



# ***Transforming Cellulosic Feedstocks for Conversion into Biobased Chemicals***

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**Arianna Giovannini**  
*R&D Special Project Coordinator*



# Gruppo M&G: biomass technology & experience



\$3B per year  
#2 producer of PET



Engineering  
division



Technology for  
biomass to sugars

# PROESA® Technology step by step



## 2006-2008

- Scouting of Technologies
- Generation of key inventions
- Proof of UNIT OPERATION in the labs



## 2009-2010

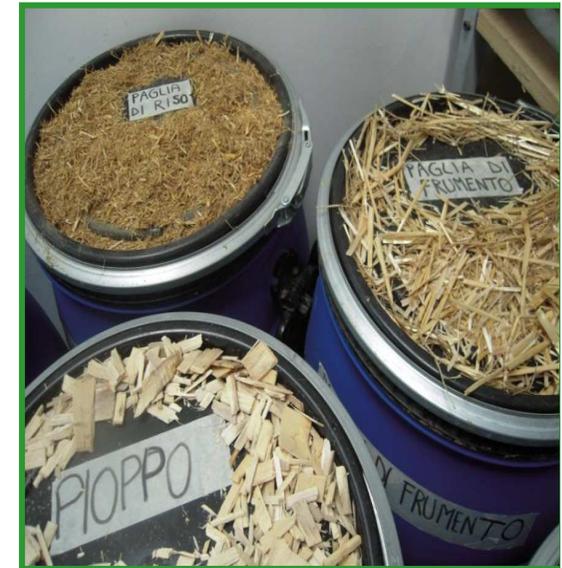
- Pilot plant start up (June 2009)
- Pilot Plant operation and Data gathering
- Test of Plant flexibility: multiple biomasses
- Start of Biolyfe and PRIT Projects



## 2011-2012

- Crescentino Unit
- Technology licensing

## More than 10 kinds of biomass tested



Respect of  
environment

No  
competition  
Fuel Vs. Food

Easy to insert  
into the  
traditional  
agronomic  
system and  
biomass  
market



## Our approach to biofuel sustainability:

- High yielding species
- High biomass-bioethanol conversion
- Low input requirements biomass (chemicals-utilities)
- Optimization of agronomic systems (cultivation-  
logistic-transportation)

### -Agriculture sustainability

The biomass should rather growth on set aside fields with good yield.

Low input requirements biomass (chemicals-utilities)

### -Price

Should be defined in order to get a competitive bioethanol toward gasoline

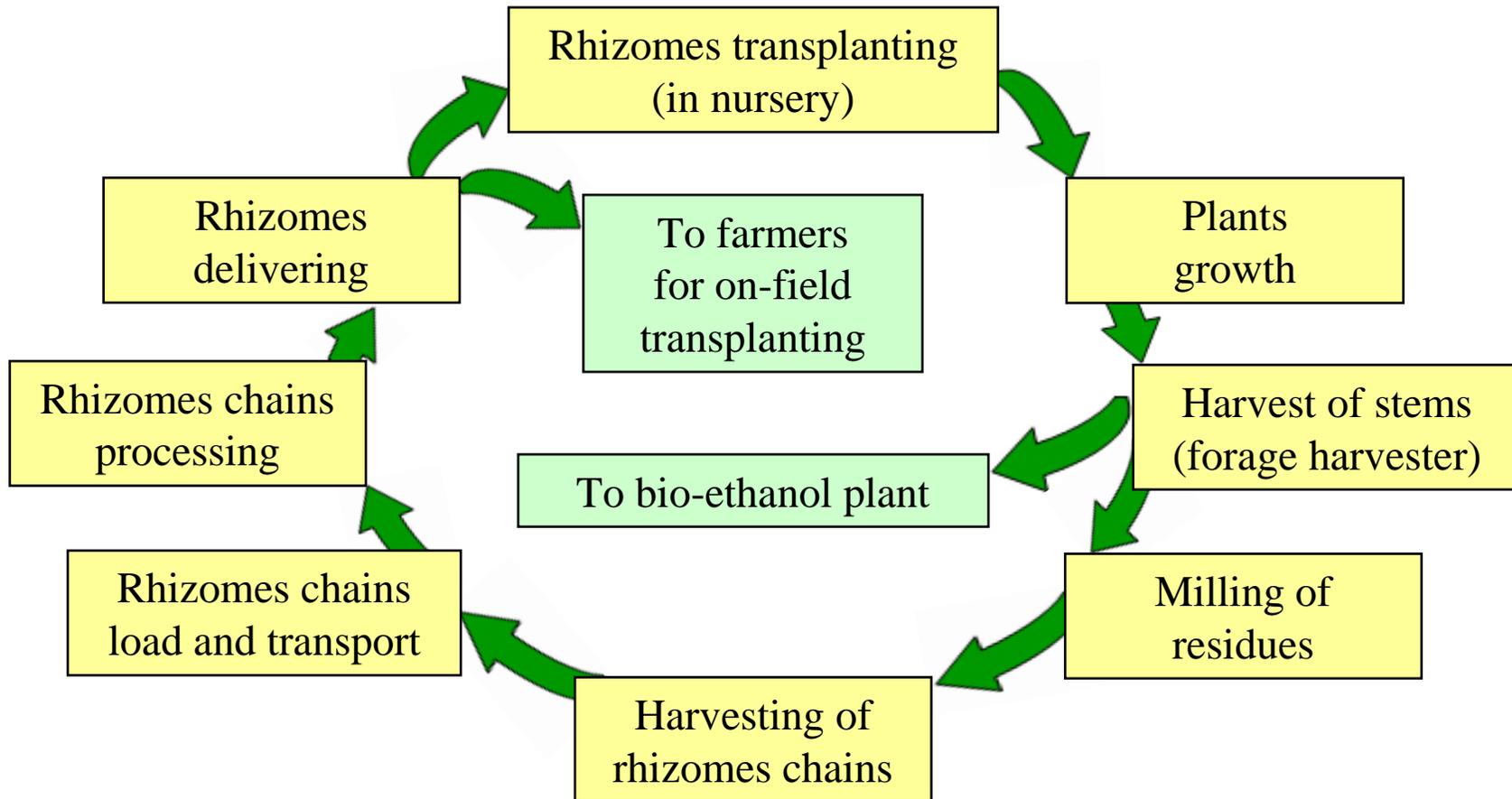
### - Technology

High efficiency and good recover of all sugars, easy to scale up



# Arundo Donax

Chain Analysis (rhizome production)



# Arundo Donax

## Chain analysis (biomass production)



Rhizomes transplanting

Crop growing (life: 10 years)

Yearly biomass harvesting

Middle storage

Load and transport

Milling

To bio-ethanol plant

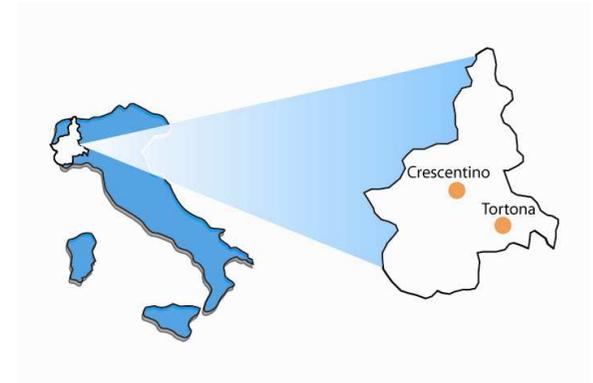
Transport

LOGISTIC



# Feedstock supply

## Terms of reference



### ■ Definition of the contract model for the biomass cultivation

The contract model between farmers and the bio-ethanol plant should be defined and checked under the legal and fiscal point of view

### ■ Certification of biomass origin

At **European level** actually there are seven voluntary biofuels sustainability schemes recognised by the Commission:

ISCC (International Sustainability and Carbon Certification)
Bonsucro EU
RTRS EU RED (Round Table on Responsible Soy EU RED)
RSB EU RED (Roundtable of Sustainable Biofuels EU RED)
2BSvs (Biomass Biofuels voluntary scheme)
RBSA (Abengoa RED Bioenergy Sustainability Assurance)
Greenergy (Greenergy Brazilian Bioethanol verification programme)

### ■ Definition of the operational procedures

### ■ Procedures for acceptance of biomass and quality control system



## The continuous Pilot Plant...

### HOW IT OPERATES

- BIOMASS AGNOSTIC
- NO BIOMASS DRYING/GRINDING REQUIRED
- LOW LEVEL OF INHIBITOR (lower than in P.O.C.)
- NO USE OF CHEMICALS (only steam is added)
- REDUCED ENZYME LOADS
- RAPID LIQUEFACTION OF THE SOLID MATERIAL
- HIGH SOLID CONCENTRATION (> 40%) IN THE HYDROLYSIS STEP

# From Pilot to Industrial Demo Plant



More than ...

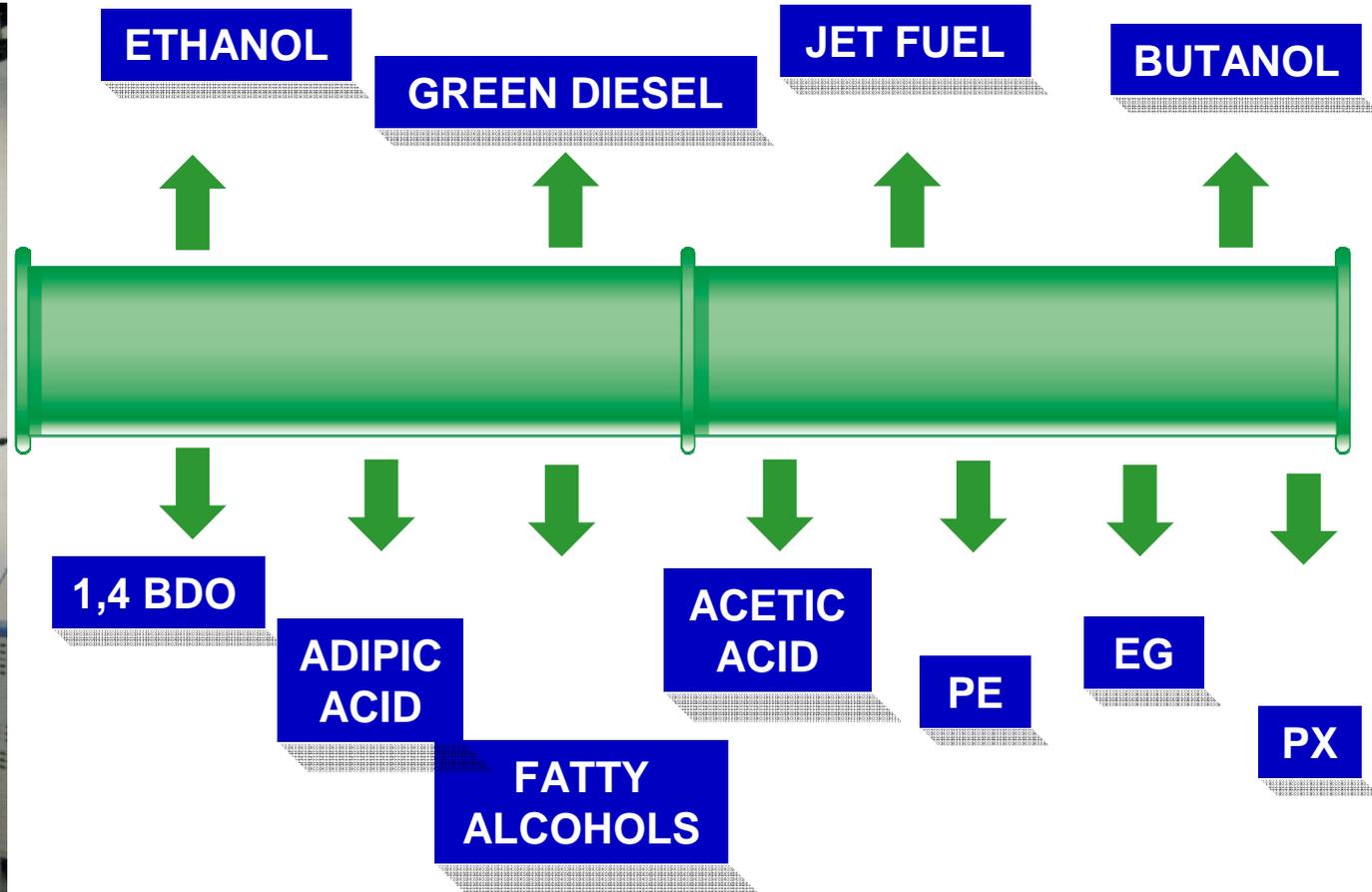
- 400 days of operation
- 3000 hours of operation
- 10 kinds of biomass tested

Multiple enzymes tested

**Largest in the World  
Cellulosic Ethanol Plant**

- 40 ktpa nameplate  
(60 ktpa design)
- 15 MWe green power
- Start up H4/2012
- Using wheat straw and  
arundo donax

# HOW TO EXPLOIT PROESA® Technology



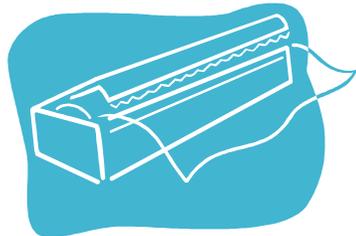
**THE BIOMASS SUGAR PLATFORM**

# Paving the Way to Sustainability

**Ethanol for Fuel**  
From  
Energy Crops  
Agricultural Residuals  
SC Bagasse/Trash  
Hardwoods



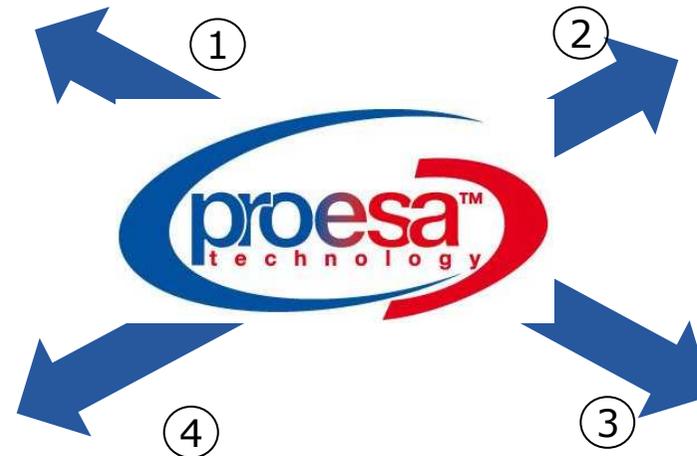
**Bio-ethylene**  
For  
Bio-PE  
Other Packaging



**Bio-chemicals**  
Farnasene  
Detergent Alcohols  
BDO  
Others



**Drop-In Fuels**  
Bio-diesel  
Marine Diesel  
Bio-jet



# Thank you

