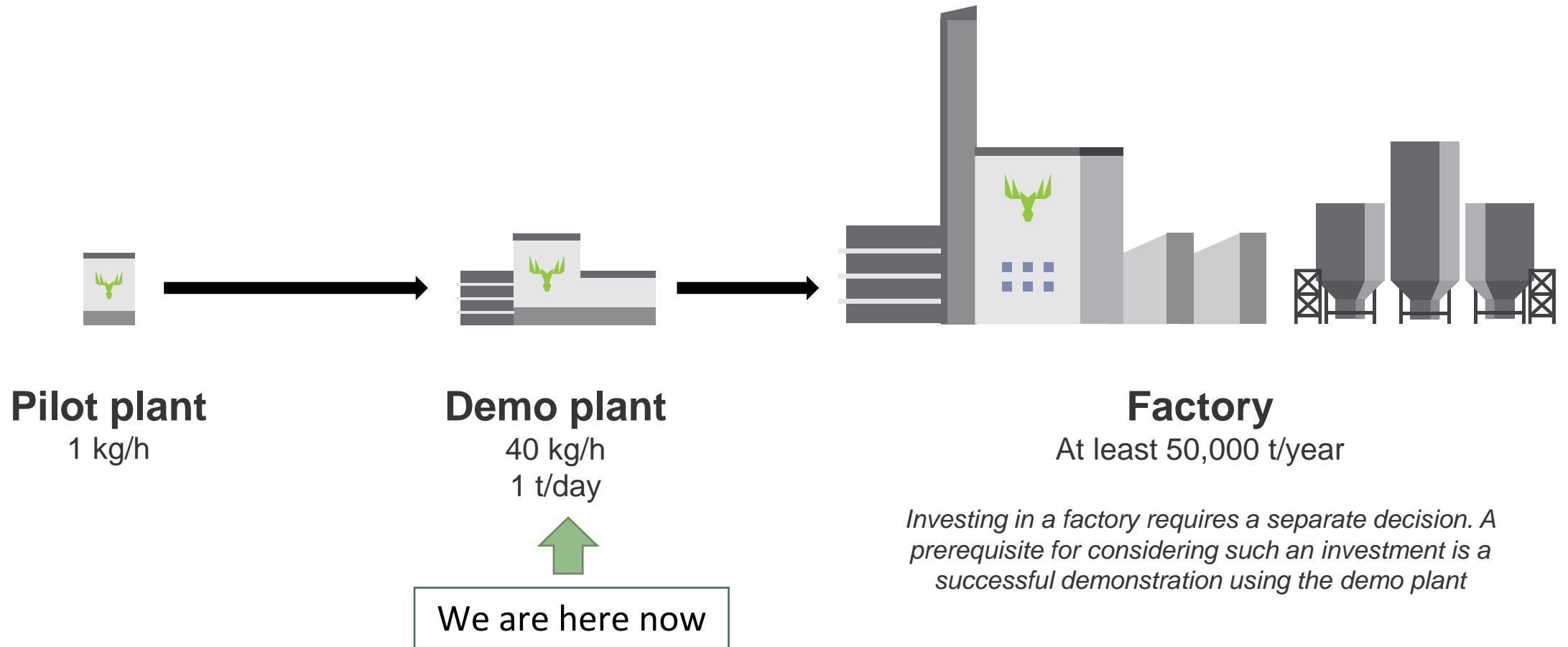


Metsä's textile fibre technology

- Origin in joint Finnish R&D programmes that targeted to find new wood-based products in 2009-2012.
- Own parallel development started in 2012.
- Collaboration with a potential customer, ITOCHU Corporation, Japan, since 2014.
- Decision to invest in a demo plant and to spin out the demo phase into a new JV in Oct. 2018.
 - JV 50/50 between Metsä Spring and ITOCHU
 - Total budget of the demo phase is 40 M€
- Demo plant now operational in Äänekoski, Finland.




Metsä's development horizon

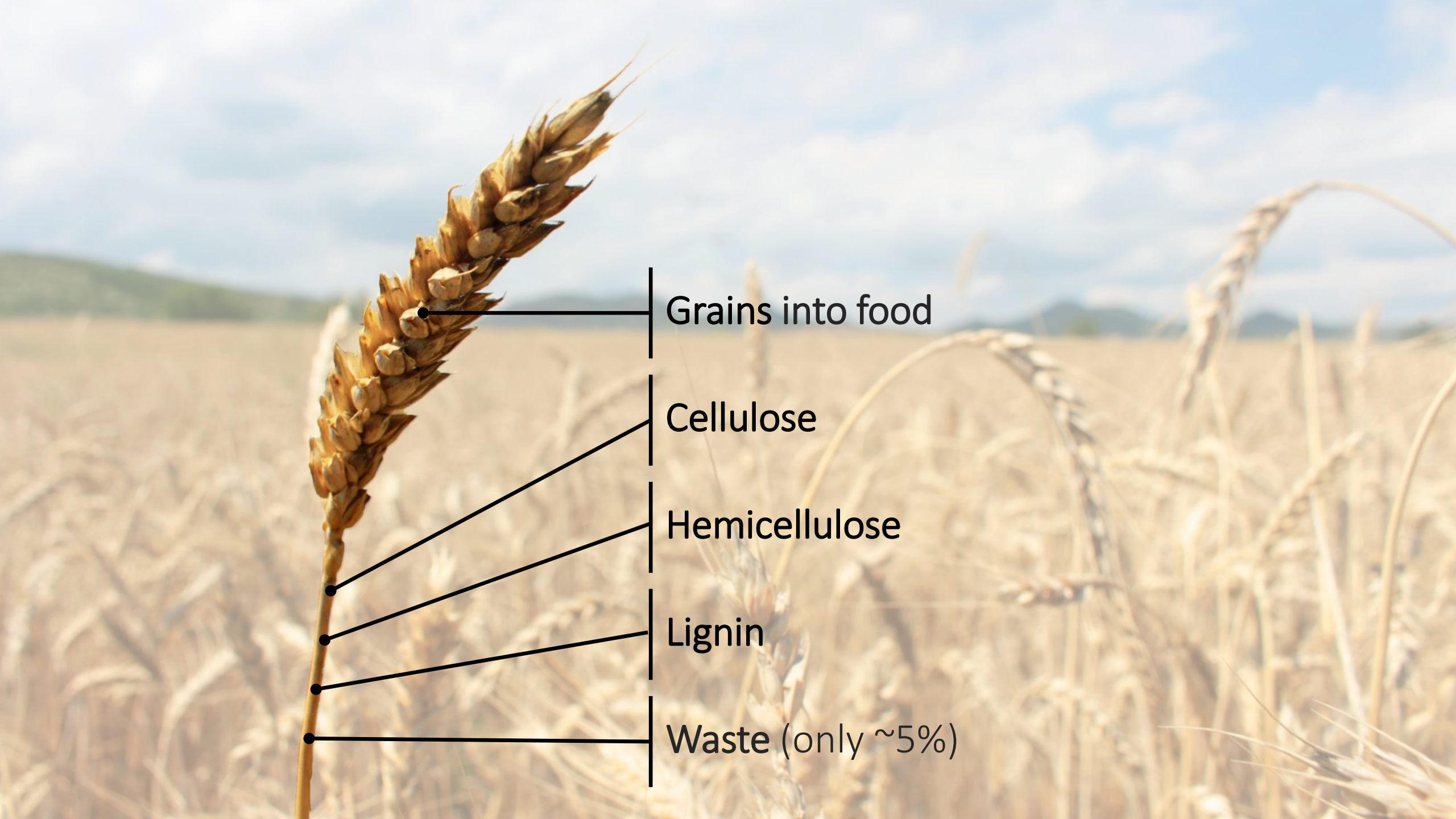


Why do we waste precious natural resources, and simultaneously pollute the environment?





What if we were to use nature's
resources in a smarter way?



Grains into food

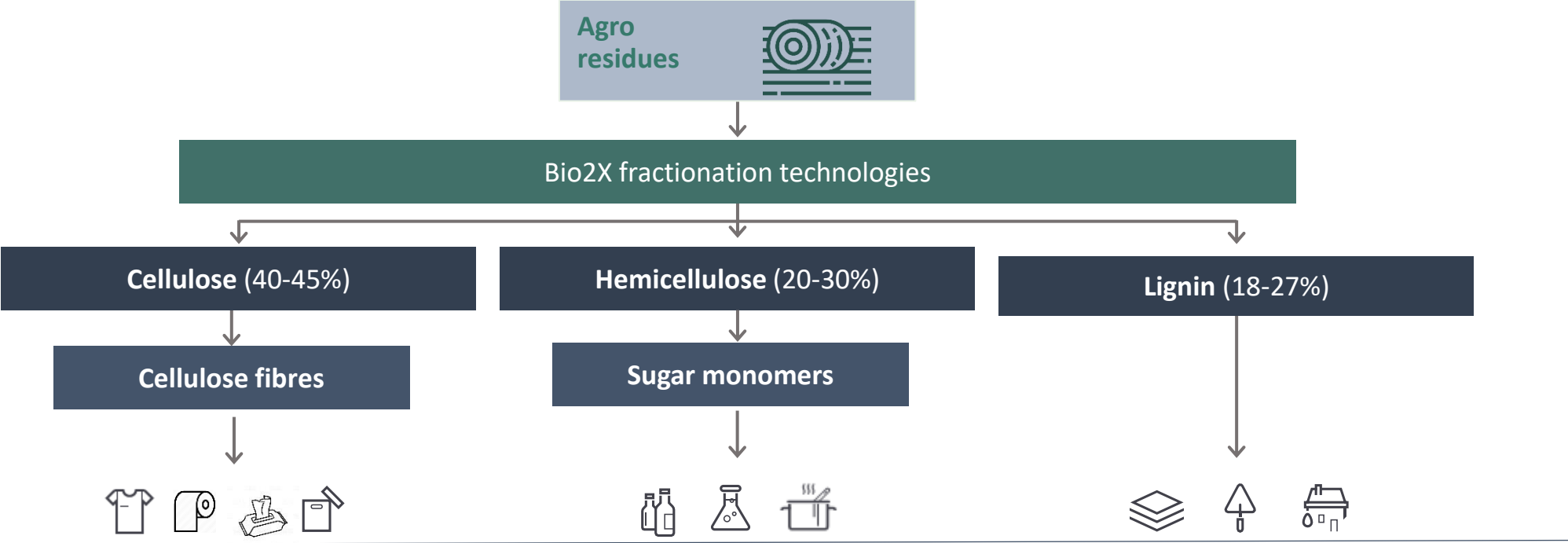
Cellulose

Hemicellulose

Lignin

Waste (only ~5%)

Turning biomass into high-value end products



End products:

- Dissolving and bleached pulp for textile fibre, applicable to clothing and non-woven
- Bleached pulp for tissue
- Brown pulp for packaging
- Composites

- Xylose for foods and cosmetics
- Furfural, acetic acid
- Other chemical intermediates


















- Bio-resins, adhesives, foams
- Concrete plasticizers, dispersants
- Thermoplastics
- Asphalt additive



2019: Fortum + Spinnova 1st straw garment launch

- Due to increasing consumer awareness, textile industry facing **increasing pressure towards more sustainable raw materials**
- Clearly visible also at Textile Exchange 2019: Increased number of event participants & demand for new innovations
- Severe need for **more sustainable production processes with scaling opportunities**
- **Availability of essence:** several small-volume raw materials tested globally, need for stable and secure supply of feeds with abundant availability and established sourcing infrastructure.



 <p>TextileExchange</p>  <p>VANCOUVER 2019</p>	<p>Product:</p>  <p>First straw garment</p>	<p>LCA:</p>  <p>thinkstep</p>  <p>VTT</p> <table border="0"><tr><td><p>GHG</p></td><td><p>Chemicals</p></td><td><p>Energy</p></td><td><p>Water</p></td></tr></table>	 <p>GHG</p>	 <p>Chemicals</p>	 <p>Energy</p>	 <p>Water</p>
 <p>GHG</p>	 <p>Chemicals</p>	 <p>Energy</p>	 <p>Water</p>			

Join us to meet the growing demand for sustainable bioproducts – we need players from every part of the value-chain

Katariina Kemppainen

Programme Manager, Metsä Group

katariina.kemppainen@metsagroup.com

Heli Virkki

Programme Manager, Fortum

heli.virkki@fortum.com

Check our website at www.expandfibre.com

EXPANDFIBRE



Metsä