The New Brazilian Biofuels Policy: RenovaBio

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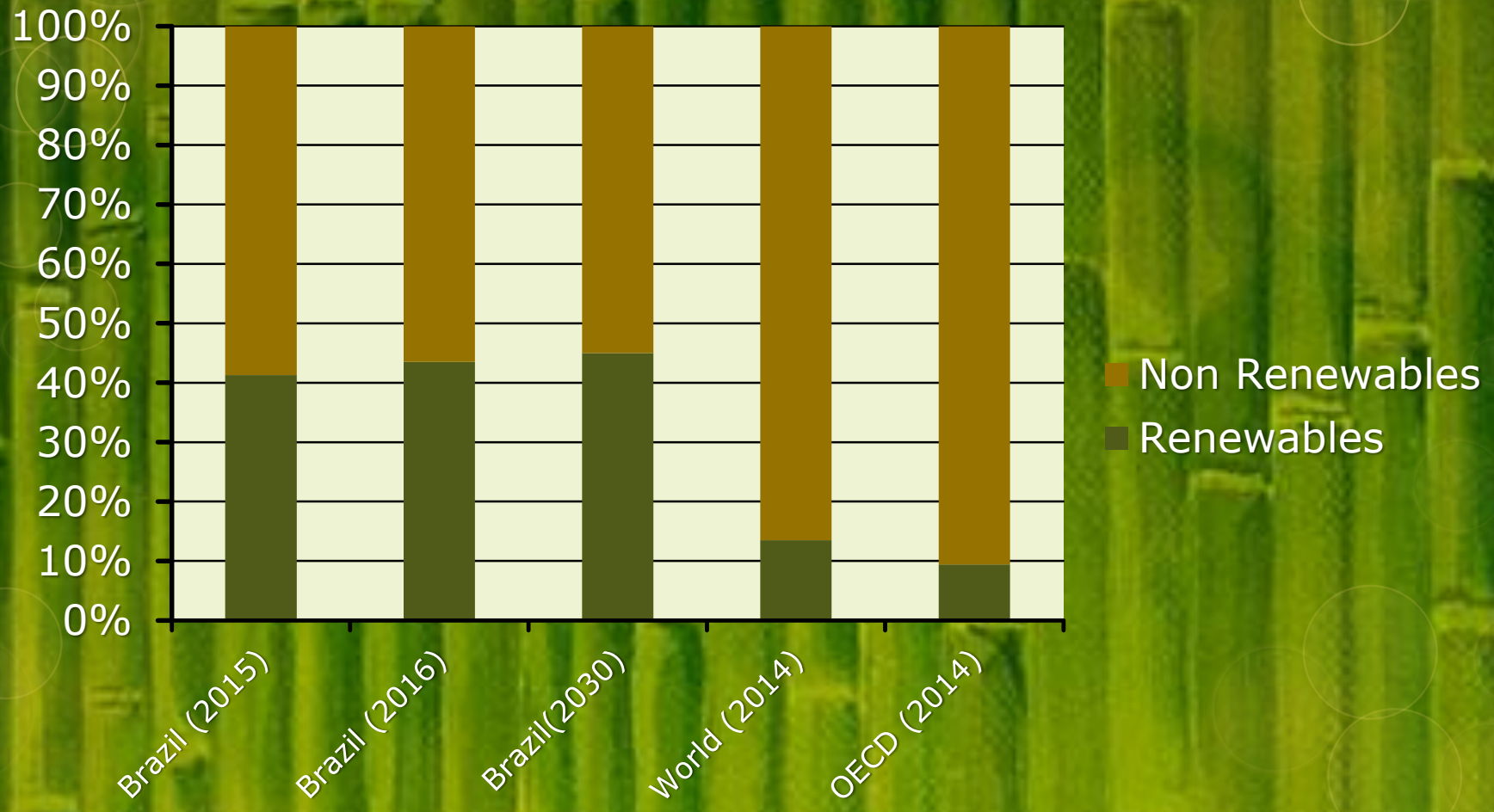
Summary

1. Renewables in Brazil
2. RenovaBio
    1. Targets
    2. Challenges
        1. Sugarcane
        2. Soybean
3. Conclusions

Renewables in the Brazilian Energy Matrix



Source: Empresa de Pesquisa Energética

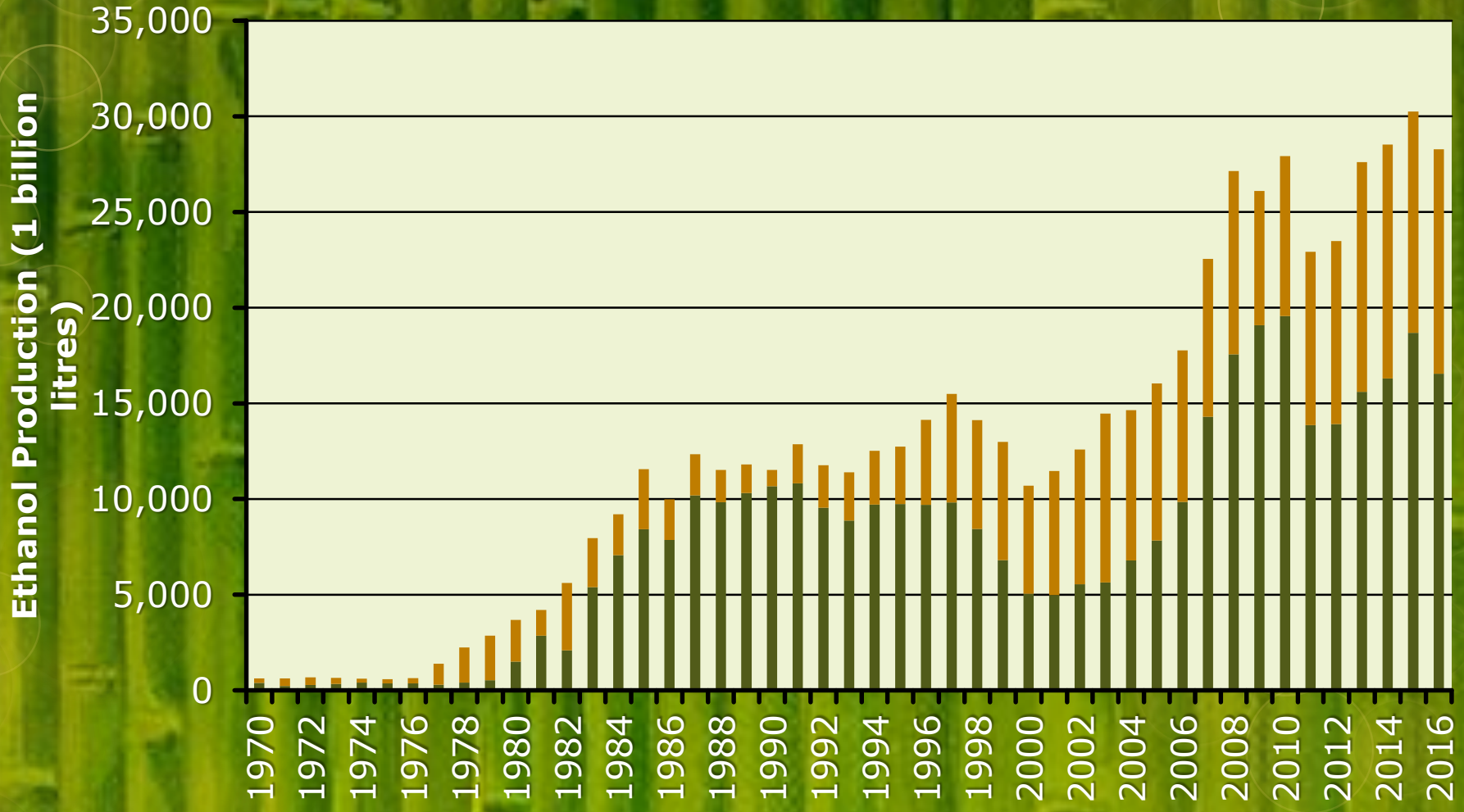
Renewables - Proalcool

- 1975 – Proalcool – Ethanol from sugarcane

Year Crop	Sugarcane (million tonnes)	Bioethanol (billion litres)	Sugar (million tonnes)
1975 / 1976	68.3	0.6	5.9
2015 / 2016	671.9	30.3	34.0

- Otto Cycle Fuels in Brazil: E27 and E100
- > 80% of new passenger cars are 'flex-fuel'
- > 73% of the passenger car fleet is 'flex-fuel'
- > 2.7 billion of oil barrels replaced

Renewables - Proalcool

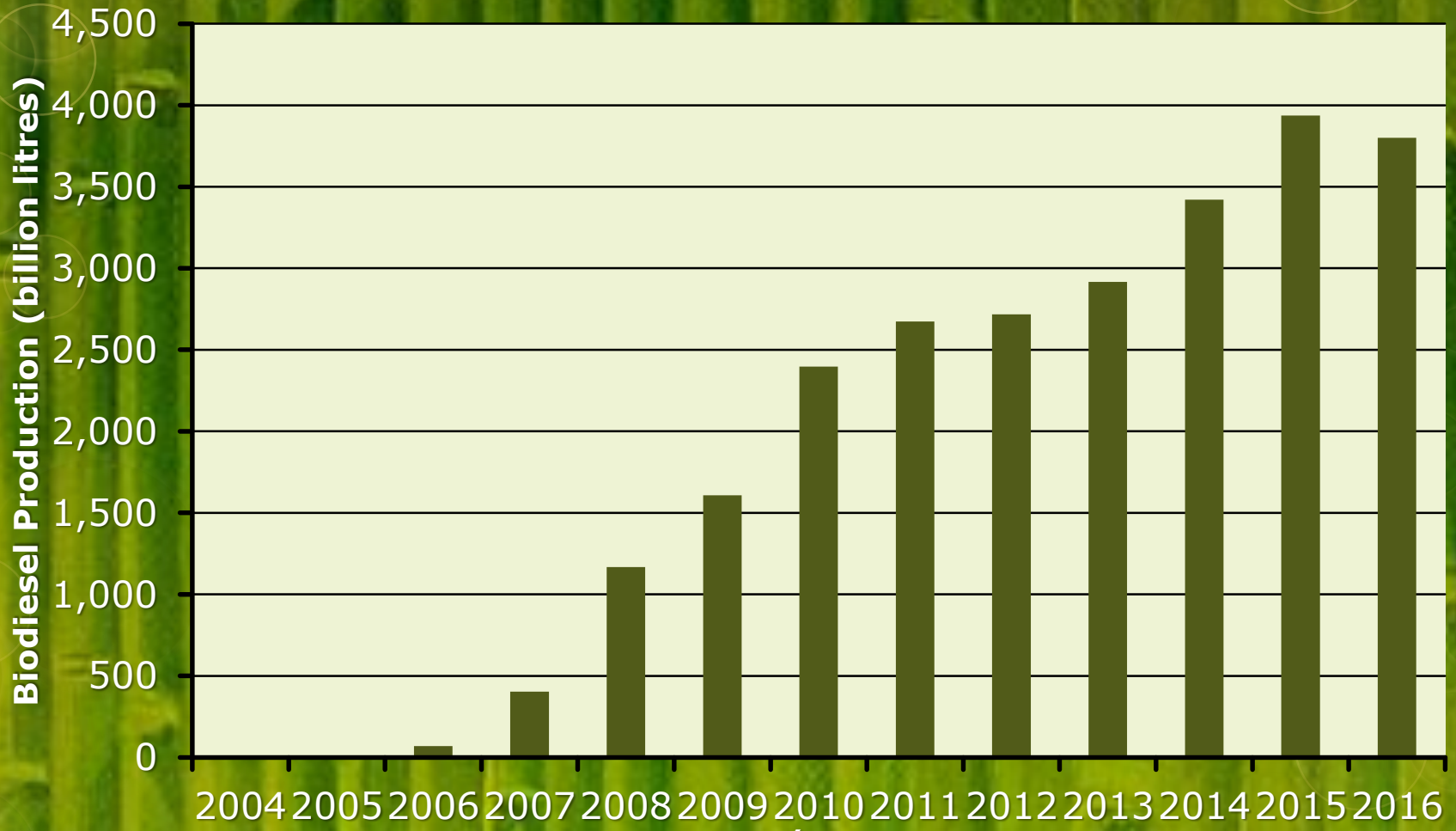


Source: Empresa de Pesquisa Energética

Renewables - Programme Biodiesel

- 2004 – Programme Biodiesel
- 2008 – B2 Mandatory
- 2018 – B10 Mandatory
- Production 2017 – 4.3 billion litres
- Production 2018 – 5.3 billion litres (est.)
- Feedstock – soybean oil (72%); beef tallow (14%)

Renewables - Programme Biodiesel



Source: Empresa de Pesquisa Energética

RenovaBio - Targets

- CO_2 emissions reduction – Brazilian NDC (Paris Agreement)
- Carbon credits per avoided emissions
- Life Cycle Analysis (LCA) of both the agricultural and the industrial phases
- Carbon Intensity (CI) reduction in the transport sector = 10.1%
- Estimation of the emissions to be avoided in the transport sector (2018-2028) = 591 million tonnes CO_2;

RenovaBio - Targets

Targets	2017	2028
Carbon Intensity gCO_2eq / MJ	74.25	66.75
Biofuels (energy) transport sector	20%	28.6%
Ethanol (billion litres)	26.7	47.1
Gasoline (billion litres)	31.1	30
Biodiesel (billion litres)	5.7	11.1
Diesel (billion litres)	51.2	62.8

RenovaBio - Targets - Ethanol

Expansion of Ethanol Production	
Ethanol (litres) per tonne of sugarcane	80
Sugarcane needed 2028 (million tonnes)	589
Sugarcane prod. 2017-18 (million tonnes)	634
Sugarcane productivity 2017-18 (tonnes/ha)	72.6
Sugarcane area 2017-18 (million ha)	8.73
Area Sugarcane Ethanol (~50%) (million ha)	4.37
Area needed RenovaBio BAU (million ha)	8.1
Additional Area BAU (million ha)	3.73

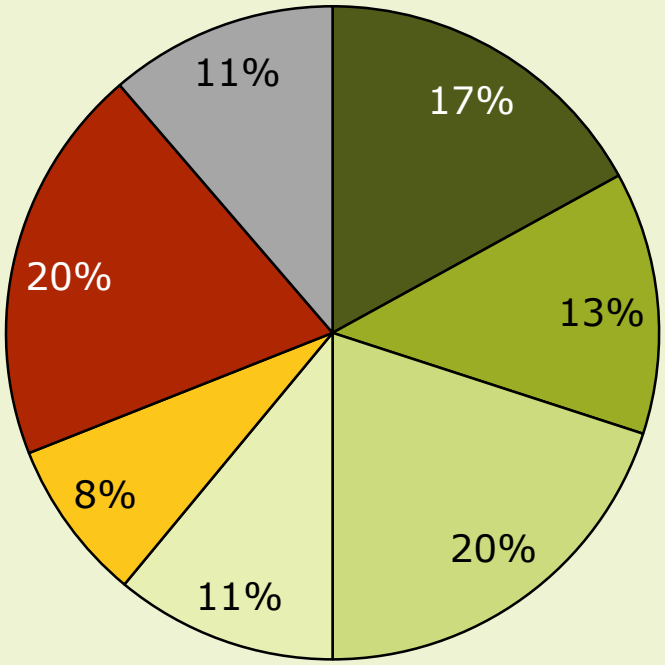
RenovaBio - Targets - Biodiesel

Expansion of Biodiesel Production	
Soybean oil (litres) per tonne of soybean	190
Soybean oil (litres) per 1 litre of biodiesel	0.88
Soybean needed 2028 (75%) (million tonnes)	38.6
Soybean production 2017 (million tonnes)	113.8
Soybean area 2017 (million ha)	33.9
Productivity soybean 2017 (tonnes / ha)	3.3
Area needed RenovaBio BAU (million ha)	11.7
Additional Area BAU (million ha)	5.7

RenovaBio - Challenges

- Land;
- Water;
- Technology

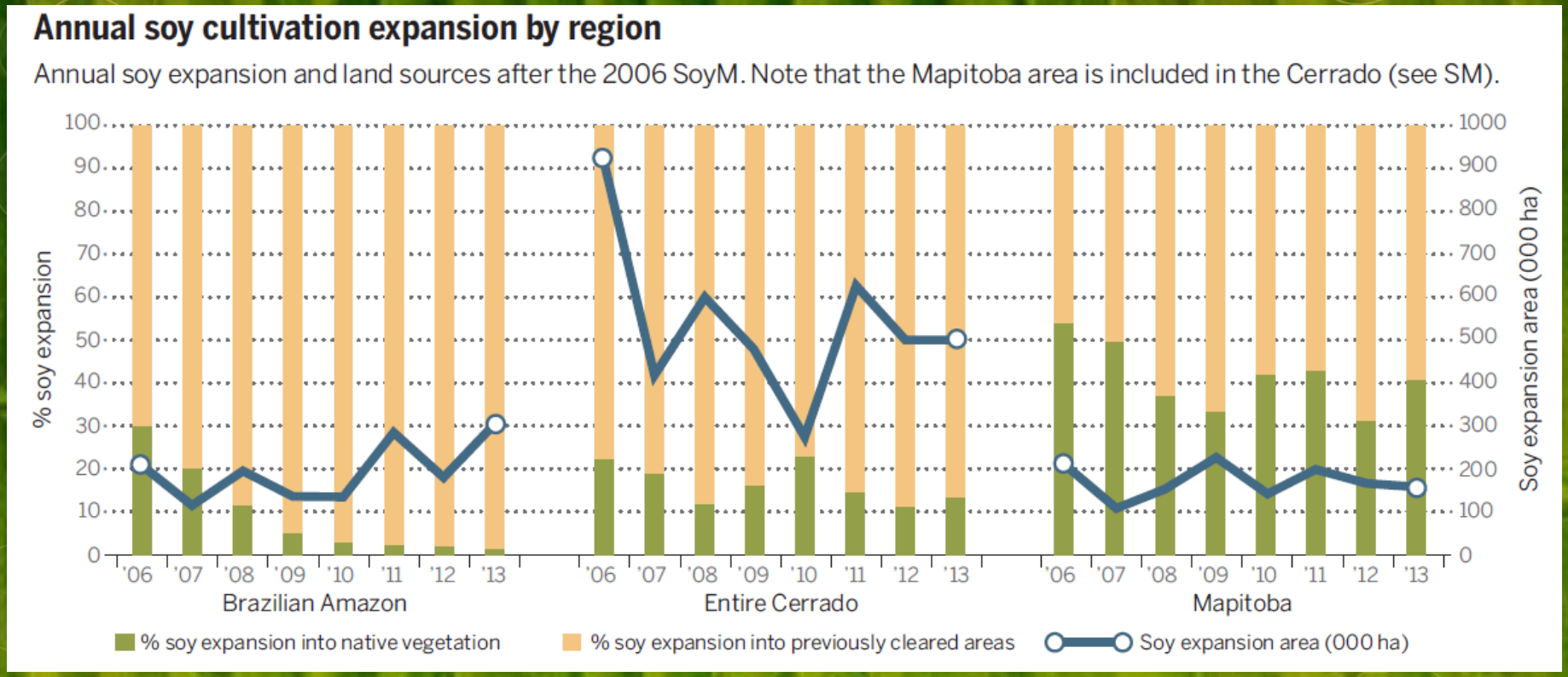
RenovaBio - Challenges



RenovaBio – Challenges - Land

Land Availability	
Pasture land (million ha)	180
Average productivity (cattle / ha)	1
Average potential productivity (cattle / ha)	3.6
Sugarcane zoning: land available (million ha)	65
Pastureland with high aptitude for sugarcane (million ha)	11.3
Pastureland with medium aptitude for sugarcane (million ha)	22.9

RenovaBio – Challenges - Land



Source: Gibbs et al., Science 347 (6220) 377-378

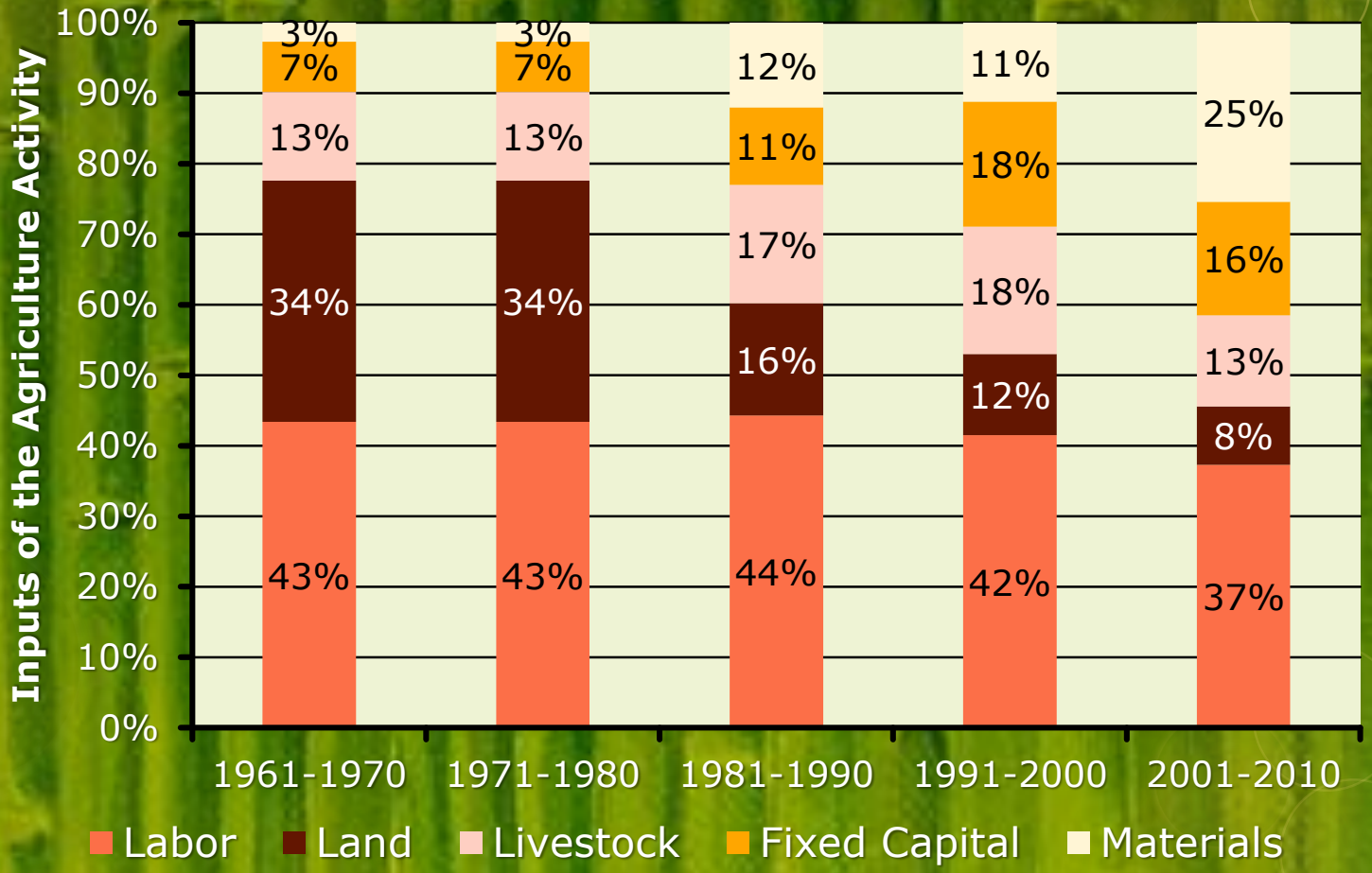
RenovaBio – Challenges - Water

Water Availability	
Total irrigated land – all crops (million ha)	7
Sugarcane irrigated land (million ha)	2.1
Potential irrigated land (million ha)	76.2
High potential irrigated land (million ha)	21.8
Effective potential irrigated land (million ha)	11.3

RenovaBio – Challenges - Technology

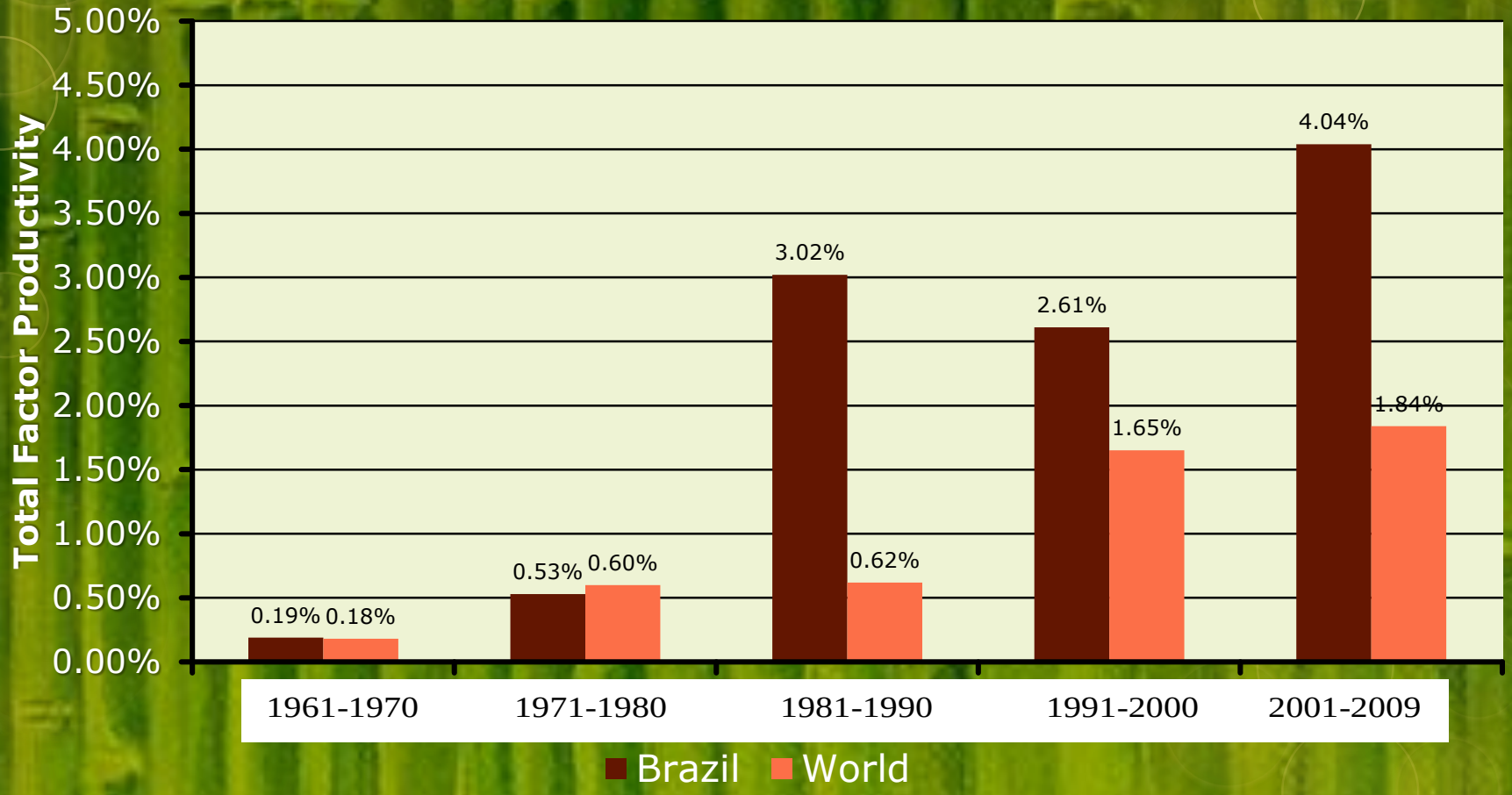
- Corn Ethanol with or without sugarcane ethanol
- Cellulosic ethanol (2nd generation ethanol)
- Other sources of oil (native palms)
- Improvement of productivity

RenovaBio – Challenges - Technology



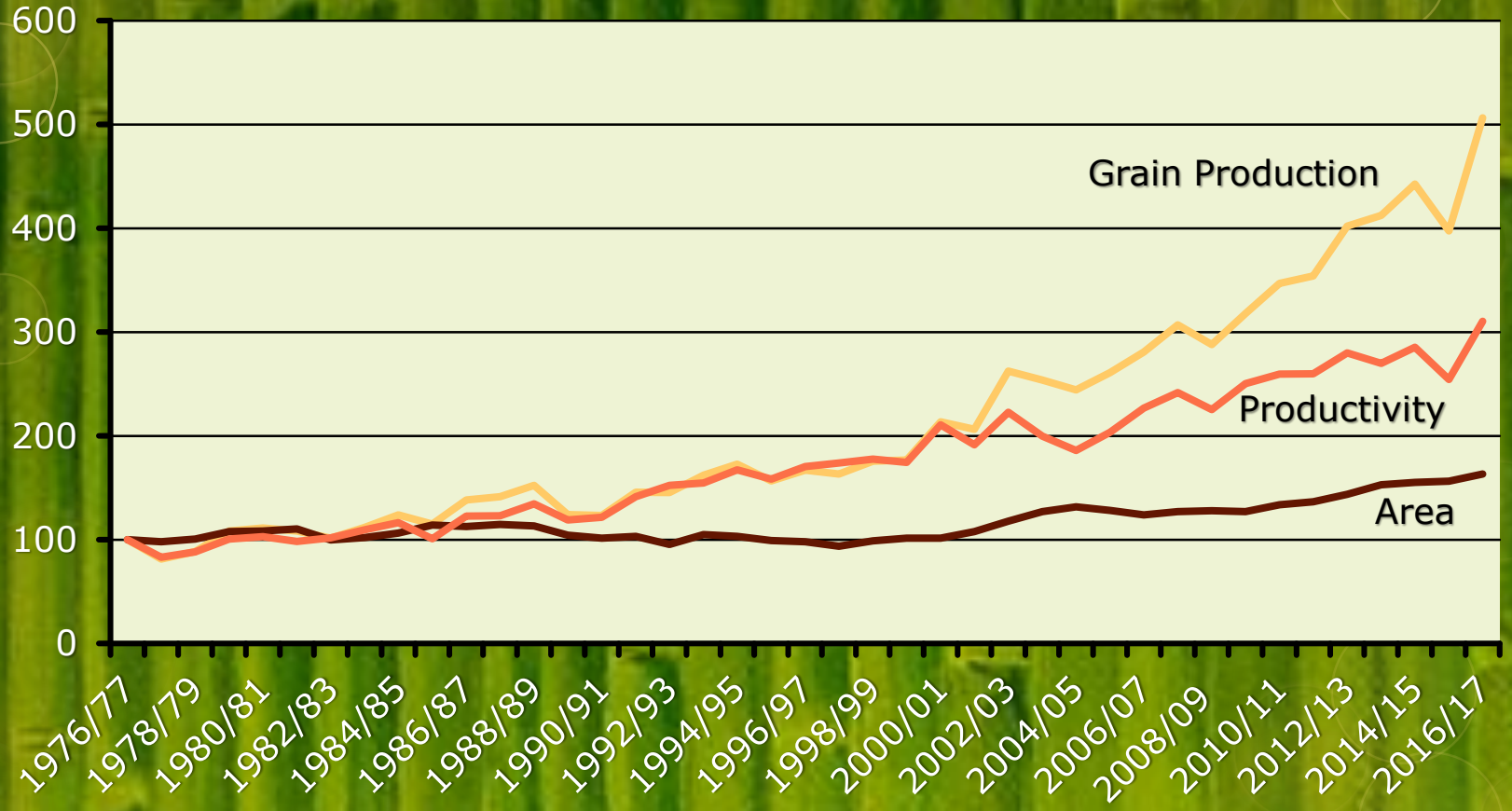
Fuglie, Productivity Growth in Agriculture: An International Perspective

RenovaBio – Challenges - Technology



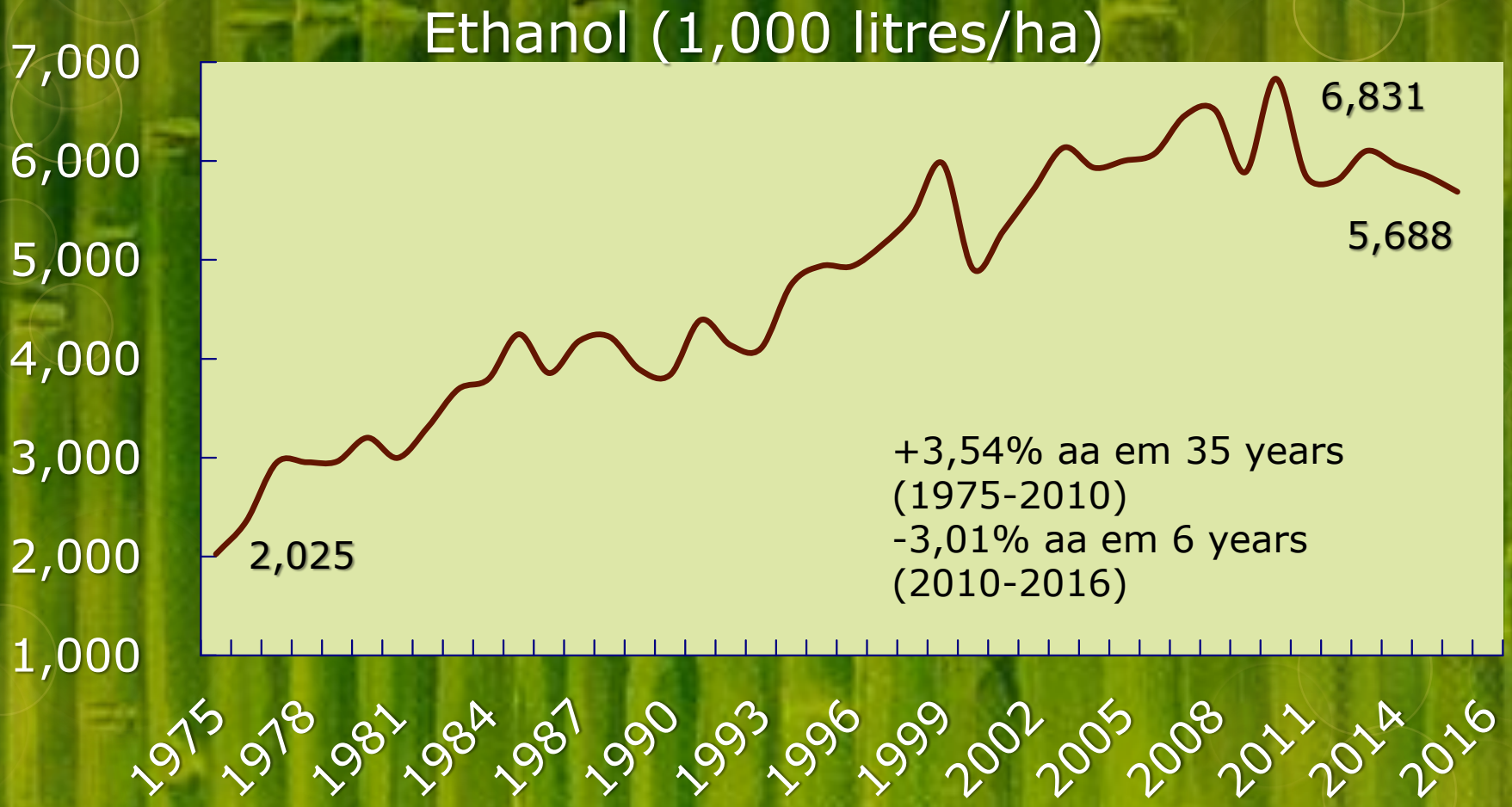
Fuglie, Productivity Growth in Agriculture: An International Perspective

RenovaBio – Challenges - Technology



Source: Conab

RenovaBio – Challenges - Technology



Source: Plínio Nastari, DATAGRO

Conclusions

- RenovaBio is feasible regarding the supply of feedstock;
- The targets of RenovaBio are conservative.