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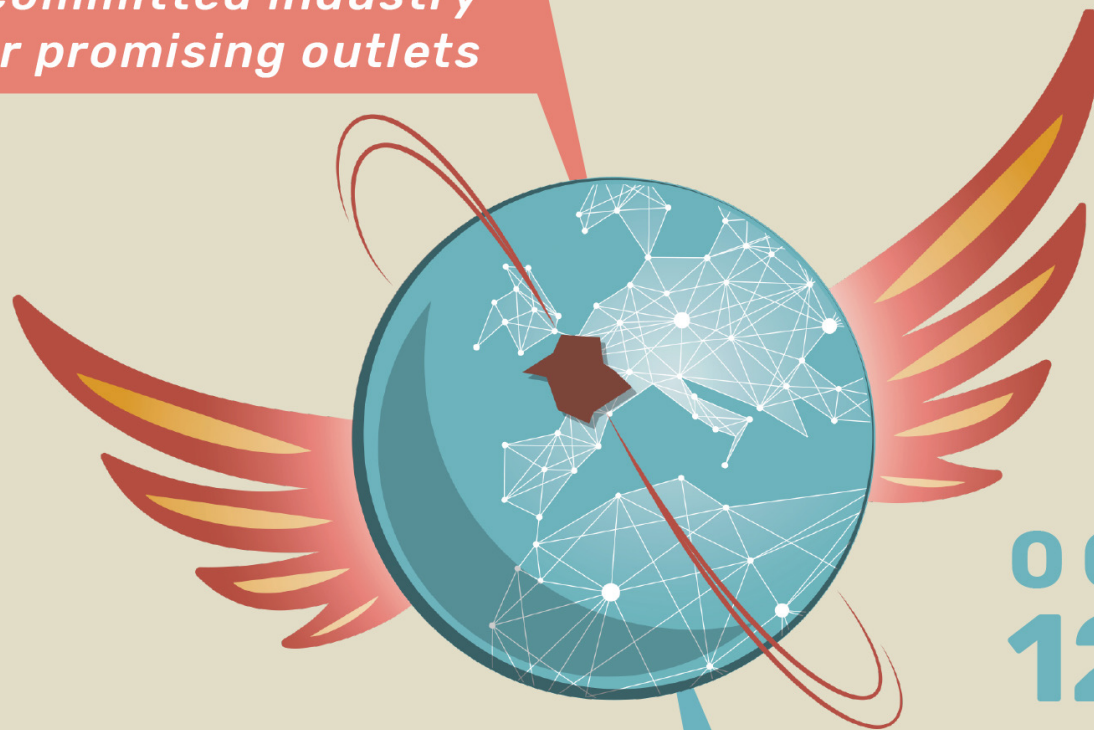


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# 3<sup>RD</sup> EUROPEAN SORGHUM CONGRESS

## THE SORGHUM

*A committed industry  
for promising outlets*



OCTOBER  
12<sup>TH</sup> & 13<sup>TH</sup>

TOULOUSE

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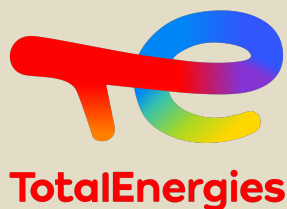
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# Insight on bioenergies : biofuels & biogas

Julie AGUILHON – Chief Sustainability Officer  
TotalEnergies BU Renewable Fuels

*Session 2 – Sorghum and Bioenergy – 12/10/2021*



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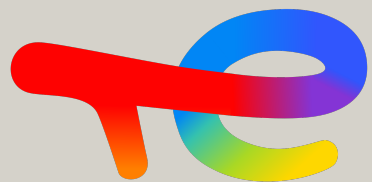




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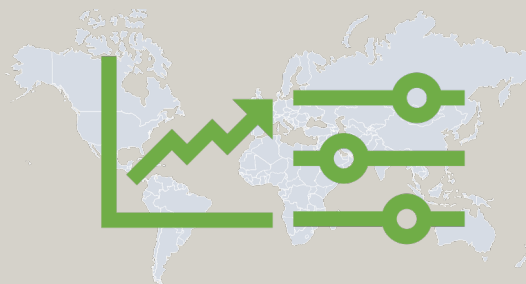
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# Outline

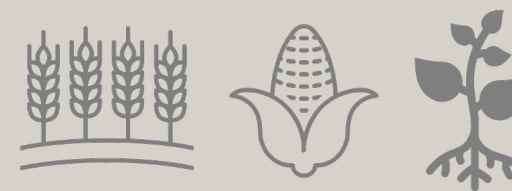


**TotalEnergies**

**Ambition  
& Strategy**



**Regulation  
& market**



**Technologies  
& Feedstocks**



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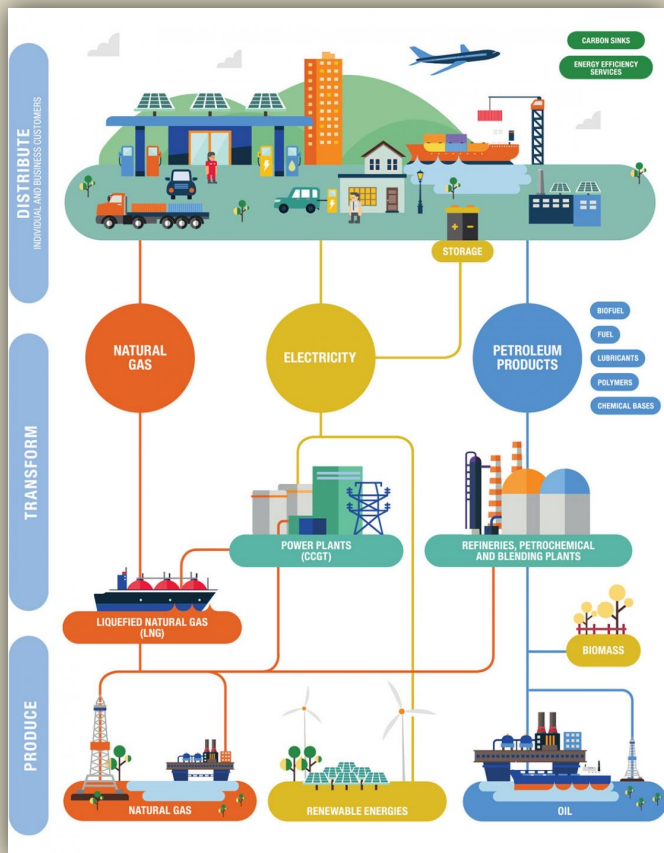




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# TotalEnergies – Ambition and Strategy

Our ambition is to **be a major player** in the energy transition  
*TotalEnergies is a multi-energy company committed to providing ever more affordable, clean, reliable and accessible energy to as many people as possible → We are investing heavily in solar and wind to be part of the top 5 producers by 2030.*



Our strategy is to **increase our energy production** while **reducing our greenhouse gas emissions**. It is based on 4 pillars:

❖ Focus on natural gas, biogas and hydrogen

❖ Build a World Leader in Electricity

❖ Develop carbon sinks

❖ Save and decarbonize liquid energies

- Focus on the most resilient oil projects by pre-qualifying value over volume;
- Adapt our refining capacity and sales to changing demand and increase our production of renewable fuels



Solar



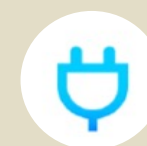
Wind



Biomass



Hydrogen



Electricity



Gas



Petrol



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# TotalEnergies – Carbon Neutrality

TotalEnergies aims to achieve **carbon neutrality by 2050**, together with the society, **from production to the use of energy products** sold to its customers (scope 1, 2, and 3)



## Carbon neutrality

for global operations

Scopes 1 + 2



## Carbon neutrality

at the global level for all  
indirect emissions related to  
the use by customers of the  
energy products sold

Scope 3



## Carbon neutrality

in Europe, from production to  
customer use of the energy  
products sold

Scopes 1 + 2 + 3

To achieve its ambition, TotalEnergies  
acts on **four levers**:

### ❖ Acting on emissions

*Reducing our own greenhouse gas emissions*

### ❖ Acting on products

*Reducing the average carbon footprint of our energy mix*

### ❖ Acting on demand

*Supporting our customers on the path to the energy transition*

### ❖ Developing carbon capture

*Investing in natural sinks and CO2 capture and storage  
technologies*



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# Biomass : scaling up biofuels and biogas production and sales

## Biofuels

**2-3 Mt/y** Renewable diesel production by 2025

Increasing share of biofuels in road transportation

Emerging market for sustainable aviation fuels (SAF)

Pioneering synthetic fuels from green H<sub>2</sub> (e-fuels)



## Biogas

**Europe ~1.3 TWh/y by 2025**

TotalEnergies Biogaz N°1 in France

- 500 GWh/y *biogas production* (7 plants)
- 400 GWh/y *in development* (4 advanced projects)
- Leveraging French expertise to expand in Europe
- Ambition: 5 new projects in operation (400 GWh/y)



**US ~0.7 TWh/y by 2025**

Teaming up with clean Energy (50/50 JV)

- *Integrated strategy: renewable gas production, bio-CNG & bio-LNG distribution*
- *Developing biogas production at dairy farms*

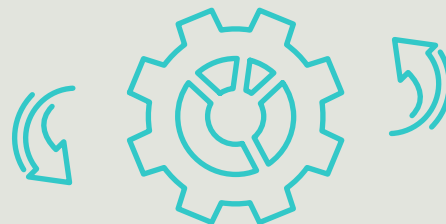
## Leading in biofuels – Investing in low-carbon products



### Convert existing sites

**La Mède**  
**500 kt/an**  
renewable diesel,  
mainly road  
**Start-up in 2019**

**Grandpuits :**  
**400 kt/an**  
of raw materials  
transformed into  
renewable diesel,  
mainly airborne  
**Starting in 2024**



### Increase co-processing

- Production capacity  
of **300 kt/an**
- Start-up in 2022-2024
- Project under evaluation in  
Port Arthur



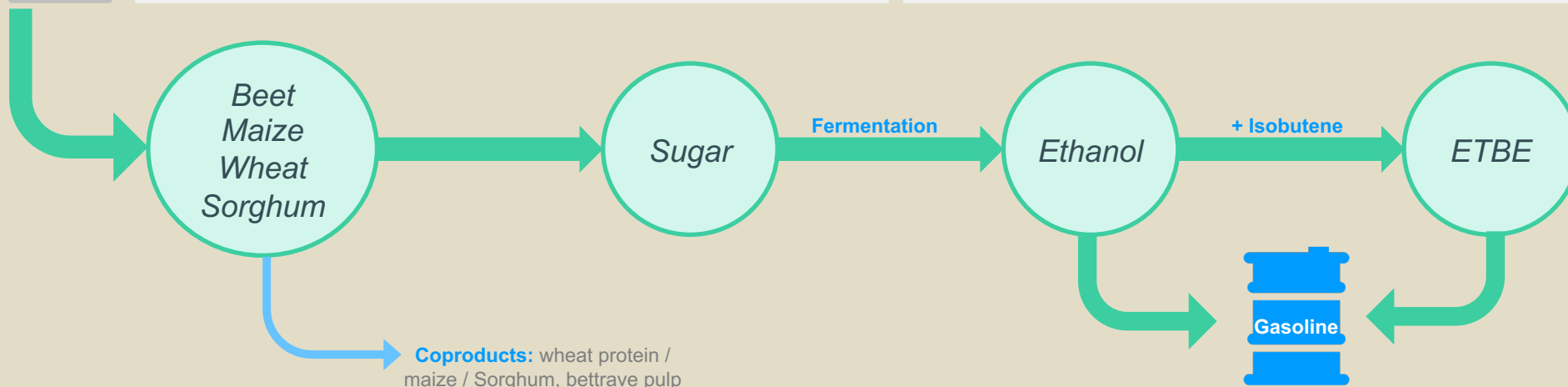
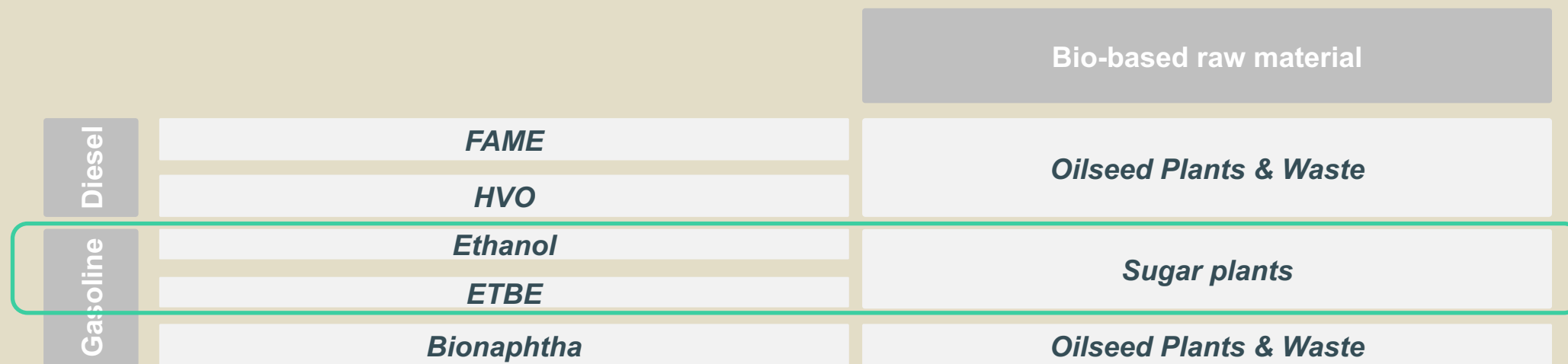
### Develop existing platforms

Evaluation of a project  
of **500 kt/an at Daesan**

**Produce nearly 2 - 3 Mt/year of renewable diesel by 2025**

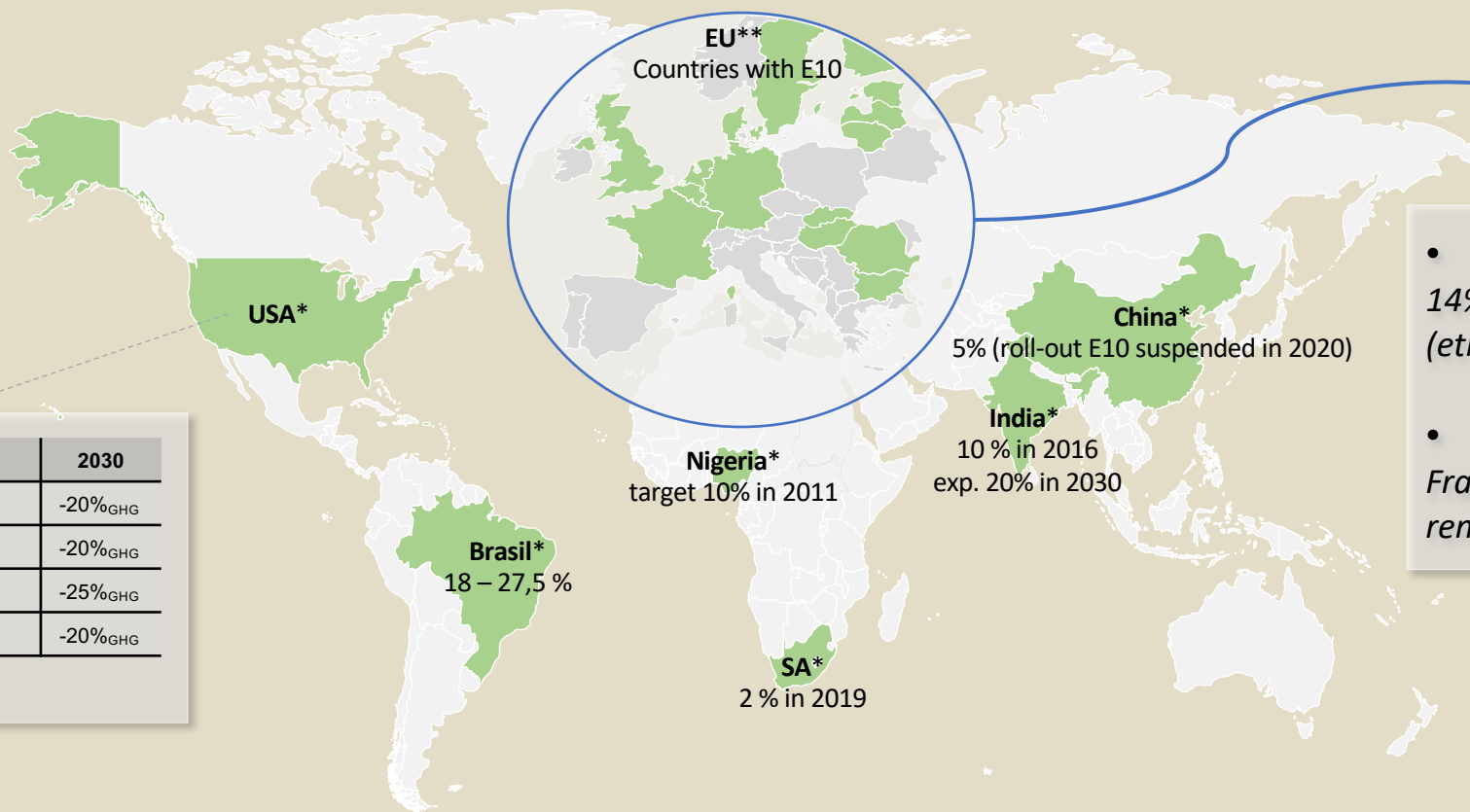
# What are biofuels ?

Biofuels are produced from **bio-based raw materials** (mainly vegetable) and therefore renewable. **There are different types:**



# Regulation is the main driver for biofuels demand

## Ethanol



## Zoom Europe

- **RED II 2030 target**  
14% renewable in transport  
(ethanol and biogas are part)
- **Biogas**  
France LTECV 2015 → 10%  
renewable gas in network by 2030

	2020	2021	2030
USA, CA <sup>(3)</sup>	-7,5% <sub>GHG</sub>	-8,75% <sub>GHG</sub>	-20% <sub>GHG</sub>
USA, OR <sup>(3)</sup>	-2,5% <sub>GHG</sub>	-5% <sub>GHG</sub>	-20% <sub>GHG</sub>
USA, WA <sup>(3)</sup>			-25% <sub>GHG</sub>
USA, NY <sup>(3)</sup>			-20% <sub>GHG</sub>

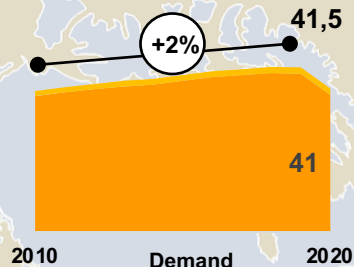
**Within Europe** : increasing demand for advanced Ethanol  
**Globally** more and more CO2 mandates and good agricultural practices leading to lower GHG emissions



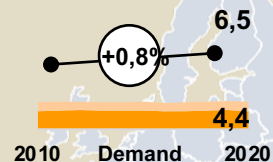
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## Ethanol fuel - world balance in 2020 (MT)

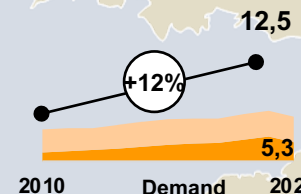
North America (Mt) *Corn*



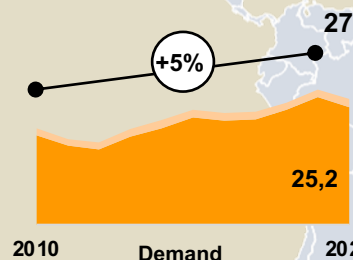
Europe (Mt) *Wheat, corn, beet*



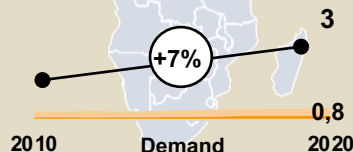
China + Asia (Mt) *Corn, wheat*



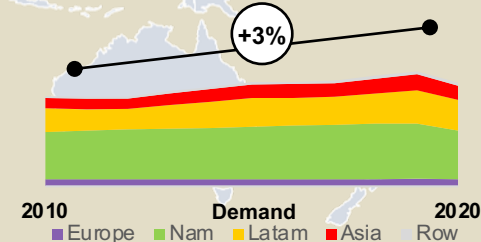
Latin America (Mt) *Cane*



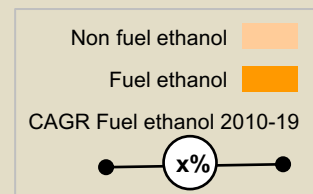
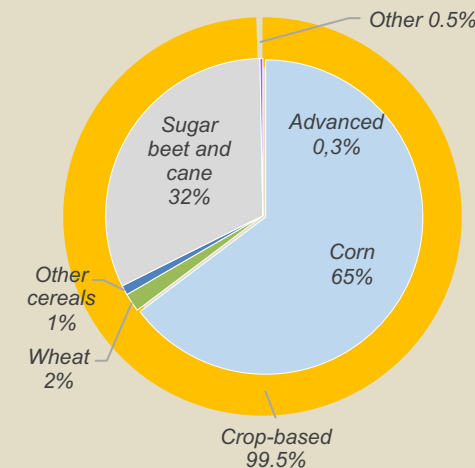
Rest of the World (Mt)



World (Mt)



Sales



Main ethanol markets are North and Latin America  
Currently, ethanol is almost entirely produced from crop-based feedstocks



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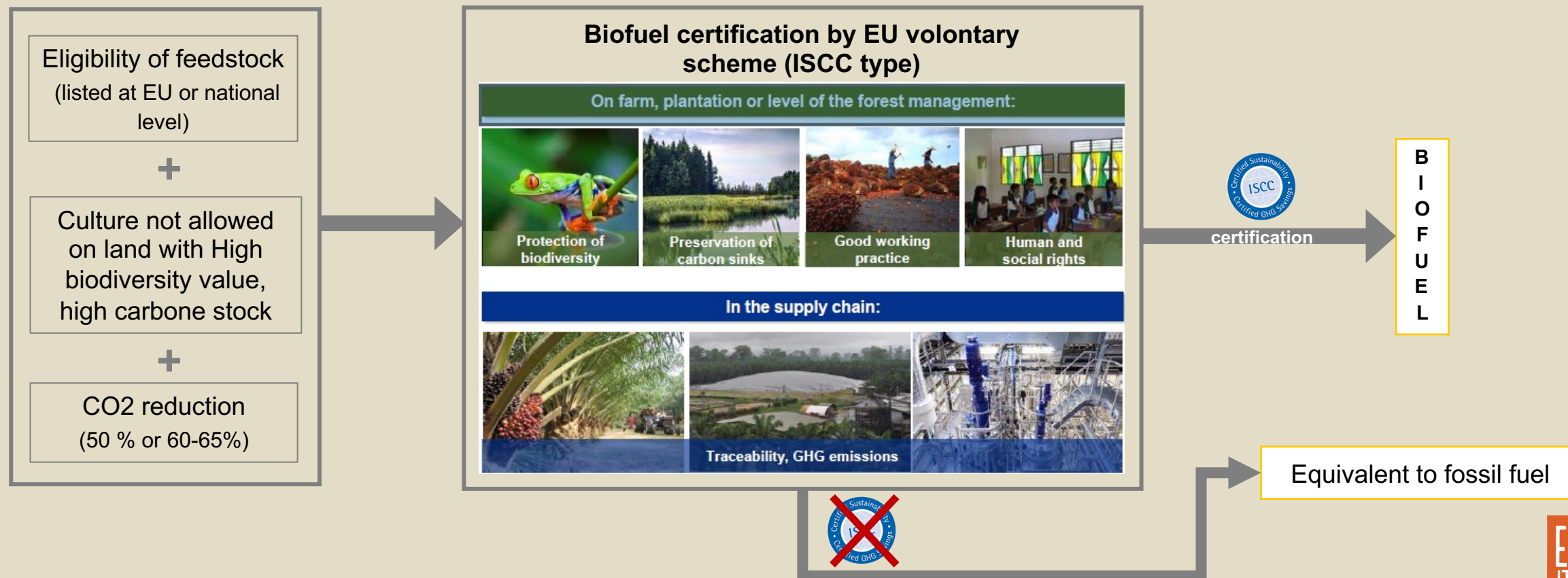
Sources: FO Licht, Gain Report USDA

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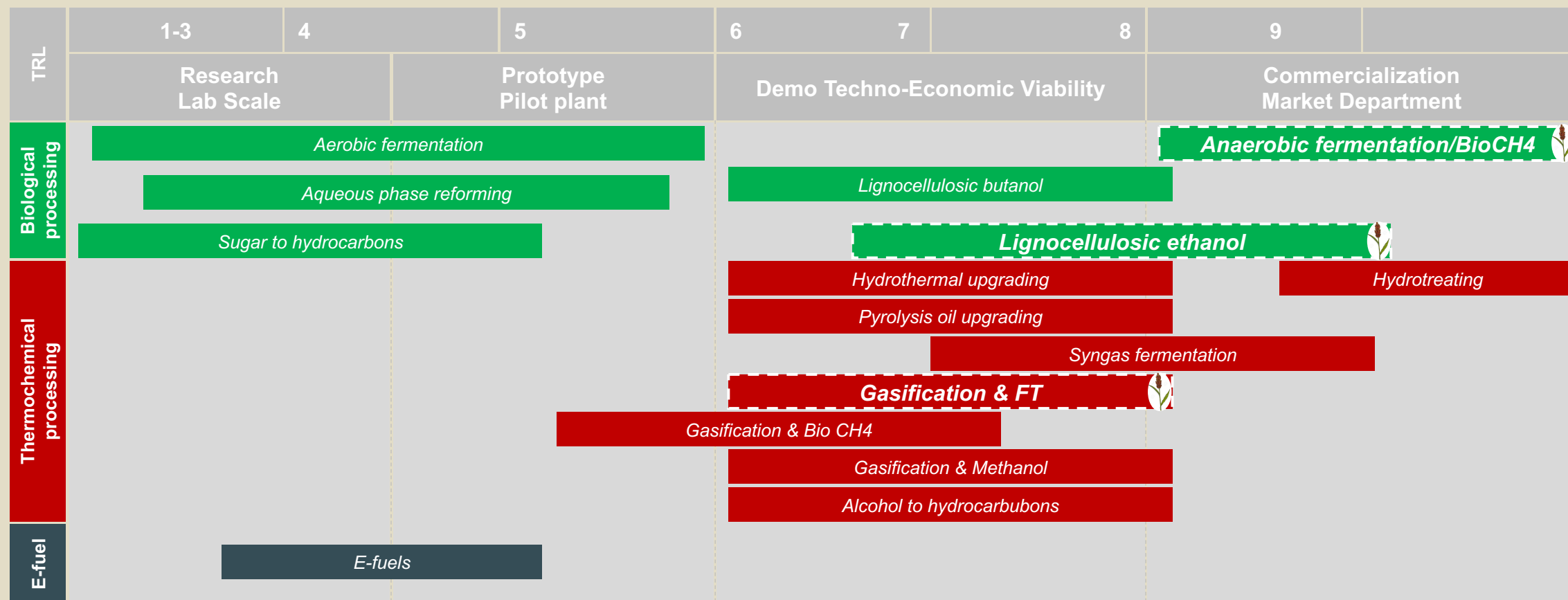
# Sustainability criteria for biofuels feedstocks are defined by EU Regulation

Evaluation for each biofuel individually under real production conditions



Source : adapted from ISCC

# Insight on technologies to produce advanced biofuels



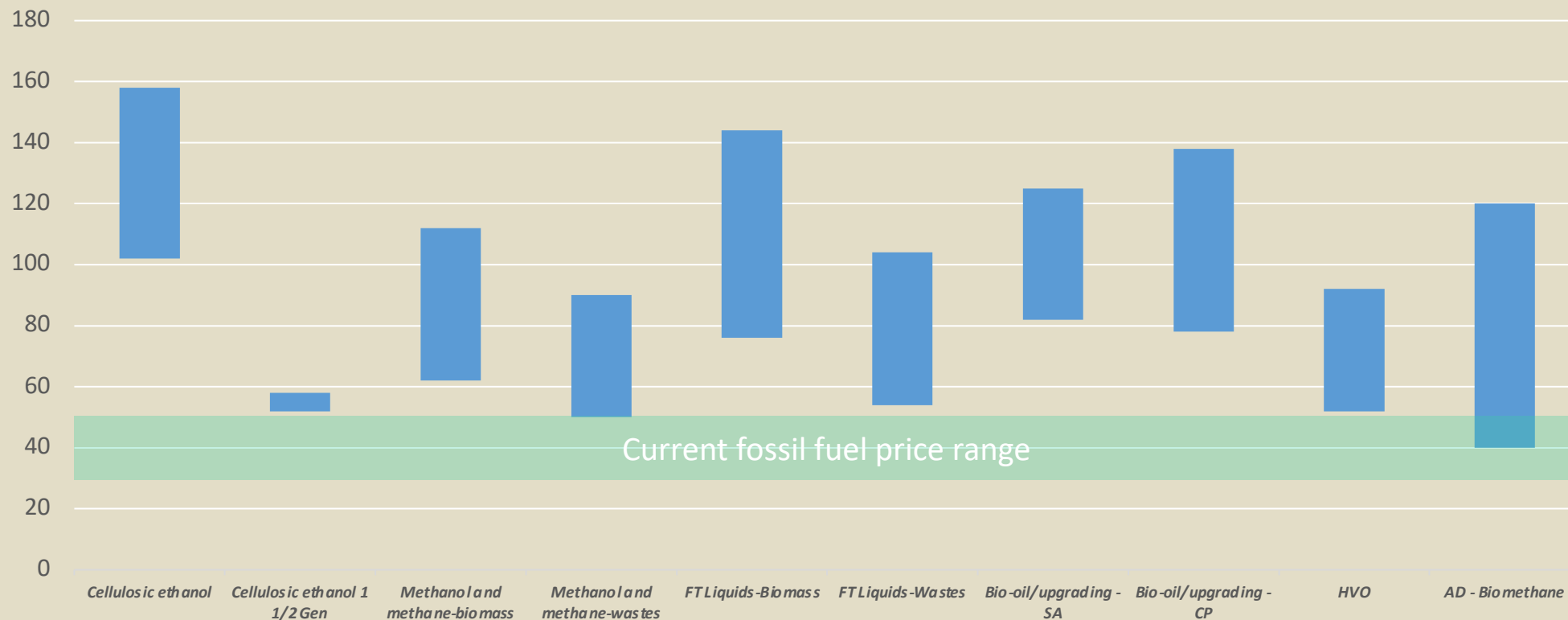
Sorghum could be converted via different pathways to produce biogas or advanced ethanol

Source : adapted from Sustainable biomass availability in the EU, to 2050 – Imperial College study – contracted by Concawe

# Insight on cost estimates to produce advanced biofuels

Production cost  
EUR/MWh

## Current cost estimates



Even most mature technologies are still too expensive compared to fossil fuel



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# Take away messages

- Ethanol and biogas market are driven by regulation
- Importance of sustainability criteria to be compliant with EU regulation
- Current challenges are availability of the feedstocks & maturity of technologies
- Sorghum : potential interest to be used as feedstock to produce advanced EtOH for Sustainable Aviation Fuel or biomethane



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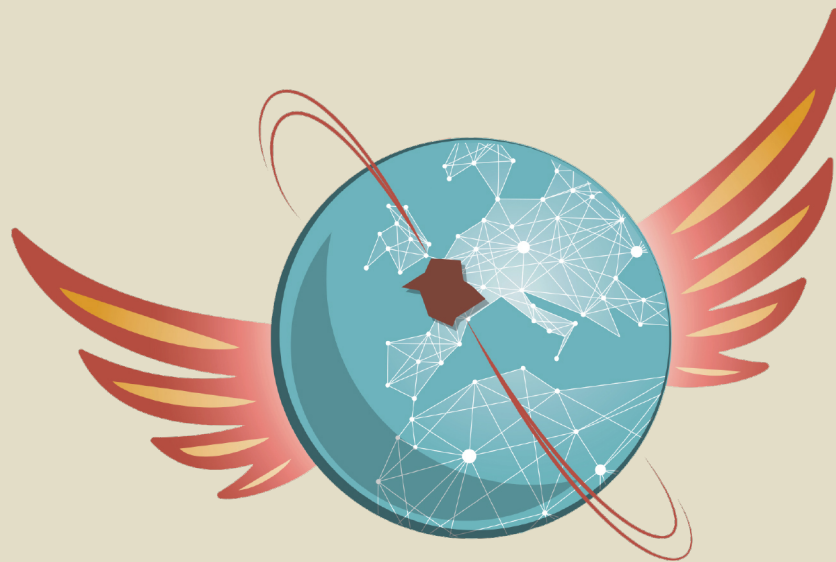
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# Thank you

## Partners



**FNPSMS**  
**maiz'EUROP'**



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