

**ADVANCES IN CELLULOSE-BASED MATERIALS IN FOOD PACKAGING**

**22 to 23 May 2023, UCP, Porto**



**From Fossil to Forest – Sustainable packaging and products to replace fossil plastic**

**22 May 2023**

**Paula Pinto**



RECOVERY AND RESILIENCE PROGRAM  
MOBILIZING AGENDAS FOR BUSINESS INNOVATION



# Forest and Paper Research Institute | RAIZ



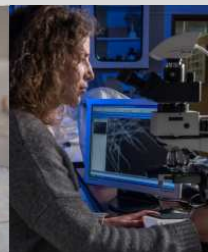
## *The R&D Centre of the Company, supporting business competitiveness and sustainability*

- A private non-profit research institute, launched in 1996; recognized as a national **INTERFACE/CTI** unit; a **Business Innovation Centre (BIC)**, certified by the European Business Network (EBN); recognized as UNESCO Club – Forest and forest-based bioeconomy
- A unique **business – university cooperation** model
- Shareholders: **The Navigator Company (97%), Universities of Aveiro, Coimbra and Lisbon / ISA**
- R&D, consulting, specialized services, tech scouting, up-scaling and new potential businesses: **Centre of excellence on eucalyptus products and technologies**
- Quinta de São Francisco – dissemination and outreach: forest and bioeconomy
- **Staff: 95** (including **23 PhD** holders)



*Science boosting a cutting-edge forest bioeconomy*

<http://raiz-iifp.pt/en/>



**Activity covering all the value chain, from forestry to industrial processes and final products**

## FOREST R&D & CONSULTING

GENETICS AND PLANT PRODUCTION  
SILVICULTURE AND FOREST MANAGEMENT  
FOREST PROTECTION  
IT SUPPORTING TECHNOLOGIES  
FOREST TRAINING AND OUTGROWING  
SUPPORT

## INDUSTRIAL R&D & CONSULTING

RAW MATERIALS  
INDUSTRIAL PROCESSES  
PRODUCT (CORE BUSINESS)  
NEW PAPER PRODUCTS / PACKAGING  
BY-PRODUCTS UPGRADING / CIRCULAR  
ECONOMY

**SERVICES:** Laboratories, edapho-climatic characterization, forestry technical support

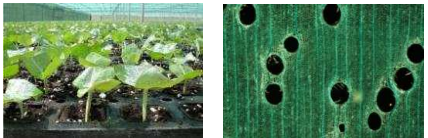
Demonstration, scale-up, new businesses

Tech scouting, intellectual property

Education and science dissemination

***Sustainable eucalyptus forest-based circular bioeconomy***

**37 patents, > 180 scientific papers, > 25 PhD training programmes supported (2016-2022)**



## Pilot Facilities

**New Pilot Laboratory**



**Hydrodistillation and extraction  
- bioactive compounds**



**Coater – Paper with barrier properties**



In acquisition

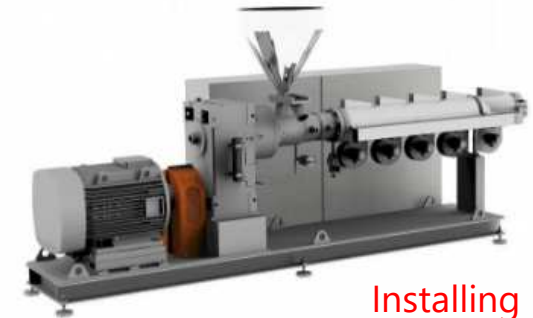
**Micronizer, blender, extruder -  
Cellulose Biocomposites**



**Thermoformer - molded  
pulp products**

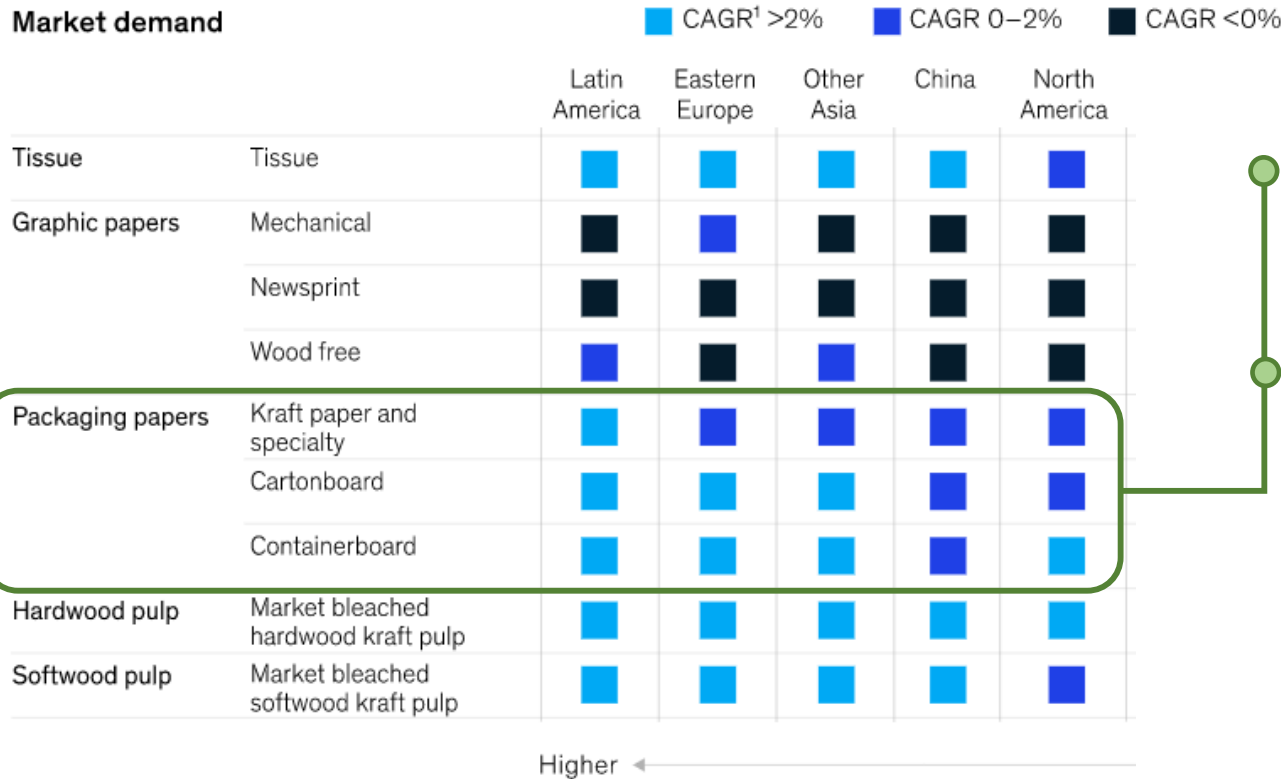


**Extruder / laminator  
– Paper with barrier properties**



Installing

# Growth prospects in P&P by segment and regions



**Driven by**  
demographic shifts

consumer trends:  
*demand for convenience & for sustainability*

**The forest-products industry as a whole is growing**

- Fiber-based packaging
- Tissue

<sup>1</sup> Compound annual growth rate  
The packaging, pulp and paper industry in the next decade | McKinsey, 2019

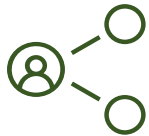
# Cellulose-based packaging to replace single use plastics



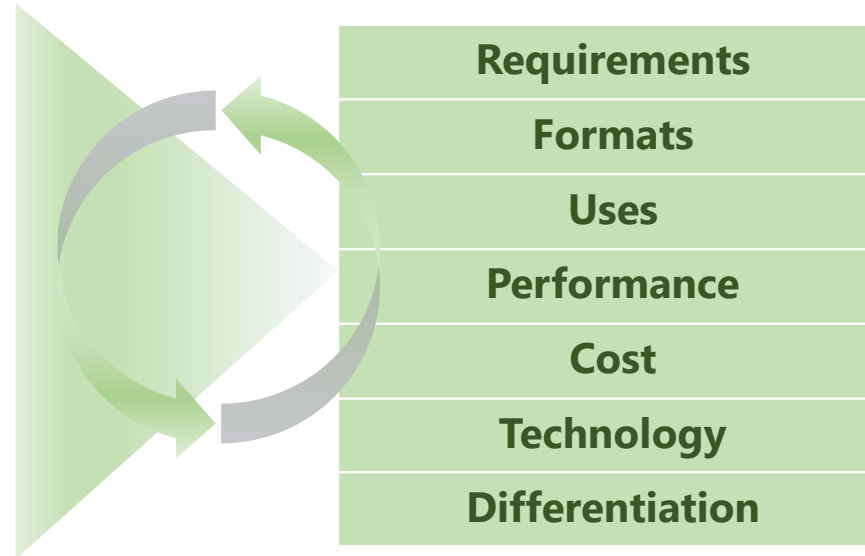
**Machine conversions into packaging**



**Innovation as critical factor**



**Cooperate with retailers and consumer goods companies**



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RECOVERY AND RESILIENCE PROGRAM  
MOBILIZING AGENDAS FOR BUSINESS INNOVATION

# FF2F Consortium



## Pulp and Paper Company



## Packaging Moulding and filaments Printing and digital



## Food and Retail Companies



## Entities of the Scientific and Technological System



# FF2F General Guidelines



Replacing fossil based materials, single use, by **renewable products, biodegradable, recyclable**



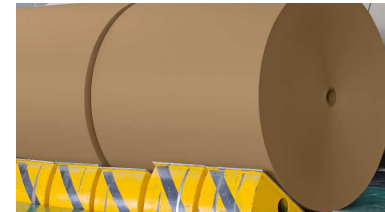
Packaging solutions based on **cellulosic fibers** produced from **planted forest (*Eucalyptus globulus*)**, based on **sustainable management**



Cellulosic-based packaging with **differentiation factors**



**High value** products from **Portuguese eucalyptus forest**





# FF2F Objectives



Development, demonstration, and industrialization of innovative and sustainable packaging solutions

Process

High-yield pulp and brown papers

Materials and Processes  
Increased **resistances**

Materials and Processes  
**Biocomposites** with cellulosic fibers

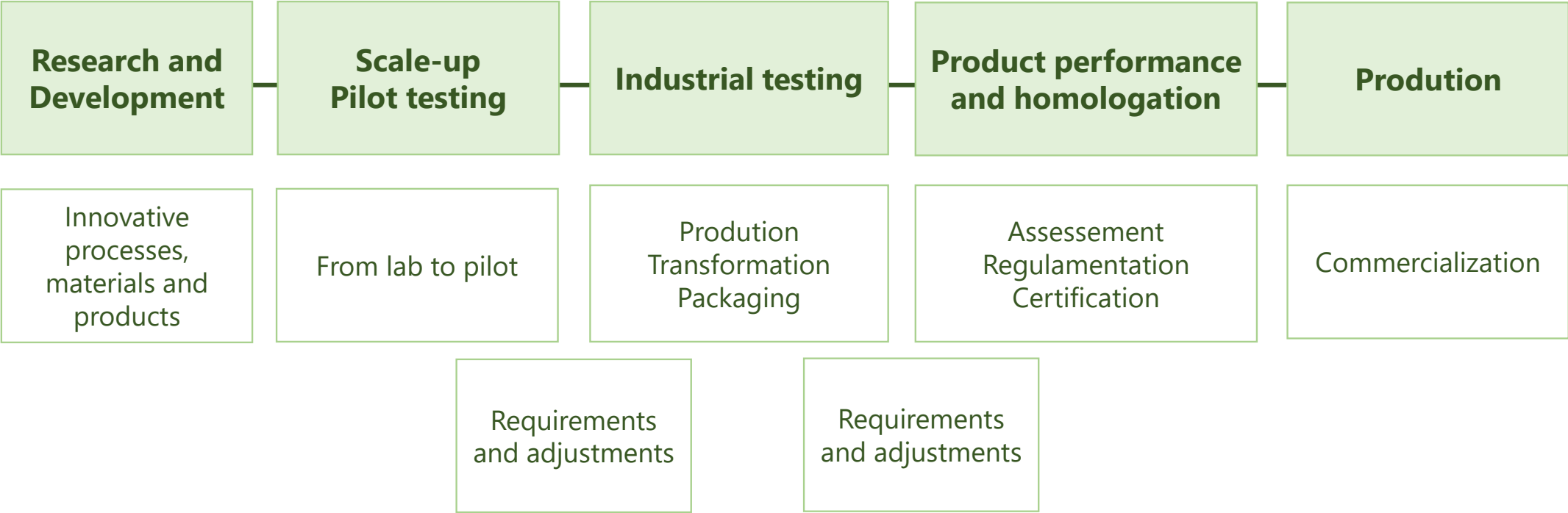
Materials and Processes  
Providing **barrier properties**

Materials and Processes  
**Rigid molded** cellulose packaging

Solutions for 'Smart Packaging'



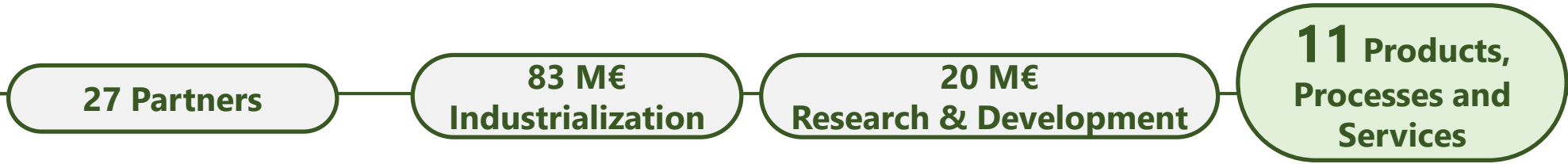
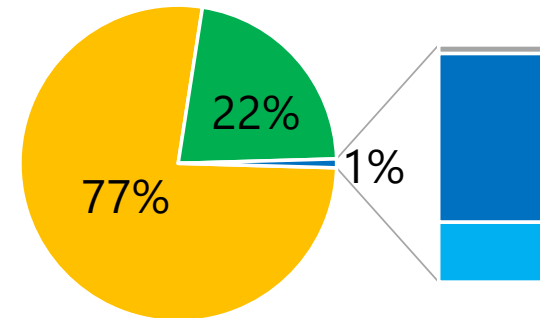
# FF2F Workflow



# FF2F Activities



- Productive Investment
- Research, Development, and Innovation
- Qualification and Internationalization of the Organizations
- Training of Human Resources
- Dissemination and Promotion of the Agenda and its Results



# FF2F Products, Processes and Services



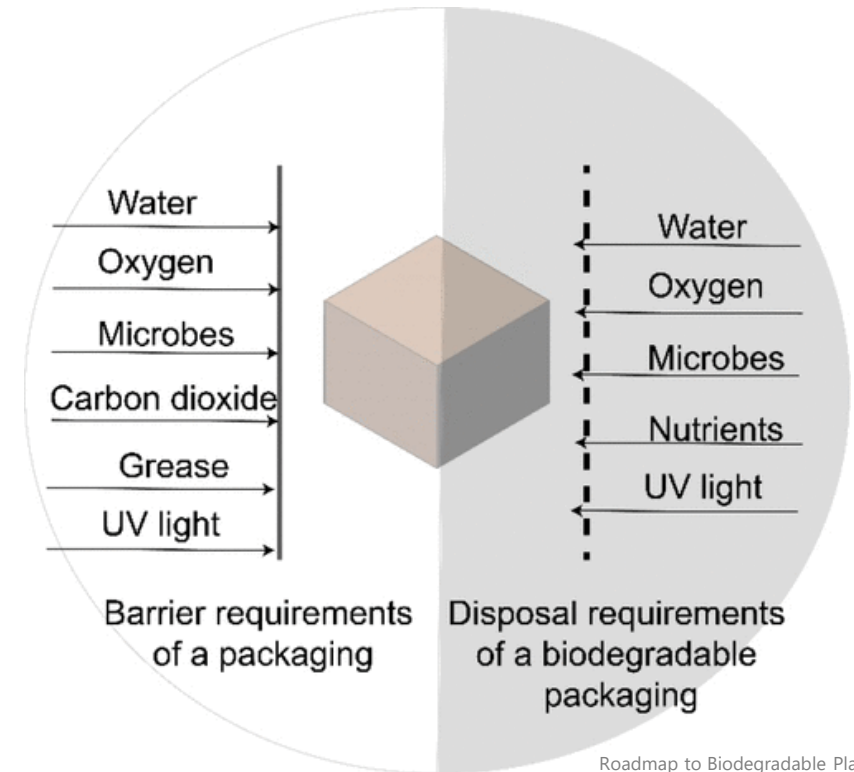
**Recyclable and compostable, fulfill the legal requirements for food contact and assuring shelf-life performance**

# Cellulose-based packaging: challenges



## Bringing together:

- **Recyclability**
- **Compostability**
- **Legal requirements for food contact**
- **Goods shelf-life**
- **Equivalent performance to plastic-based products**
- **Bio-based solutions for resistance and for barrier properties**
- **Equivalent or lower cost than plastic products**



Roadmap to Biodegradable Plastics—  
Current State and Research Needs, 2021,  
DOI: 10.1021/acssuschemeng.1c00801

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2022-2025**

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**Thank you**



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**22 May 2023**

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THE

**NAVIGATOR**

COMPANY



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