French Nettle, an alternative fiber for textile applications

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UNIVERSITÉ DE LORRAINE

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Three areas of activities

R&D Technical Center

Project Engineering Unit

Textile Metrology

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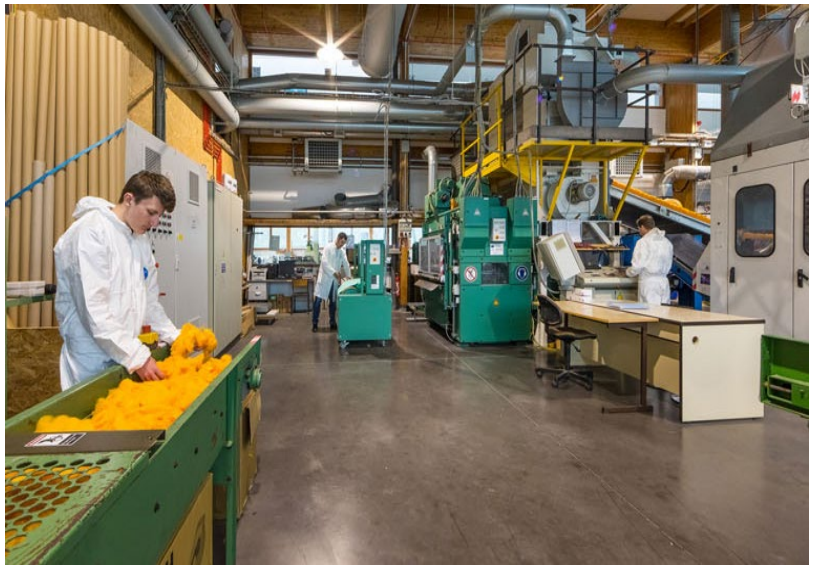
R&D Technical Center
Technical means of industrial type at disposal

Production of bio-sourced materials based on plant and technical fibers:

- Non-woven insulation for the building industry
- Reinforcement of composite
- Non-woven geotextile type
- Treatment and / or complexing of materials



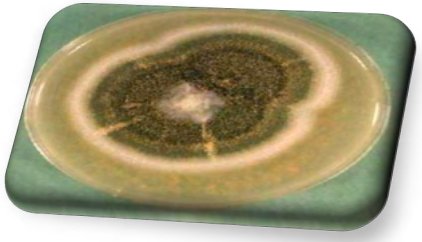
Development of the recycling and revalorization of materials

Characterization of the plants fiber

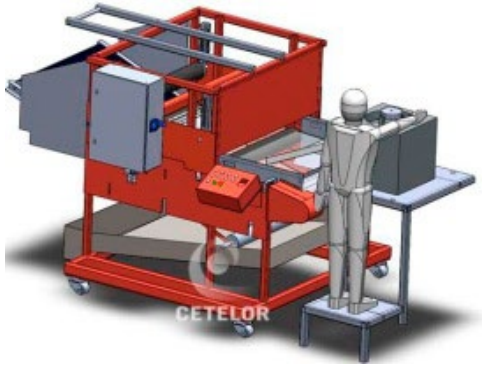
- Morphological, chemical, mechanical

Characterization of materials:

- Chemical and Mechanical
- Thermal conductivity
- Resistance to mould growth in materials (bio-composite, building insulation, textile)
- Resistance to degradation and accelerated aging



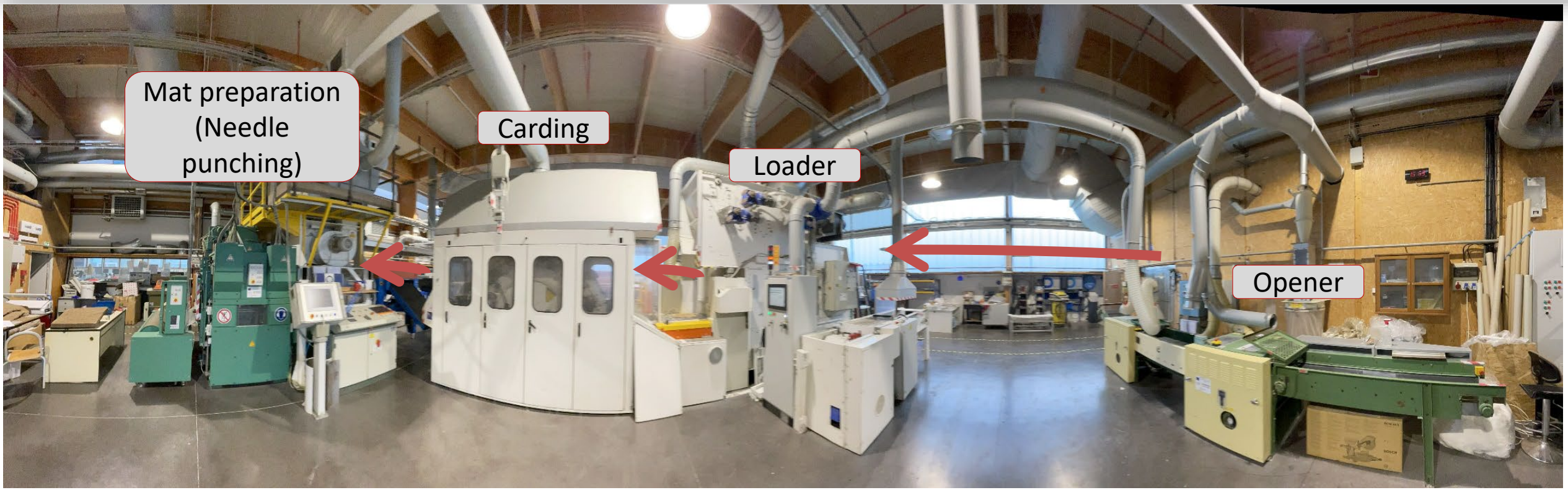
Development of technical means for specific research needs or for companies

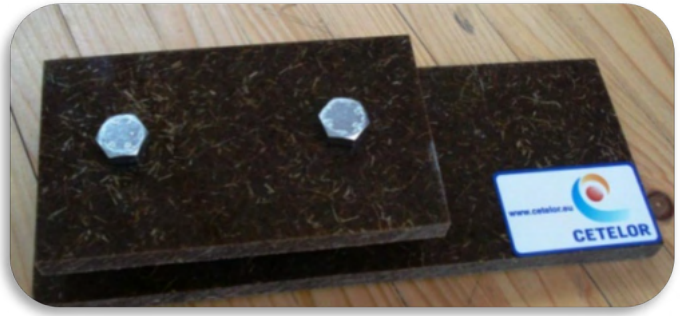


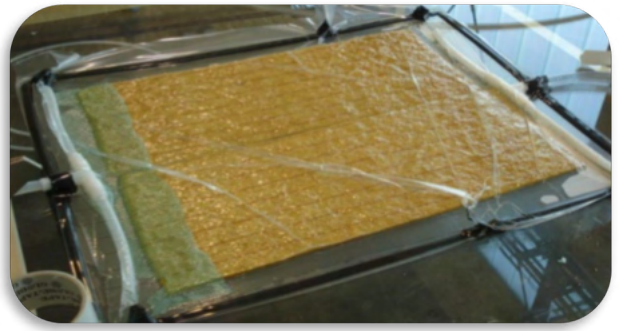
Two pilot production lines !

R&D Technical Center

Technical Hall – Non woven fabrication

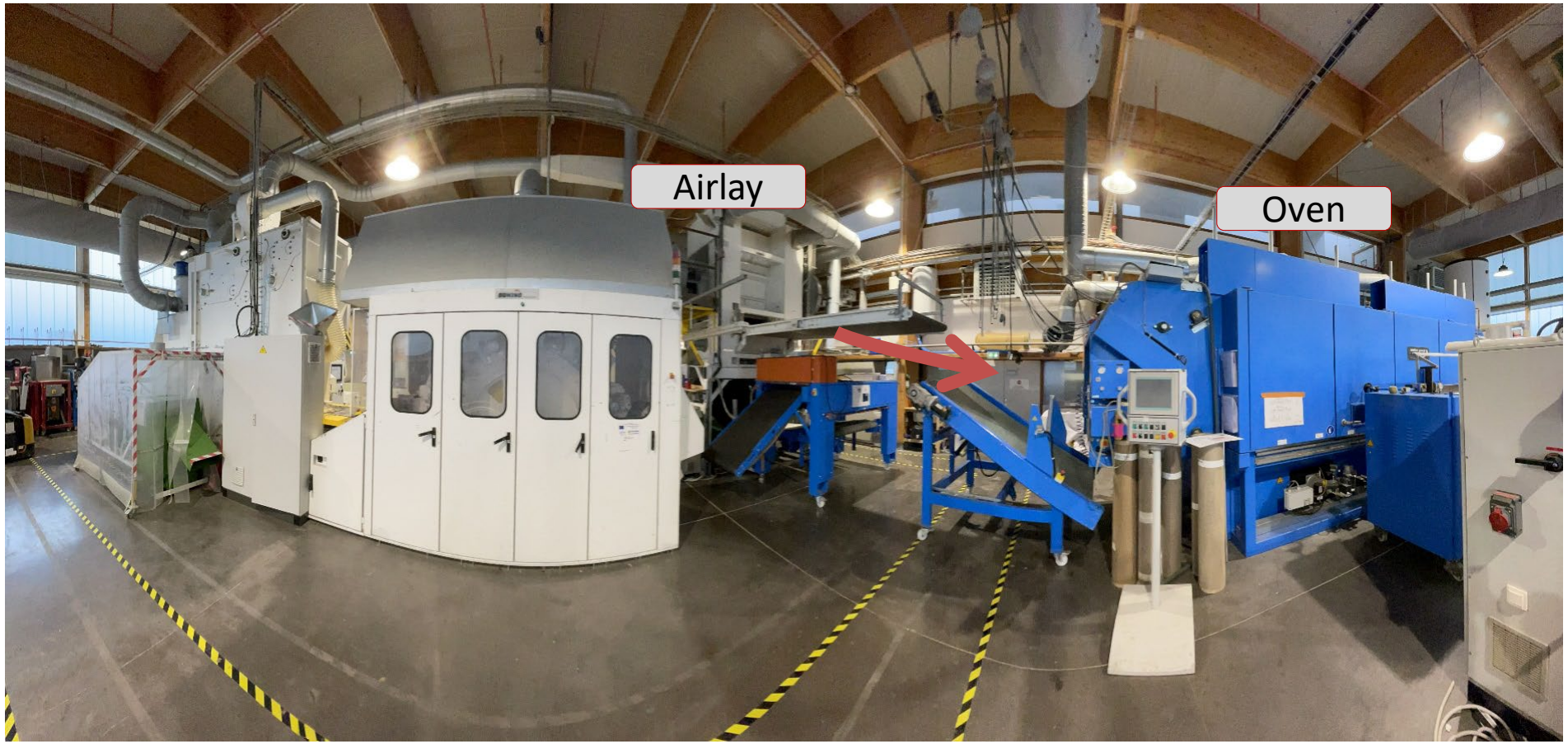






R&D Technical Center
Technical Hall – insulation fabrication

Non-woven insulation for the building industry



- Thermal conductivity
- Resistance to mould growth in materials (bio-composite, building insulation, textile)
- Resistance to degradation and accelerated aging

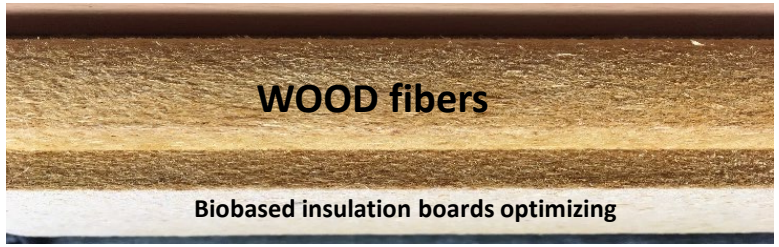
R&D Technical Center

Technical Hall – Microspinning line

Project Engineering Unit

Setting up and monitoring of research projects

National Projects

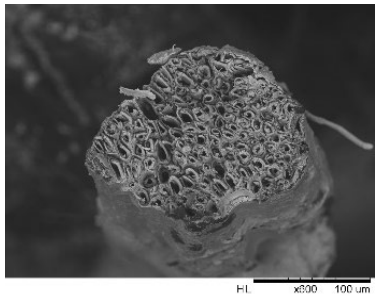


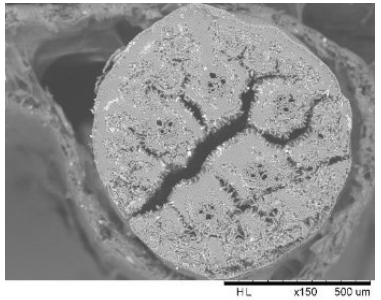
Flax ;
Hemp ;
Nettle ;
Hope ;

International Projects

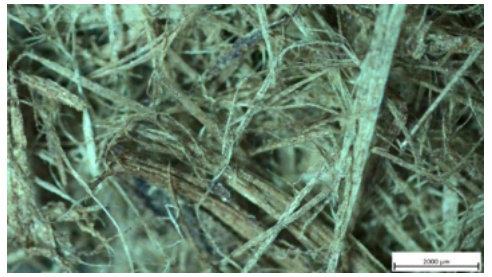
***Project P*HC Utique & Project EcoSUD**

Alfa
Posidonia





Eucalyptus bark fibers



Triumfeta Cordifolia

Another fibers : Jute, kenaf, Palm, Rodofolia etc

Why Nettle ?

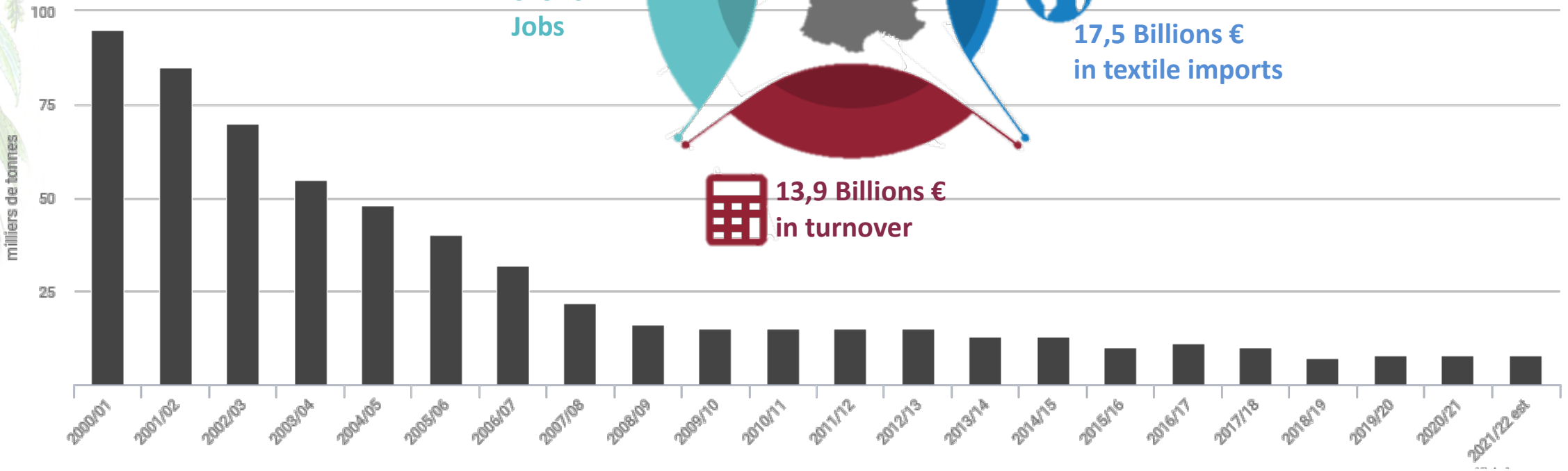
2165
Businesses

61910
Jobs

9,7 Billions €
in export

17,5 Billions €
in textile imports

13,9 Billions €
in turnover



The import of Cotton has decreased in france

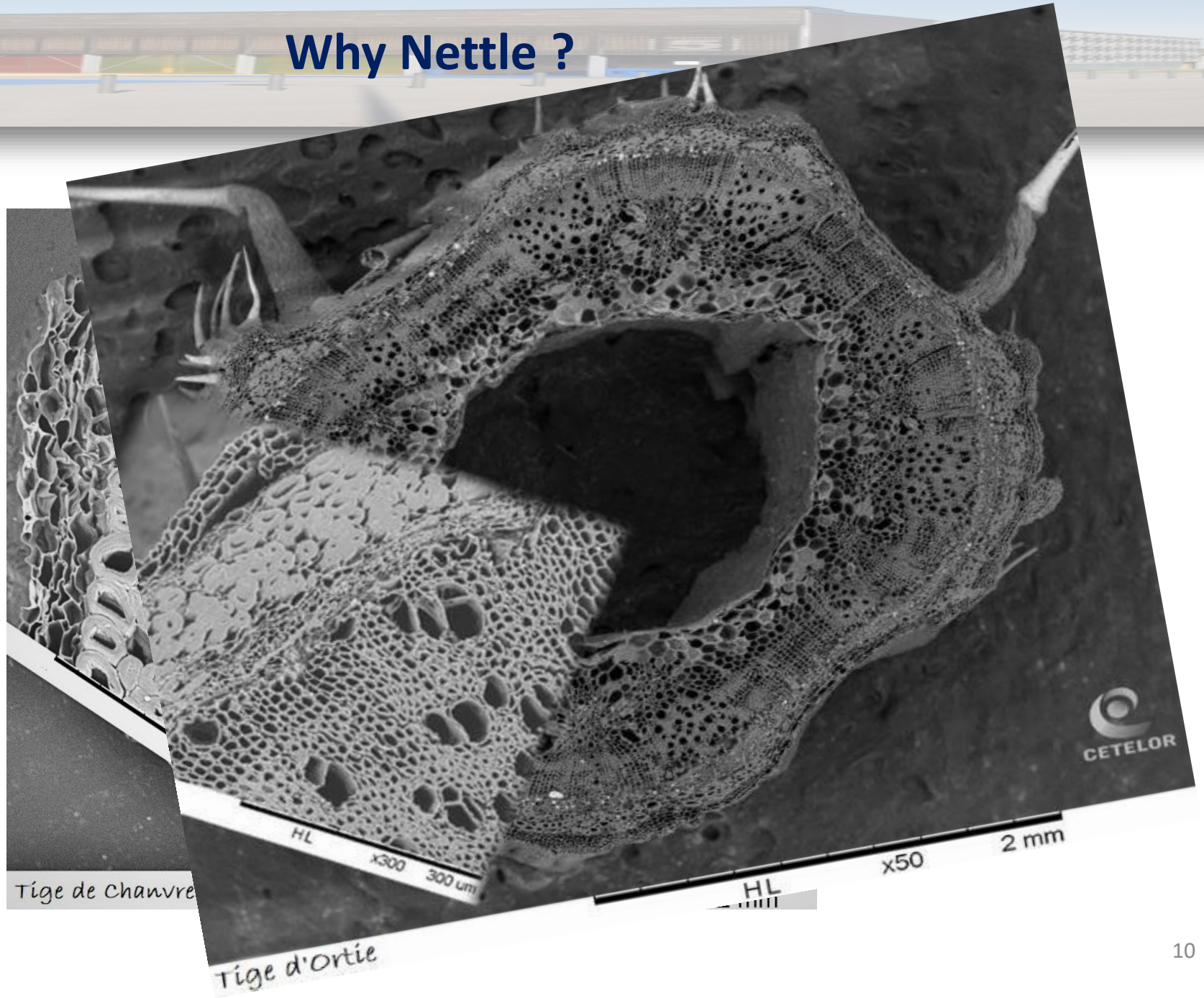
ICAC (International Cotton Advisory Committee)

Why Nettle ?

- NATURAL FIBRES
  - PLANT
    - BAST
      - Flax (*Linum Usitatissimum*)
      - Hemp (*Cannabis Sativa*)
      - Kenaf (*Hibiscus Cannabinus*)
      - Jute (*Corchorus Capsularis*)
      - Ramie (*Boechmeria Nivea*)
      - Isora (*Helicteres Isora*)
      - → **Nettle**
    - LEAF
      - Ananas (*Ananas Bracteatus*)
      - Sisal (*Agave Sisalana*)
      - Abaca (*Musa Textilis Nee*)
      - Curua (*Ananas Erectifolius*)
      - Cabuya (*Furcraea Andina*)
      - Palm
        - African Palm
        - Chambira (*Astrocaryum Chambira*)
      - Opuntia (*Opuntia Galapagos*)
      - Paja (*Carludovica Palmata*)
      - Jukka (*Yucca L*)
    - SEEDS
      - Cotton (*Gossypium*)
      - Coir (*Cocos Nucifera*)
      - Kapok (*Ceiba Pentandra*)
      - Soya (*Glycine*)
      - Poplar (*Populus Tremula*)
      - Calotropis (*Calotropis Procera*)
    - FRUIT
      - Coir (*Cocos Nucifera*)
      - Luffa (*Luffa Aegyptiaca*)
    - GRASS
      - Bamboo (*Bambusa Shreb.*)
      - Totora (*Scirpus Californicus*)
    - WOOD
      - hardwood
      - softwood
  - ANIMAL
    - WOOLS AND HAIR
      - Sheep (*Ovis Aries*)
      - Alpaca (*Lama Pacos*)
      - Camel (*Camelus Bactrianus*)
      - Goat (*Genus Capra*)
      - Horse (*Equus Caballus*)
      - Rabbit (*Oryctolagus Cuniculus*)
      - Vicuna (*Lama Vicugna*)
    - SILK
      - Natural (*Bombyx Mori L*)
      - Spider Silk (*Araneus Diadematus*)
  - MINERAL
    - Asbestos
    - Glass
    - Mineral Wool
    - Basalt
    - Ceramic
    - Aluminium
    - Borate
    - Silicate
    - Carbon

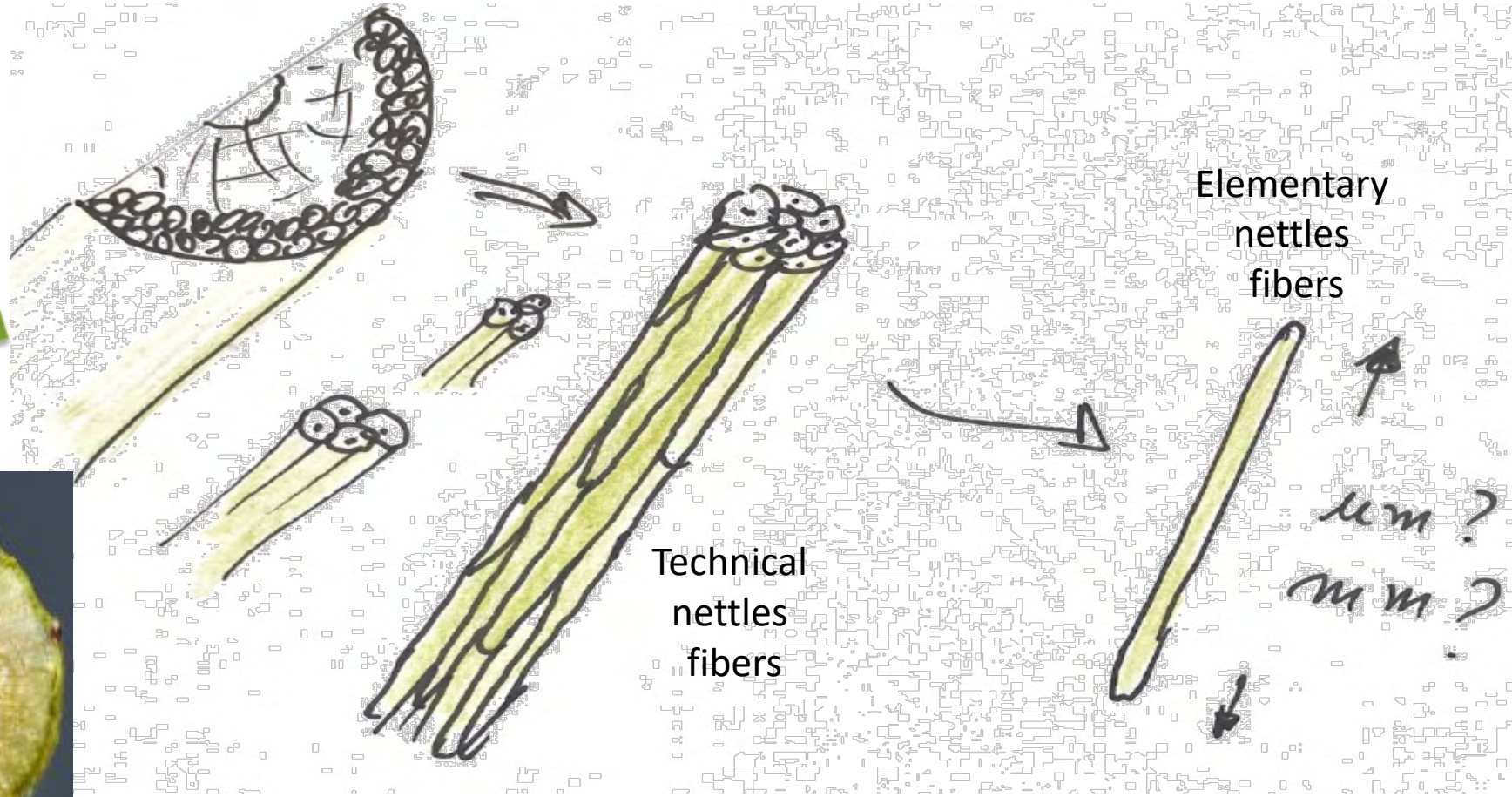
NEWFIBRE

Why Nettle ?

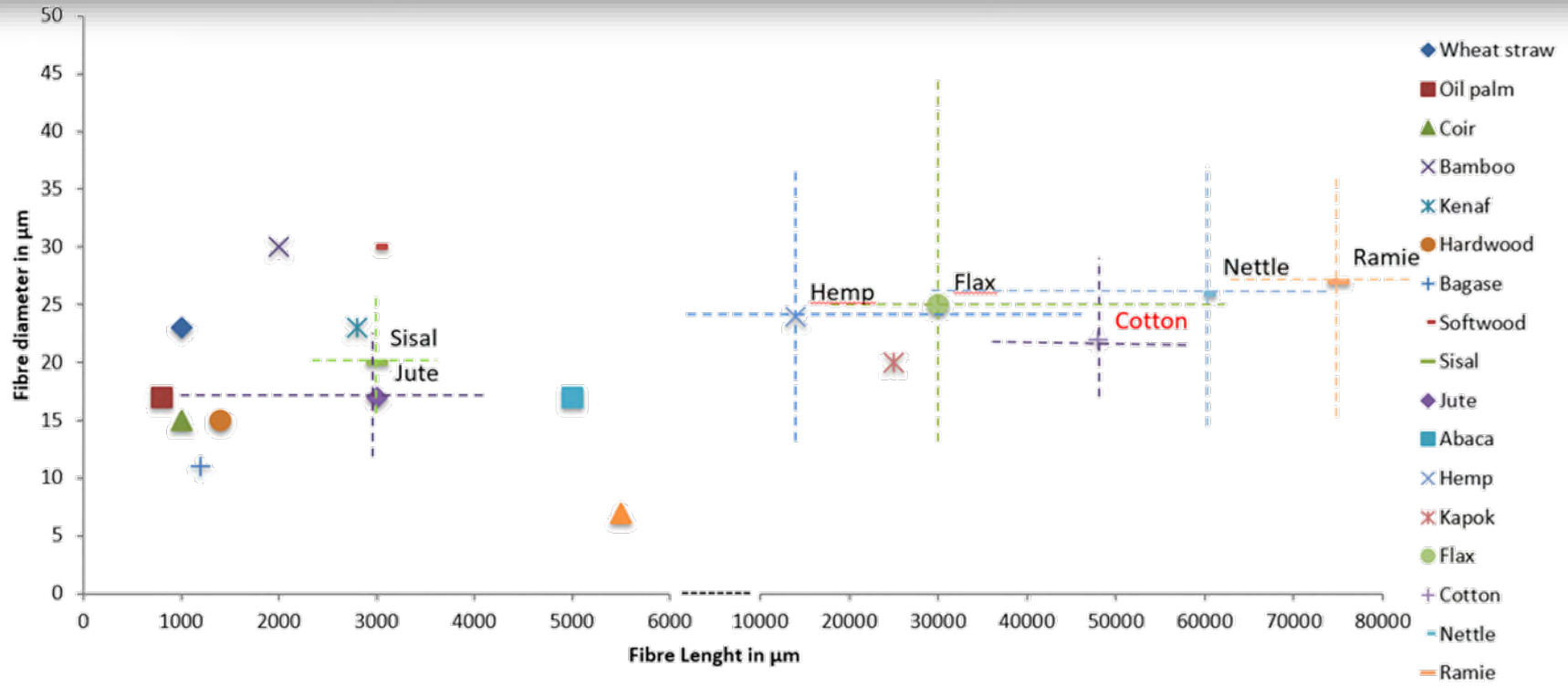


Why Nettle ?

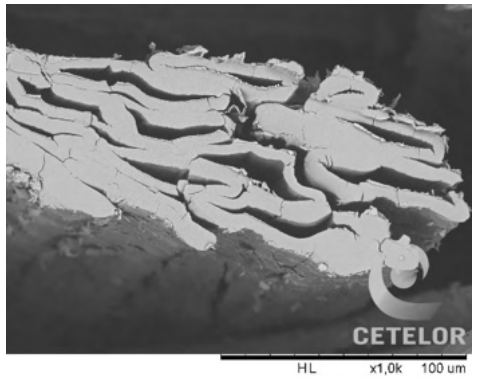
Stem cross section

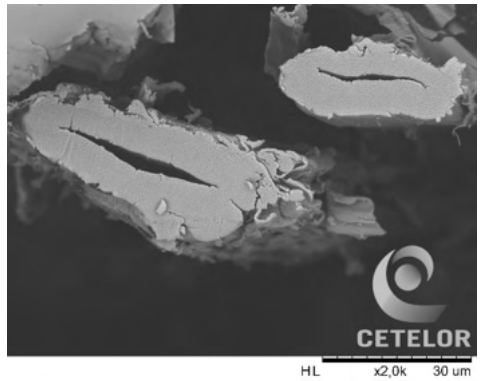


Why Nettle ?



- ✓ Length
- ✓ Finenesse
- ✓ Resistance
- ✓ Hollow
- ✓ Dyeing affinity





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NEWFIBRE

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La Région Grand Est

Leaves

- Food and feed
- Molecules of interest (cosmetics, nutraceutics, etc)

Roots (end of plant life)

- Molecules of interest (cosmetics, nutraceutics, etc)

Seeds

- Horticulture (seeds, plants)
- Proteins

Stem Fibers /Wood

Unitary fibers

- Textile (furnishing, apparel)

Technical fibers

- Textile
- Composite strenghtening
- Paper

Aggregates / Wood

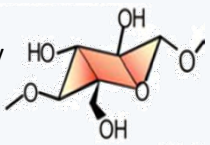
- Particle board
- Composites /plastics processing
- Concrete
- Litter
- Mulch
- Energy

Dust

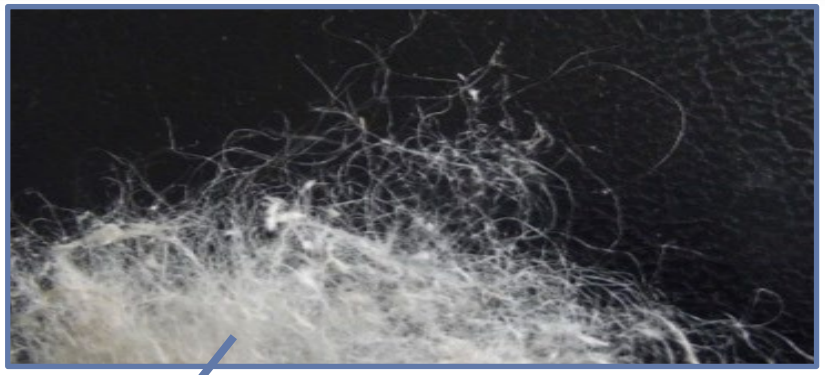
- Energy (pellets, methanization…)
- Organic amendment
- Composite charges

Microfibrills

- Molecule of interest extraction
- Green chemistry
- Artificial fibers



Nettle fiber for textile applications



Crop and harvest → Retting → Défibering → Refining treatment → Spinning

Mechanical
Chemical
Enzymatic
Steam explosion

Nettle fiber for textile applications

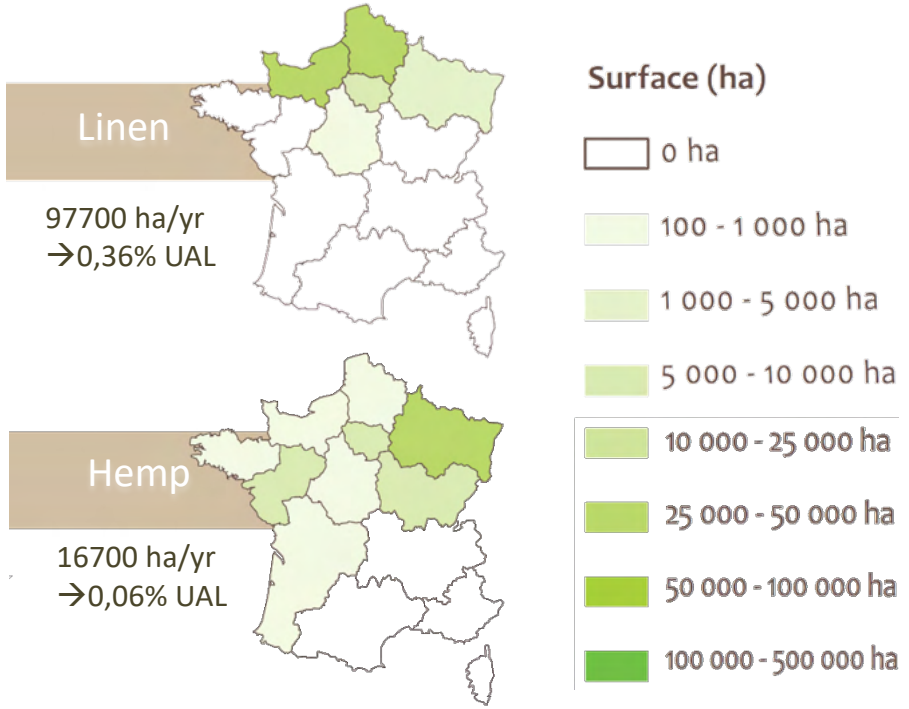
1 hectares cultivated in Lorraine
(8 in France)

Linen

97700 ha/yr
→0,36% UAL

Hemp

16700 ha/yr
→0,06% UAL



Sources : Memento des marchés fibres végétales techniques à usages matériaux (hors bois)

Conclusion and Upcoming challenges

Scientific challenges

- Technical expertise on the transformation of the different parts of the plant
  - Leaves,
    - Stems,
      - Tops and rhizomes
- Retting
- Refining
- Microspinning

Technical challenges

- No specific mechanization
- Full control of large-scale nettle production to be established
- Demand for high volume material for the textile industry

LORTINNOV

FORTITEX

La Région Grand Est

Thank you for your attention!

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