CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Agrobiology, Food and Natural Resources
Department of Chemistry

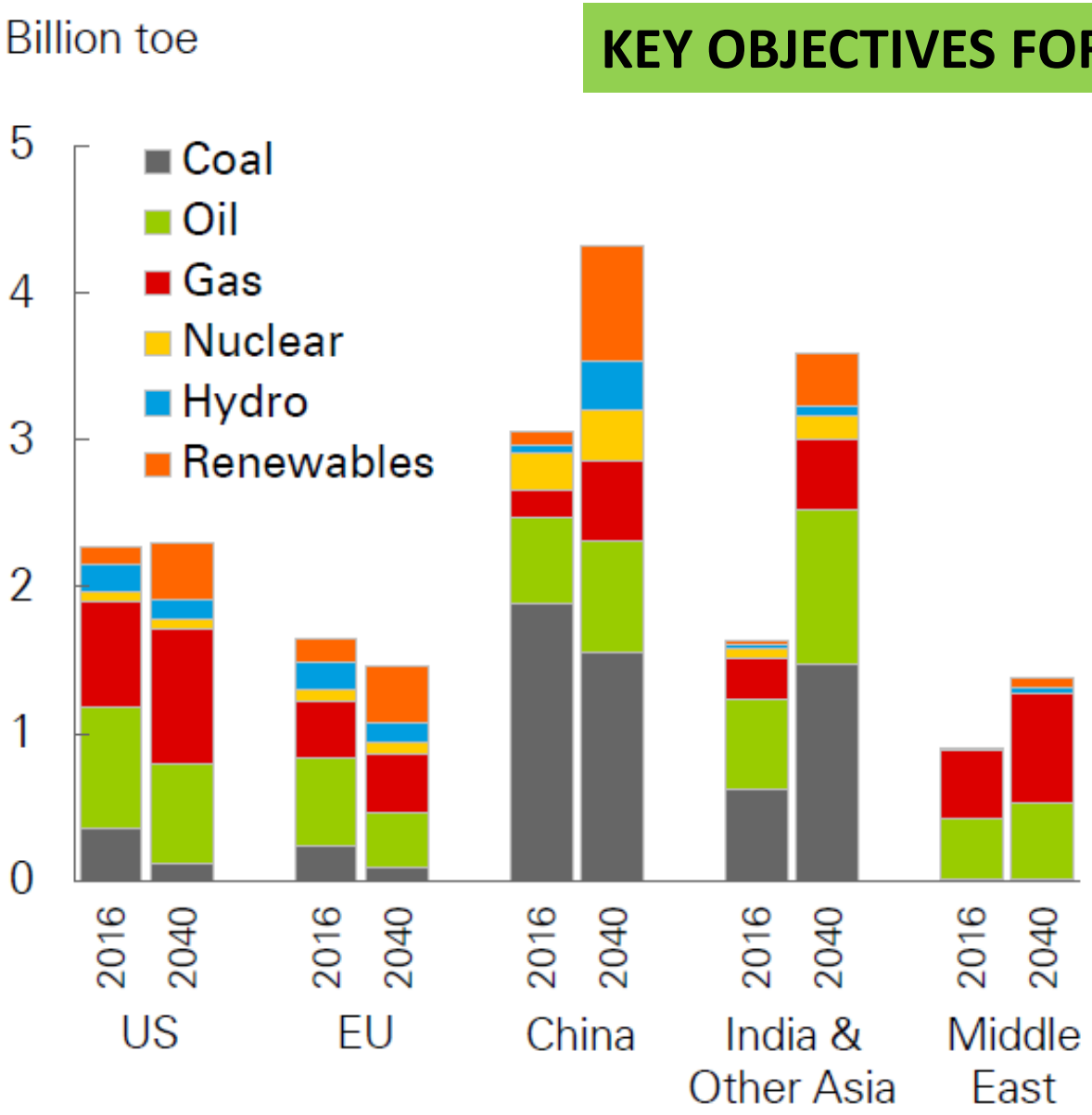
UNIVERSITY OF ECONOMICS PRAGUE

Faculty of Business Administration
Department of Strategy
Center for Economy in Regulated Sectors

4E BIOFUEL PRODUCTION CRITERIA

Engineering, Environment, Energetics, Economy

VLADIMÍR HÖNIG



KEY OBJECTIVES FOR ENERGY TECHNOLOGY

- REDUCTING THE COST OF **CLEAN ENERGY**
- OCCUPY A LEADING POSITION IN THE EU INDUSTRY IN THE RAPIDLY GROWING **LOW CARBON INDUSTRY**

More efficient technology will need to be used to obtain renewable energy - **2nd generation biofuels**.

Coal will once again consolidate its lost position among energy sources through the use of new technologies.

The price of **crude oil and natural gas** will keep the price above 100 $ per barrel due to a growing lack of resources.

Total energy consumption in the world will increase from the current 10 Gt of crude oil equivalent per year to 22 Gt in 2050.

The **coal price** will reach 110 $ per tonne in 2050.

Two thirds of energy consumption in **developing countries** in 2050

The **volume of the world economy** will be four times higher, but the total energy consumption will increase 2.2 times.

Energy demand is growing in **developing countries**.

Renewable and nuclear growth will start after **2020**.

ENERGY STRATEGY 2020

MAIN GOALS

- reduction of GHG production by at least 20%
- increasing the share of renewables in the pan-European energy mix to at least 20% of total consumption
- increasing energy efficiency by at least 20% or increasing energy savings by 20%

HOW?

- accelerate investment in energy saving measures
- simplifying the change of supplier and monitoring consumption
- building good relationships with major external suppliers of energy raw materials through the Energy Community organization

ENERGY STRATEGY 2030

MAIN GOALS

- 40% decrease in GHG production compared to 1990
- at least 27% share of renewable sources in final consumption

HOW?

- reform in the Emissions Trading Scheme (EU ETS)
- diversification of supplies
- new management system based on national plans for a competitive, secure, sustainable energy industry

ENERGY STRATEGY 2050

MAIN GOALS → 80-95% decrease in GHG production compared to 1990

HOW?
- energy efficiency (not only efficiency but also austerity measures)
- renewable energy
- carbon dioxide storage

IEA
investment in the energy sector after 2020 will be 4.3 times expensive

The full potential of the internal market should be exploited for decarbonisation.

ENERGY STRATEGY 2050

The layout should be as follows

- **industry** and **energy sector** by more than 80 %
- **transport sector** by around 60 %
- **agricultural sector** by around 40 %

Main feedstock categories

Biomass from agriculture

- Energy crops (cellulosic and other)
- Primary crop residues (straw, stalks, stover, prunings)
- Secondary crop residues (processing residues)
- Manure
- Grassland biomass

Biomass from forestry

- Round-wood production (stemwood)
- Primary forestry residues (logging residues)
- Secondary forestry residues (woodchips, pellets, and sawdust)

Biomass from waste

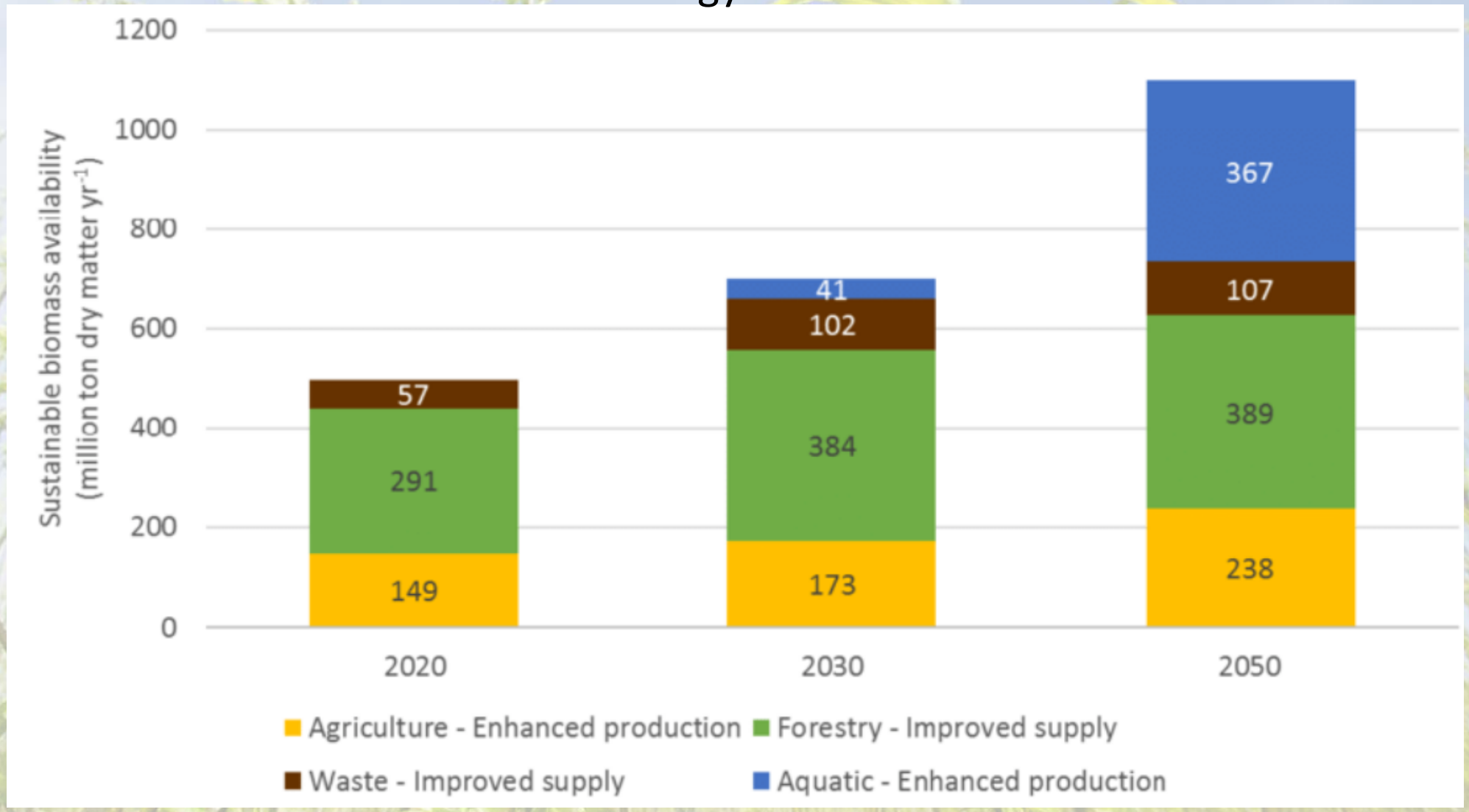
- Household waste (OFMSW)
- Animal, mixed food waste (UCO)
- Wood wastes (post-consumer, packaging wood)
- Vegetal wastes
- Paper and cardboard wastes
- Sludges and liquid wastes (sewage sludge)

Aquatic biomass

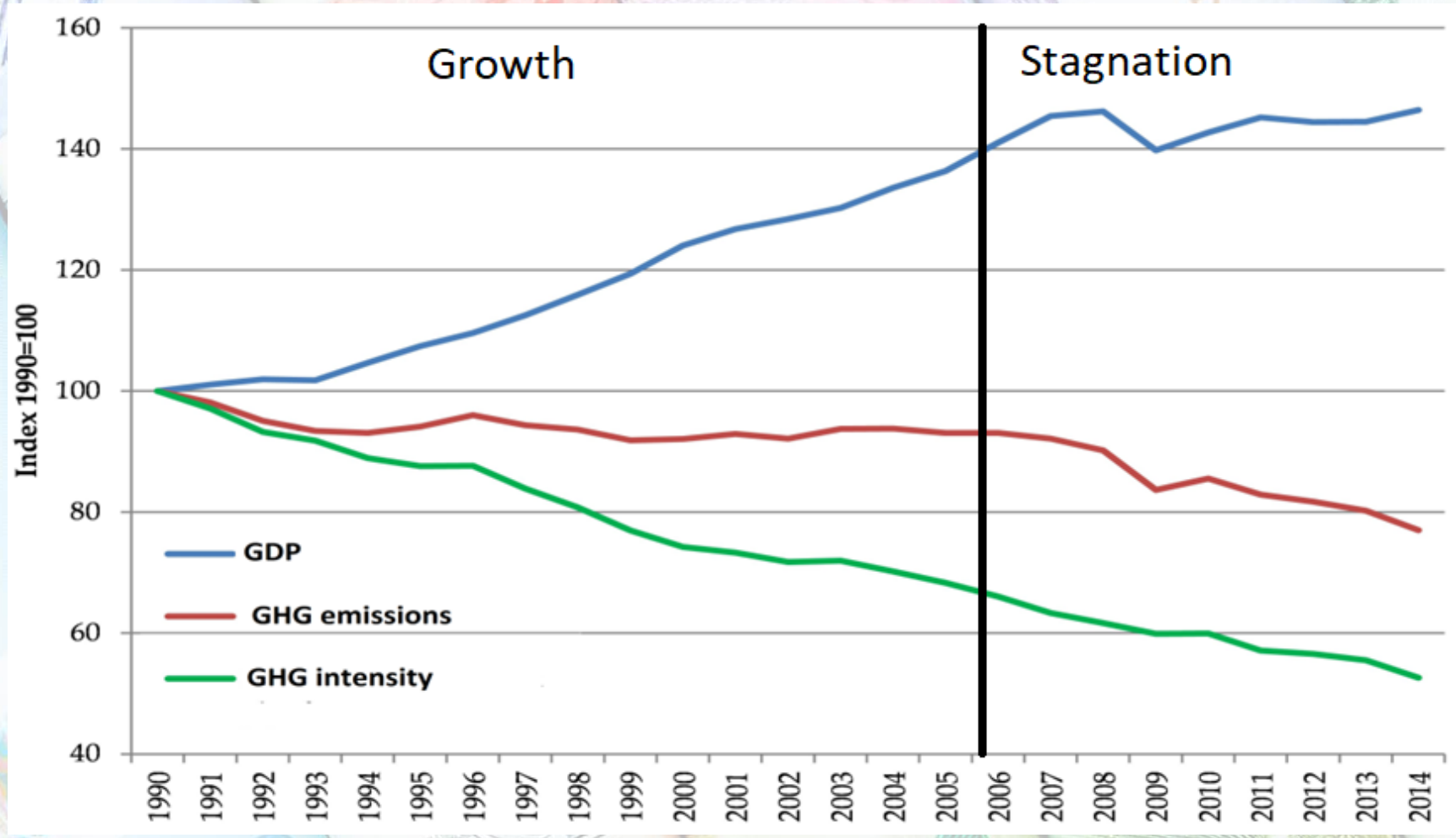
- Micro-algae
- Macro-algae

Carbon Caputure and Utilisation

Maximum estimated potential availability of biomass for energy use in the EU

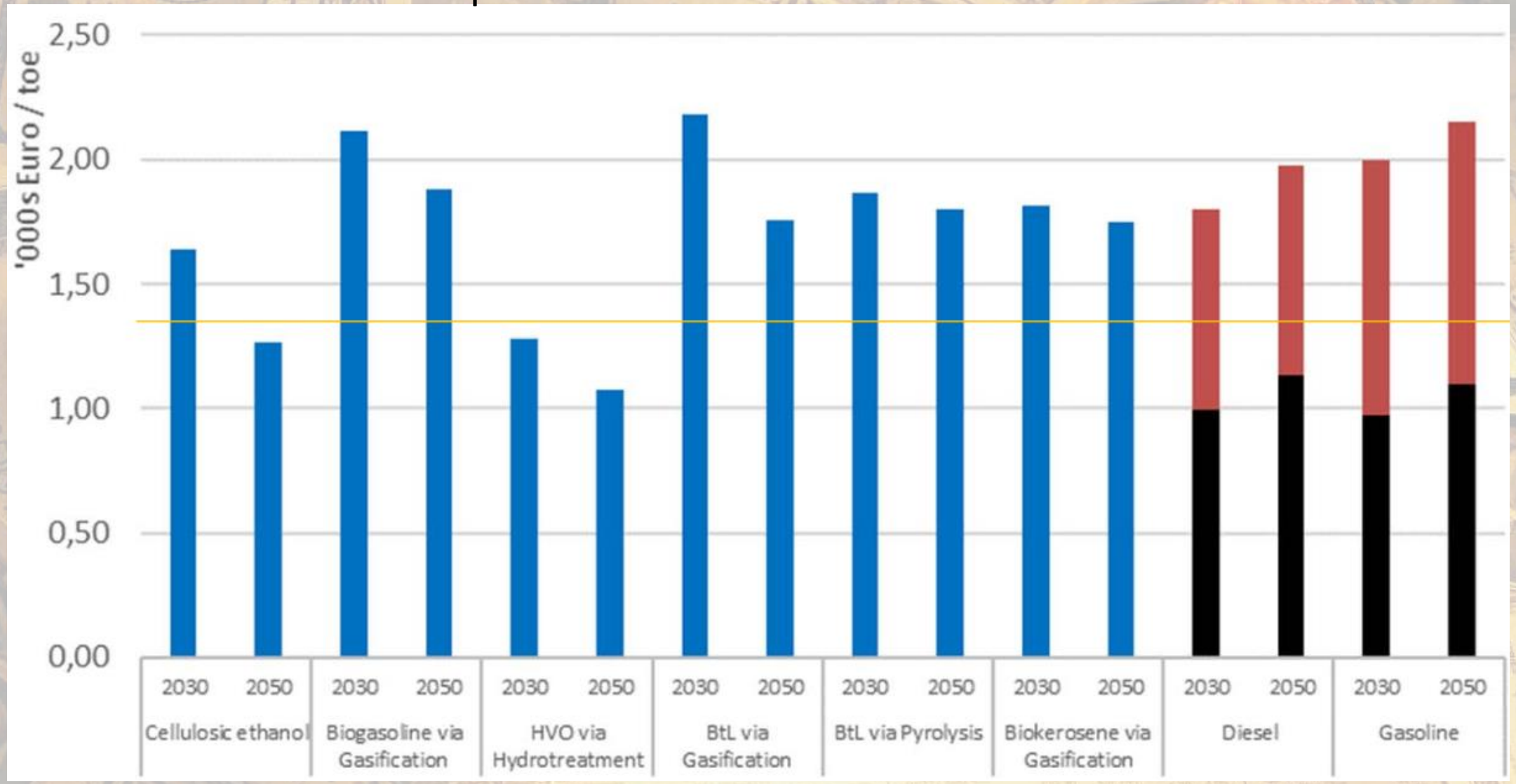


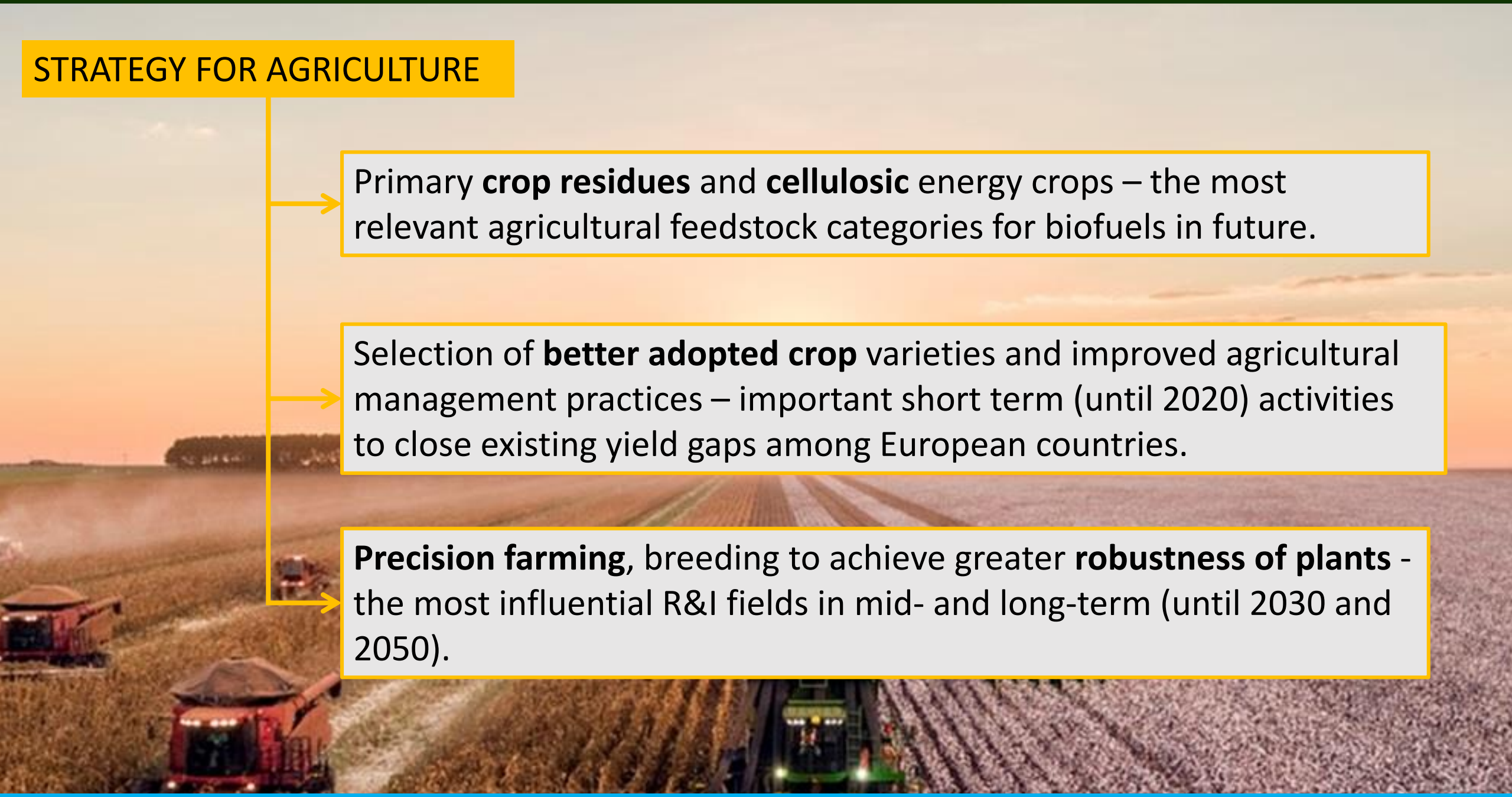
Emission savings are increasing GDP: conversion of stagnation to growth is needed



Average production costs of advanced biofuels (scenario HIGH)

Most advanced biofuel types become a cost-competitive alternative if the tax levels for fossil fuels remain in place and advanced biofuels are untaxed



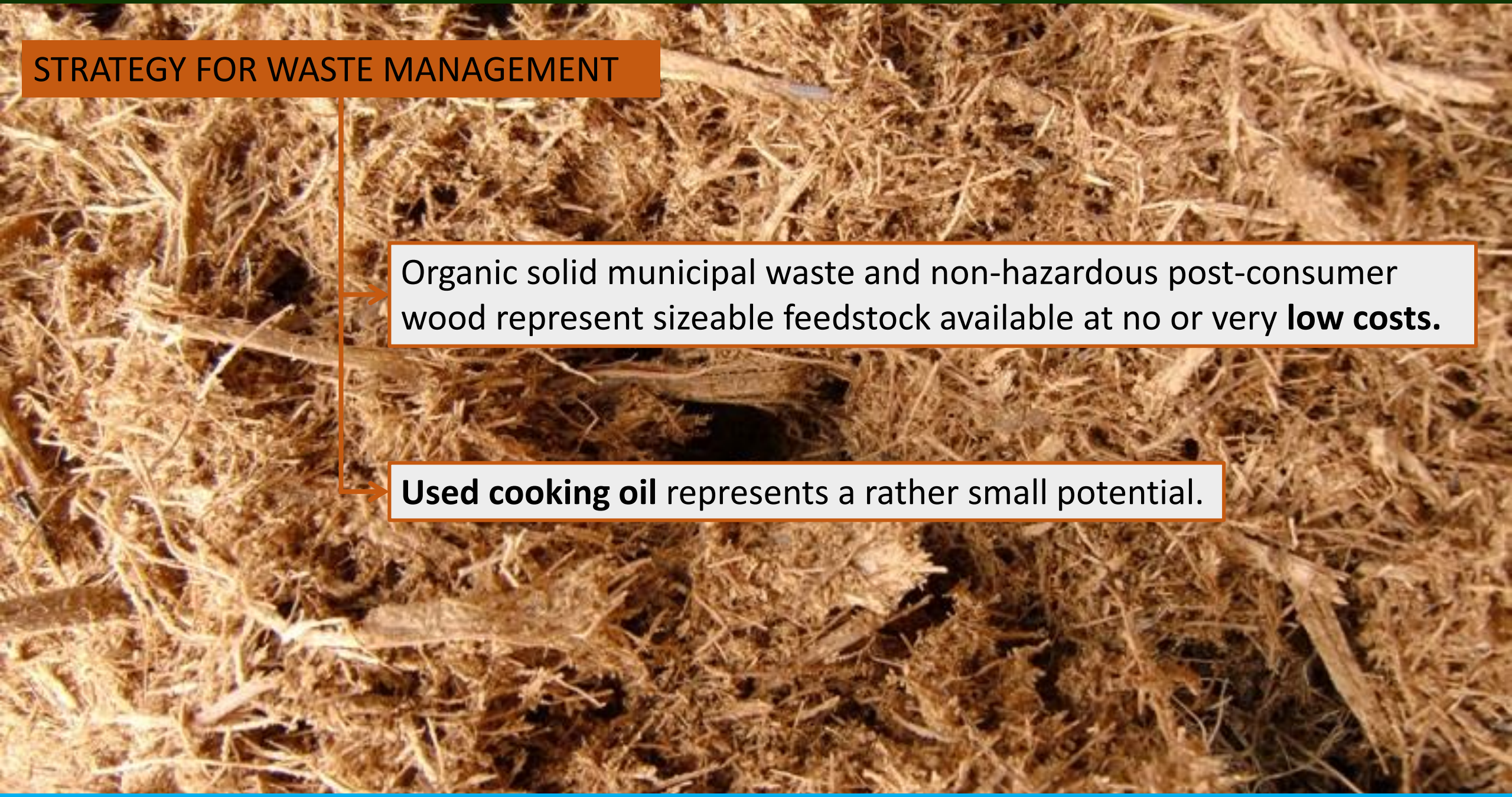


STRATEGY FOR AGRICULTURE

- Primary **crop residues** and **cellulosic** energy crops – the most relevant agricultural feedstock categories for biofuels in future.
- Selection of **better adopted crop** varieties and improved agricultural management practices – important short term (until 2020) activities to close existing yield gaps among European countries.
- **Precision farming**, breeding to achieve greater **robustness of plants** - the most influential R&I fields in mid- and long-term (until 2030 and 2050).

STRATEGY FOR FORESTRY

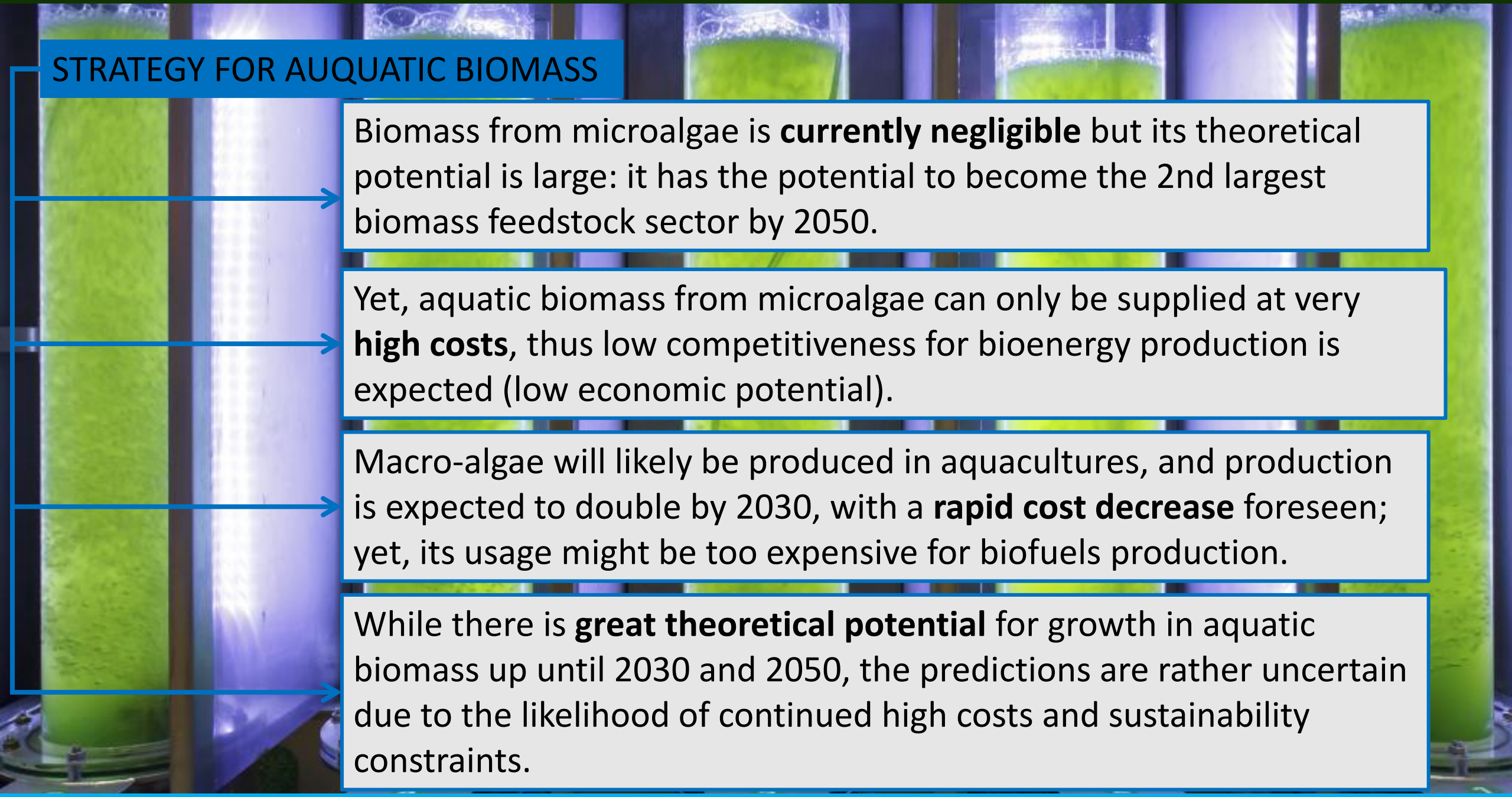
- Forest sector is estimated to be and remain the **largest potential** supplier of biomass.
- Measures related to **improving supply** have the strongest impact on availability and costs of woody biomass until 2050.
- Measures to **enhance production** appear to be less effective concerning availability and costs of woody biomass until 2050 due to long rotation cycles. These measures should nevertheless be considered already now to **guarantee availability** in the future.



STRATEGY FOR WASTE MANAGEMENT

Organic solid municipal waste and non-hazardous post-consumer wood represent sizeable feedstock available at no or very **low costs.**

Used cooking oil represents a rather small potential.



STRATEGY FOR AUQUATIC BIOMASS

Biomass from microalgae is **currently negligible** but its theoretical potential is large: it has the potential to become the 2nd largest biomass feedstock sector by 2050.

Yet, aquatic biomass from microalgae can only be supplied at very **high costs**, thus low competitiveness for bioenergy production is expected (low economic potential).

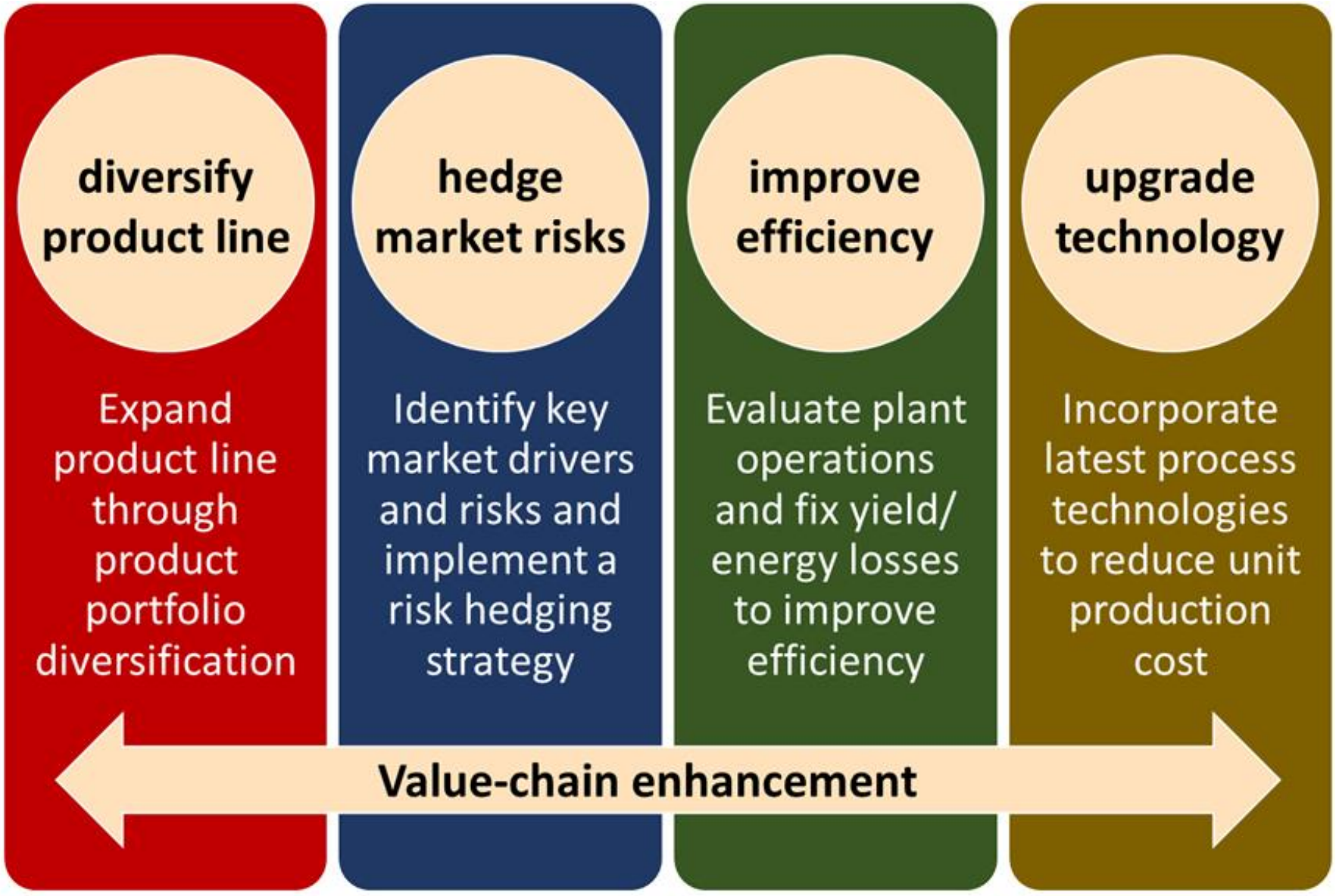
Macro-algae will likely be produced in aquacultures, and production is expected to double by 2030, with a **rapid cost decrease** foreseen; yet, its usage might be too expensive for biofuels production.

While there is **great theoretical potential** for growth in aquatic biomass up until 2030 and 2050, the predictions are rather uncertain due to the likelihood of continued high costs and sustainability constraints.

ALL BIOMASS SOURCES

- R&I measures are able to significantly increase availability of biomass by 2050.
- Full potentials can only be realized at very high cost.

Competitive strategy for the biofuels industry



CONCLUSION

1. dependence on fossil fuel imports for energy sector is estimated at **around 35-45% in 2050** compared to today's 58%;
2. fuel **costs will be reduced** but at the expense of **high investment costs**;
3. carbon **capture and storage** will play a key role in transforming a carbon-free economy;
4. Europe 2050 only gives a general idea of how to achieve our goals; Europe 2050 sets the **key conditions** for its fulfillment.
5. legal **support** for switching to alternative fuels and electromobility is needed;
6. fuel **standardization**, **infrastructure building** and **research** support are needed.

THANKS FOR YOUR ATTENTION

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