



Transforming Cellulosic Feedstocks for Conversion into Biobased Chemicals

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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

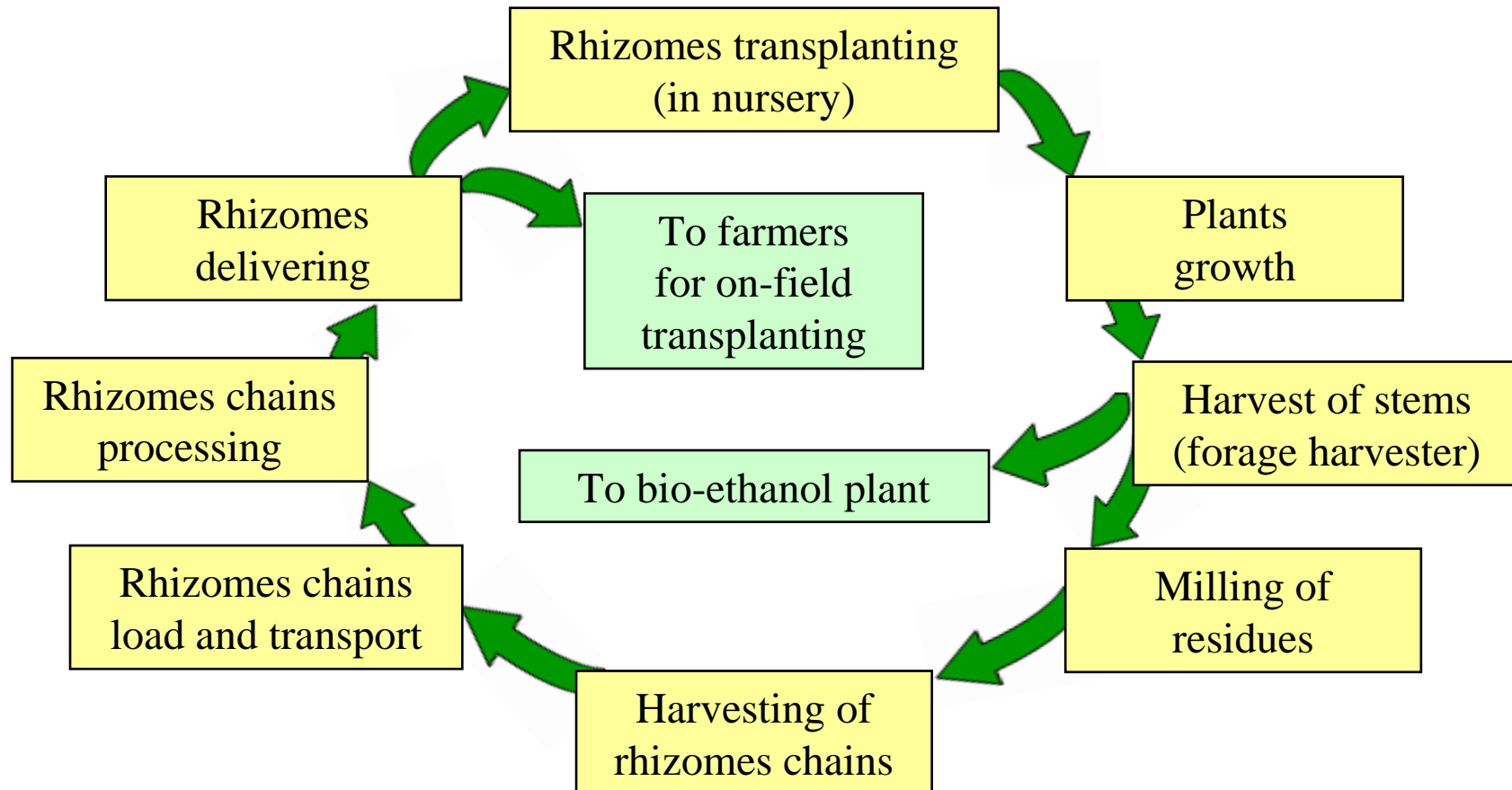
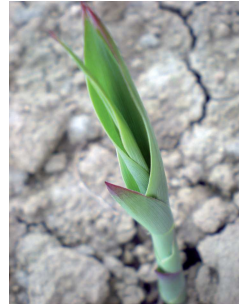
- Technology

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

Transport

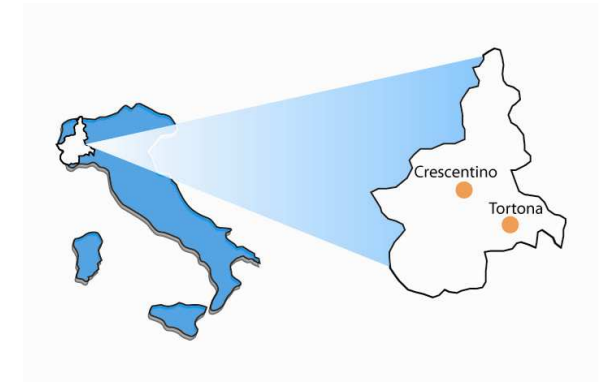
To bio-ethanol plant

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

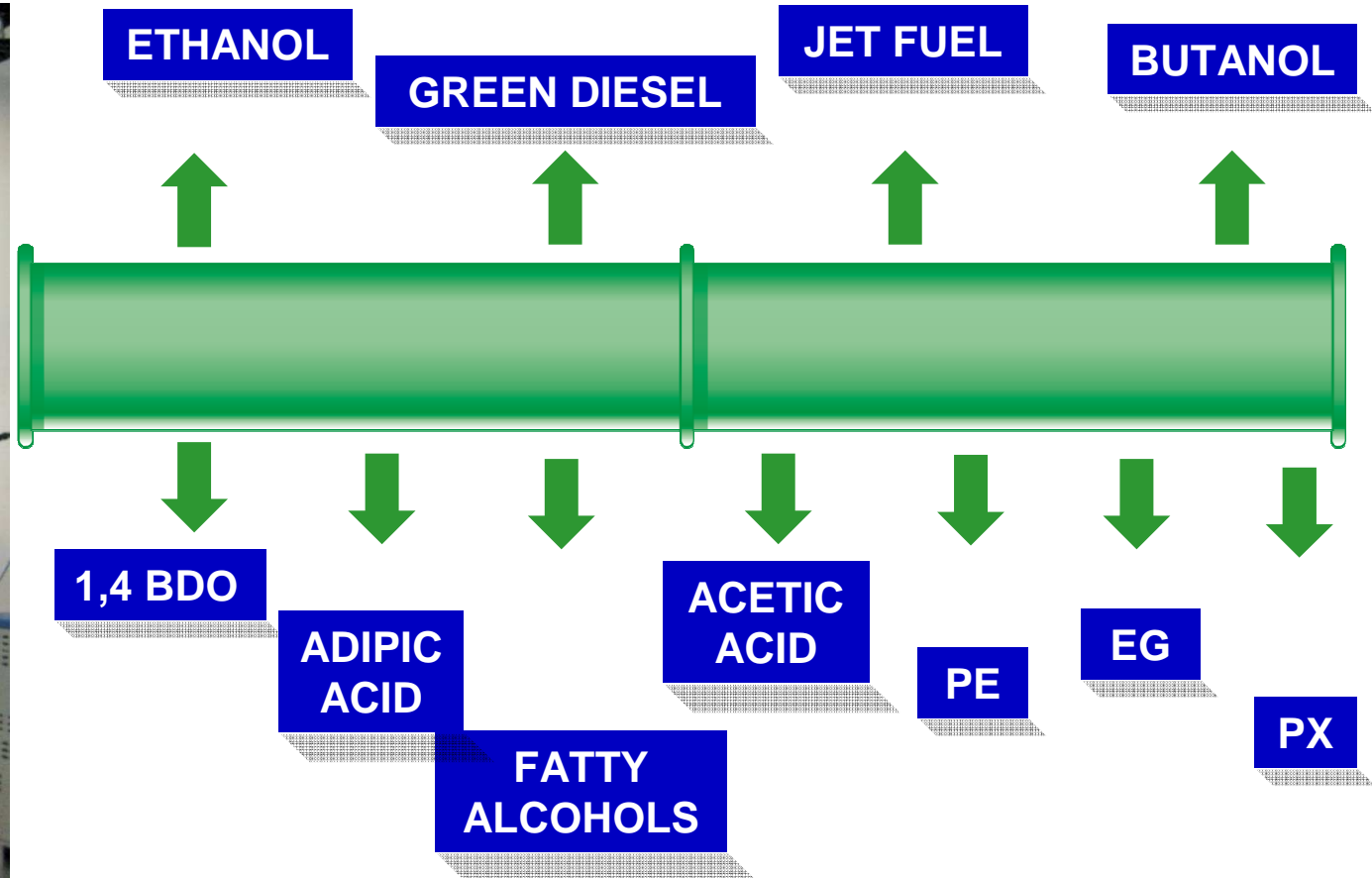
Multiple enzymes tested

**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

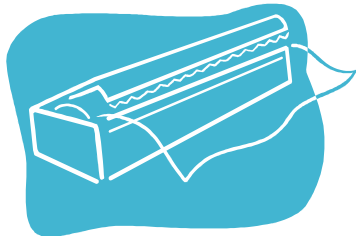
Ethanol for Fuel

From
Energy Crops
Agricultural Residuals
SC Bagasse/Trash
Hardwoods



Bio-ethylene

For
Bio-PE
Other Packaging



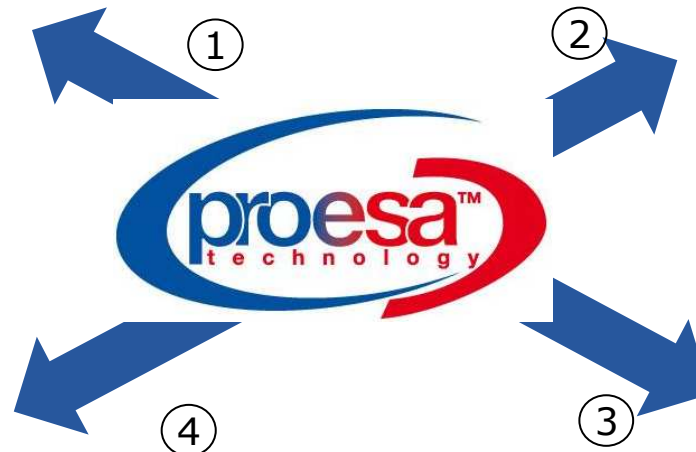
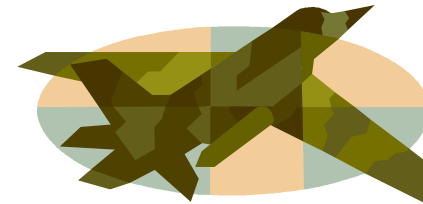
Bio-chemicals

Farnasene
Detergent Alcohols
BDO
Others



Drop-In Fuels

Bio-diesel
Marine Diesel
Bio-jet



Thank you

