Biofuels for the energy transition in transport

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Decarbonising Transport: EVs Accelerate, Biofuels Essential for Freight and Aviation

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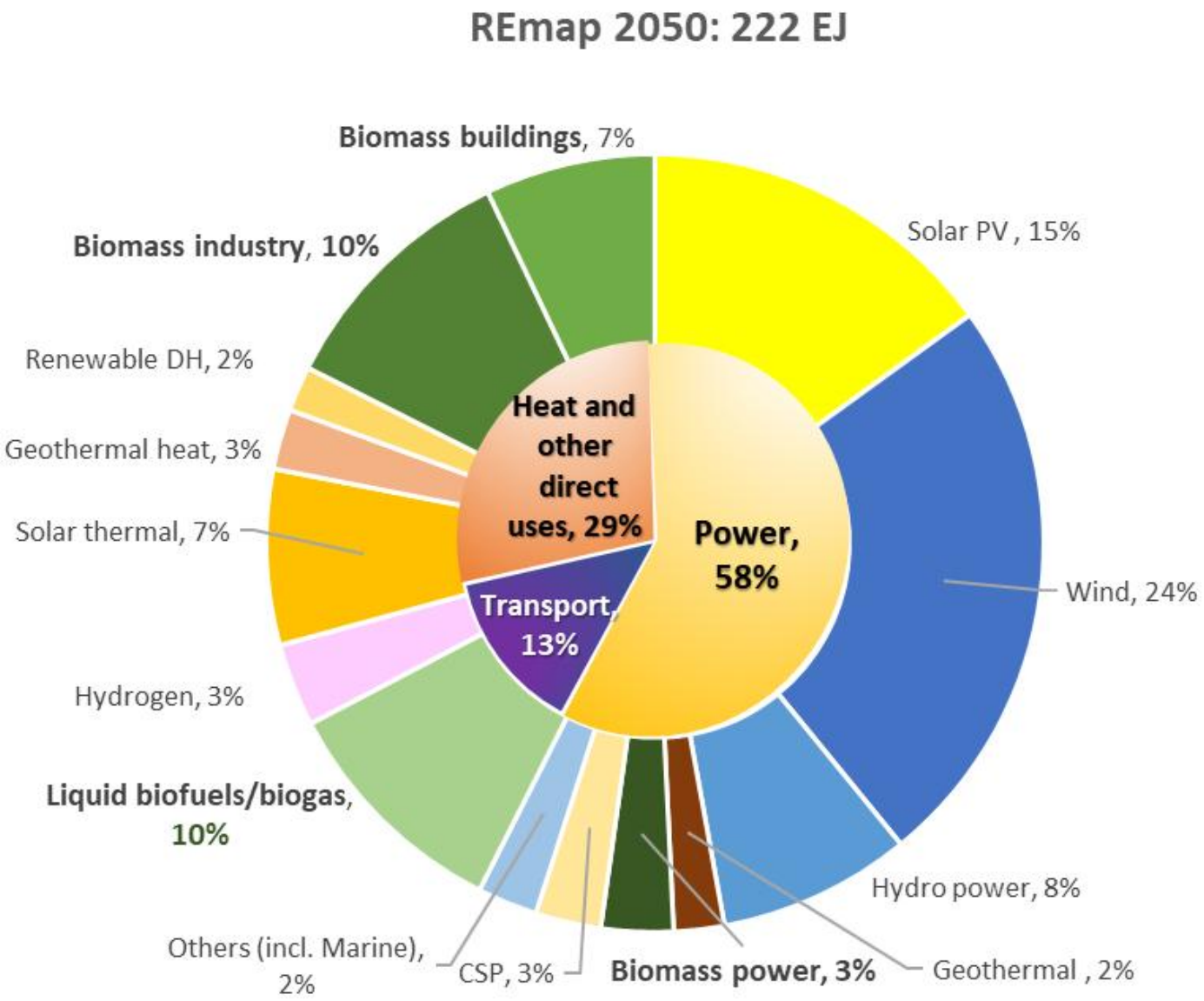
- ***Renewable Power to Electrify Passenger Vehicles***,
  - better batteries bringing greater EV range
  - mass production lowering EV purchase costs,
  - operating costs lower for EVs than oil-fueled vehicles
  - GHG emissions lower for EVs even with fossil-fueled power, decline sharply as RE generating share grows
- ***Biofuels for Aviation, Freight and Marine Shipping***
  - High power needs require fuel with high energy density
  - Biofuels can be produced from many feedstocks

Bioenergy largest RE source globally: 1/3 of cost-effective potential in 2050



Most important RE source in EU: 2/3 in 2010, still over 1/2 in 2030

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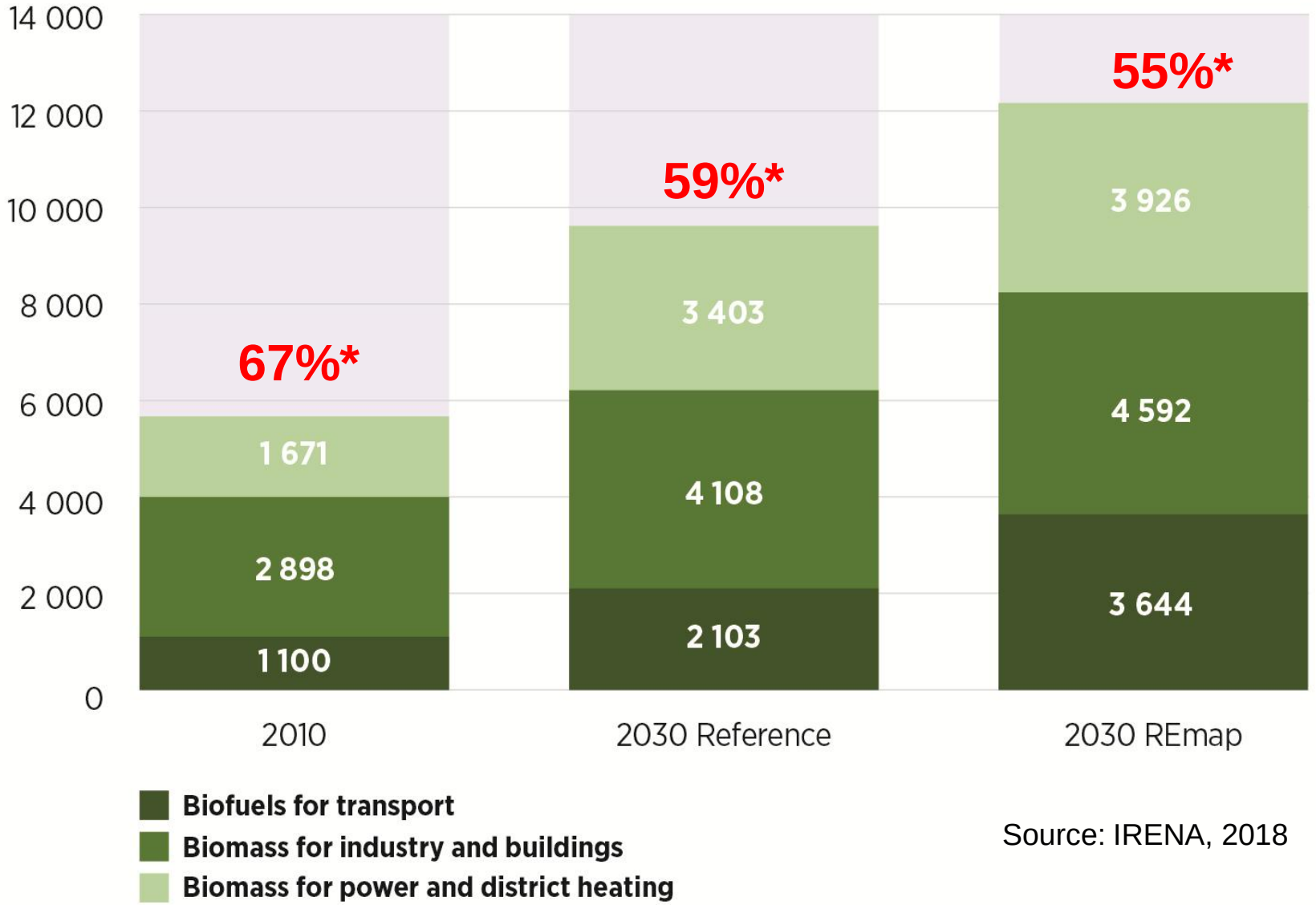
*biomass share of total RE deployment



Source: IRENA, 2018

Sustainable Biomass Resources

- Agriculture
  - Residues associated with growing food production
  - Higher yields on cropland (sustainable intensification)
  - Efficient livestock husbandry, freeing up pasture land
  - Reduced food losses and waste, freeing up farmland
- Forestry
  - Residues (complementary fellings on timberland)
  - Higher yields in planted forests (better management)
  - Afforestation of degraded forest and marginal lands

Carbon Benefits of Biofuels (gCO2/MJ)

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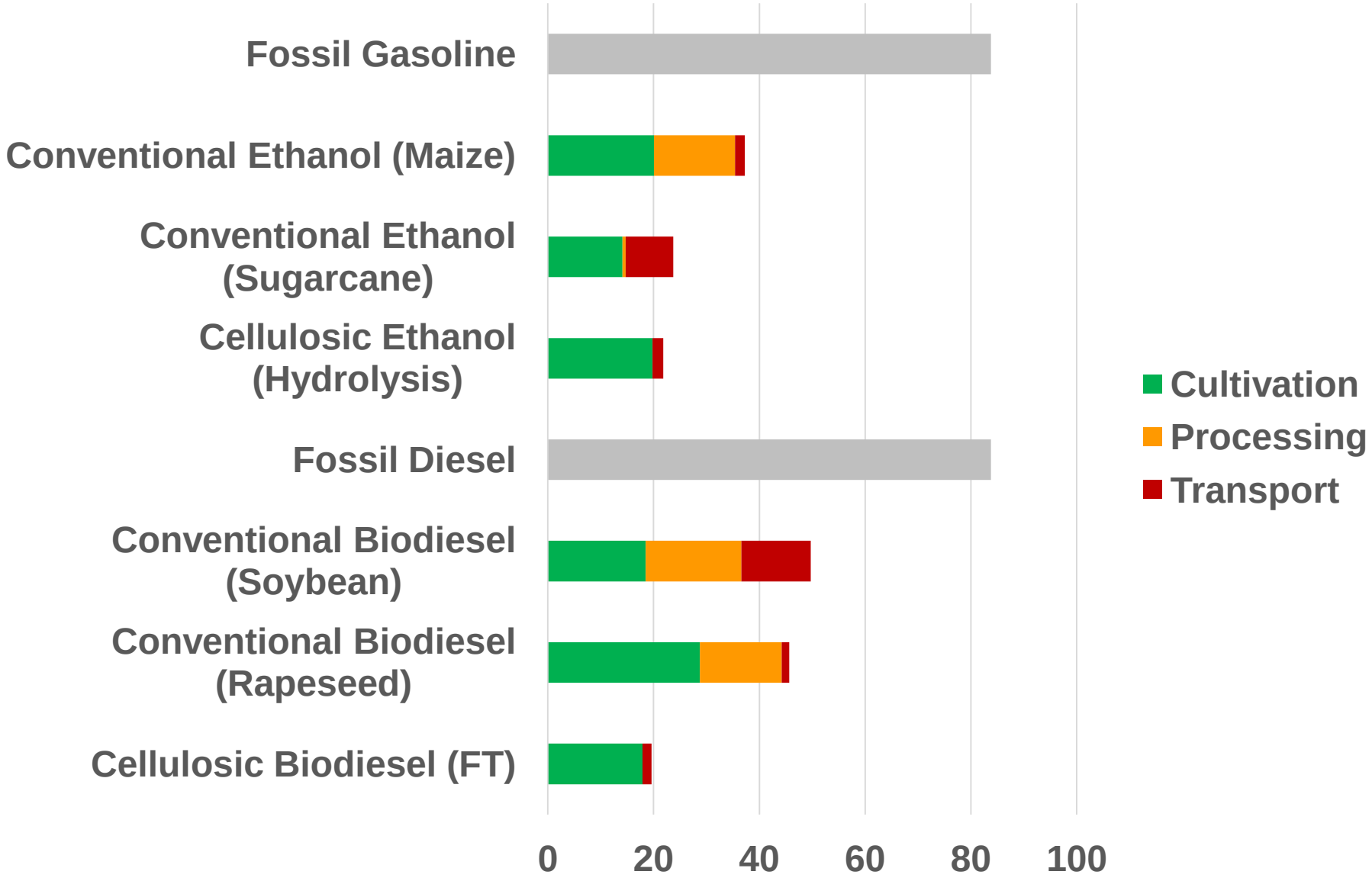

Future Fuel Costs in 2050 ($/GJ) with $117/bbl Oil and $0-80/tCO2-eq

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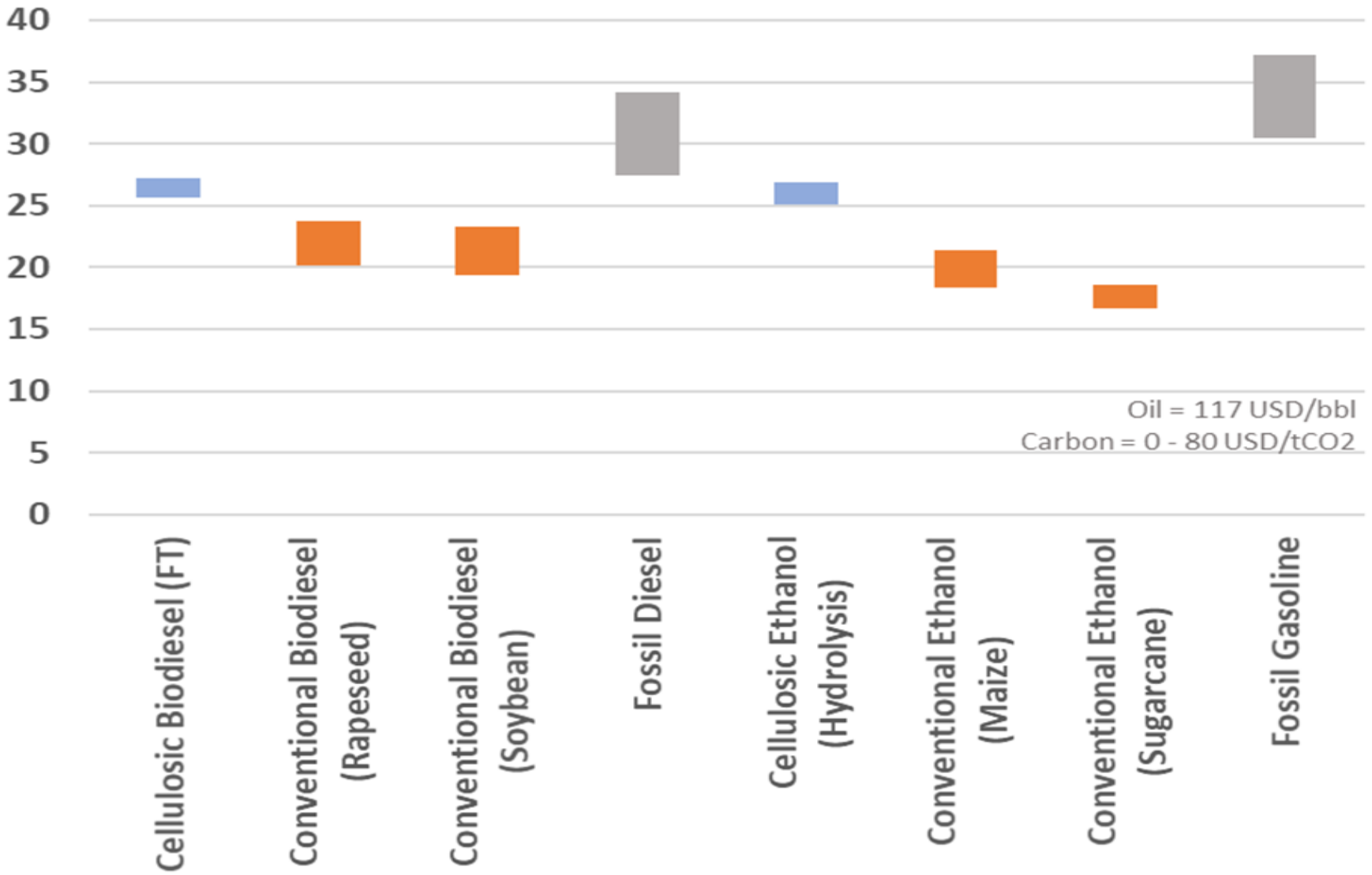

Future Fuel Costs in 2050 ($/GJ) with $70/bbl Oil and $0-80/tCO2-eq

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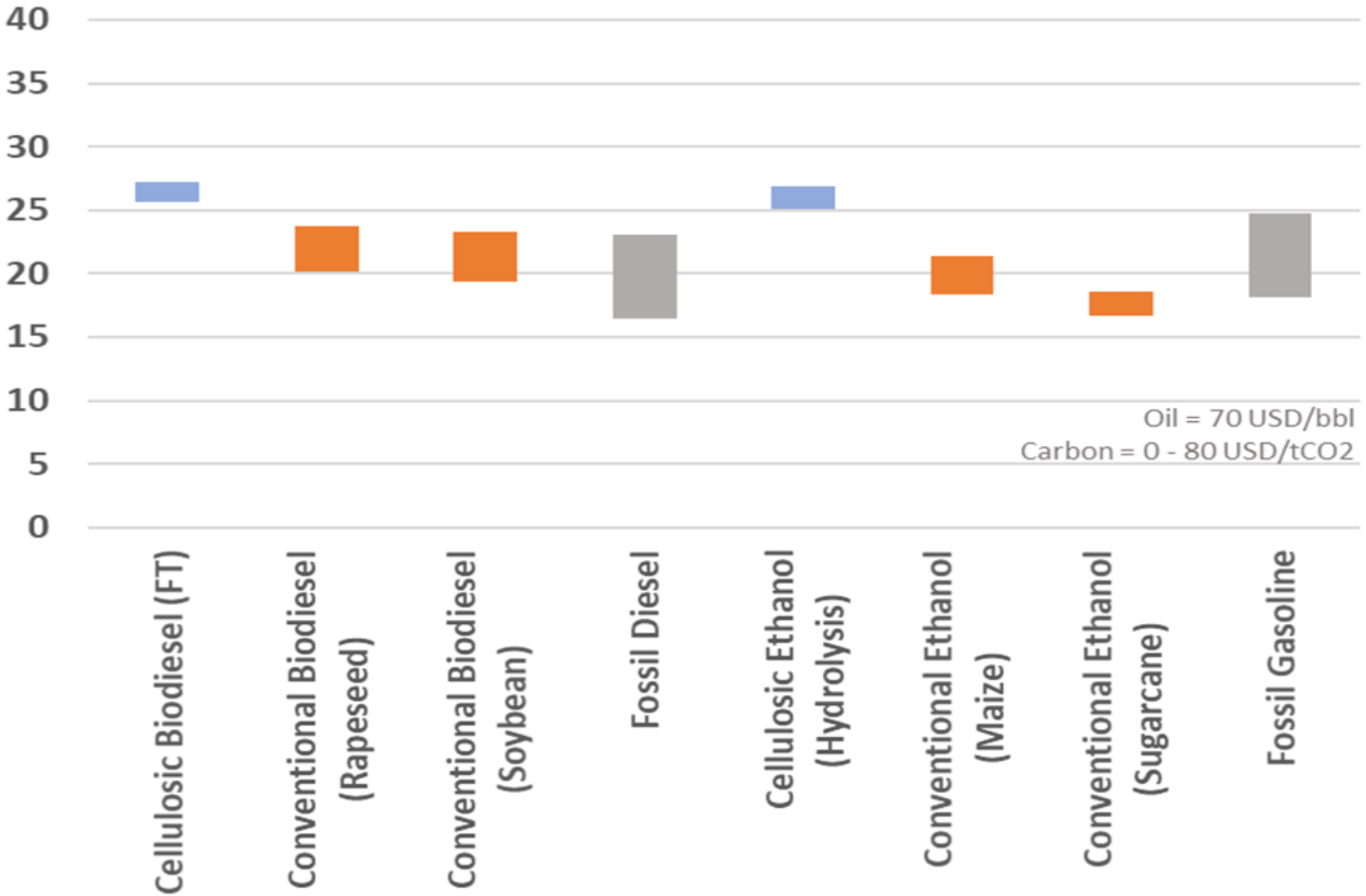
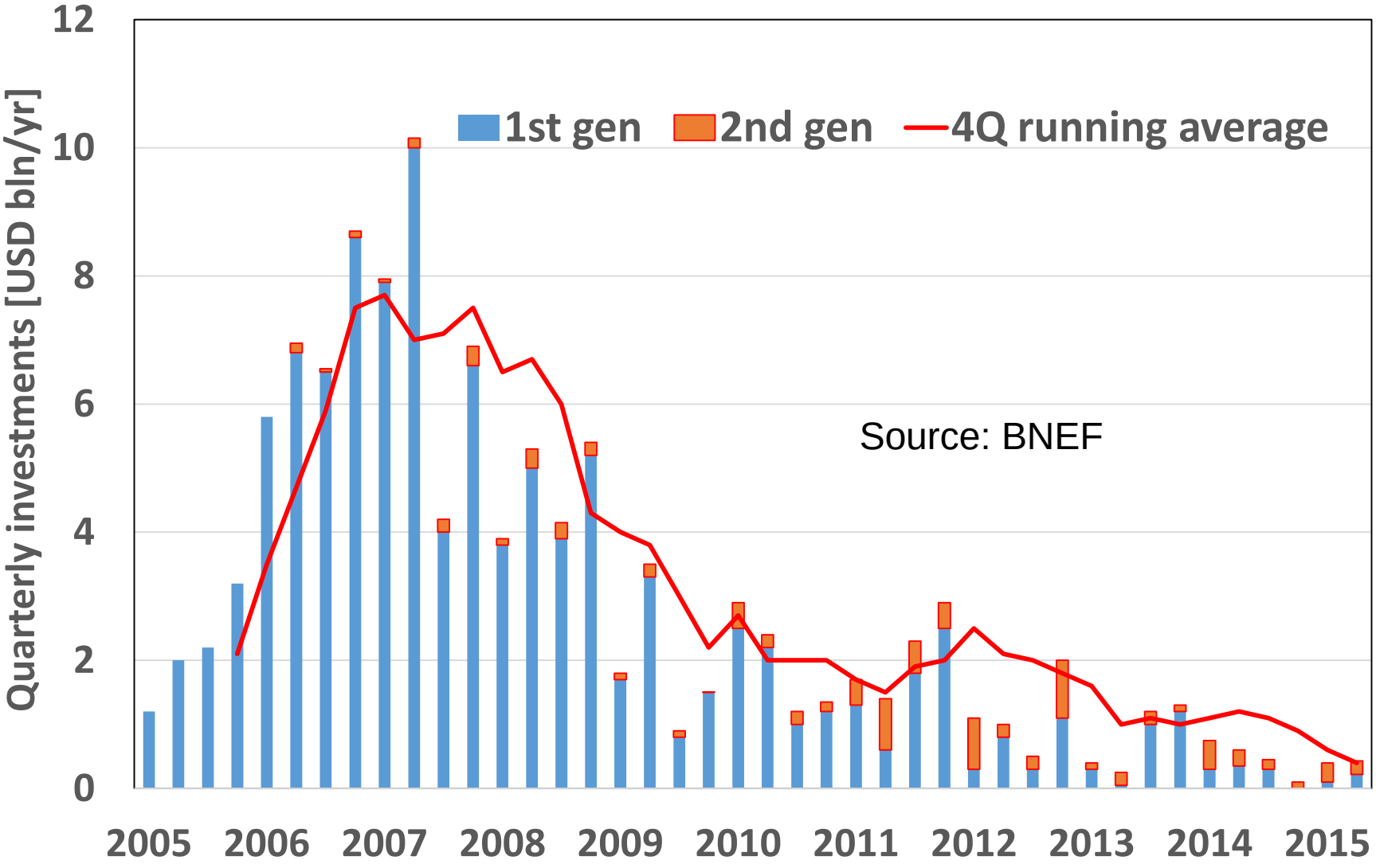


Global Investment in Liquid Biofuels



Sector is not developing as needed for energy transition

Where will we get our biojet?,

- ***Feedstocks and technologies to consider:***
  - Oilseed crops on restored land (upgrade biodiesel)
    - Europe (rapeseed), China, Americas.
  - Wood residues (Fischer-Tropsch thermochemical route)
    - Unrealised potential in SE Europe
  - Sugar/Energy cane (1G+2G ethanol plus conversion)
    - Brazil, Southern Africa, Caribbean
- ***Policy supports to consider:***
  - RD&D support for pilot plants w lignocellulosic feedstock
  - Significant market value for carbon and methane
  - Volumetric renewable fuel mandates
  - Limits on jetfuel carbon per person-km, tonne-km

Bioenergy for Sustainable Development

IRENA – International Renewable Energy Agency
http://www.irena.org/

IEA Bioenergy – International Energy Agency
Technology Collaboration Programme on Bioenergy
http://www.ieabioenergy.com/

FAO – Food and Agriculture Organization of the UN
http://www.fao.org/

Yield Gap: Illustrated by Maize

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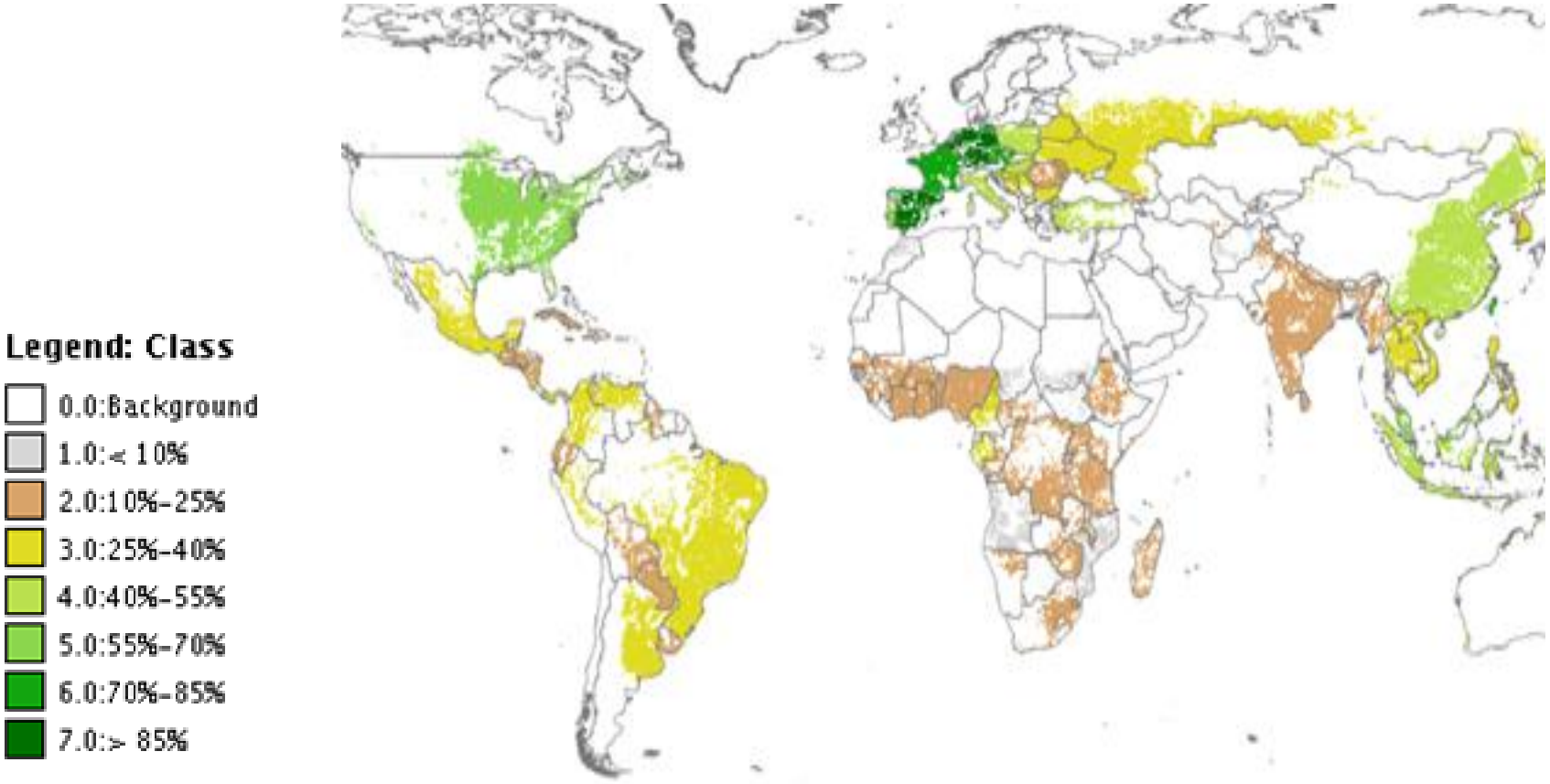
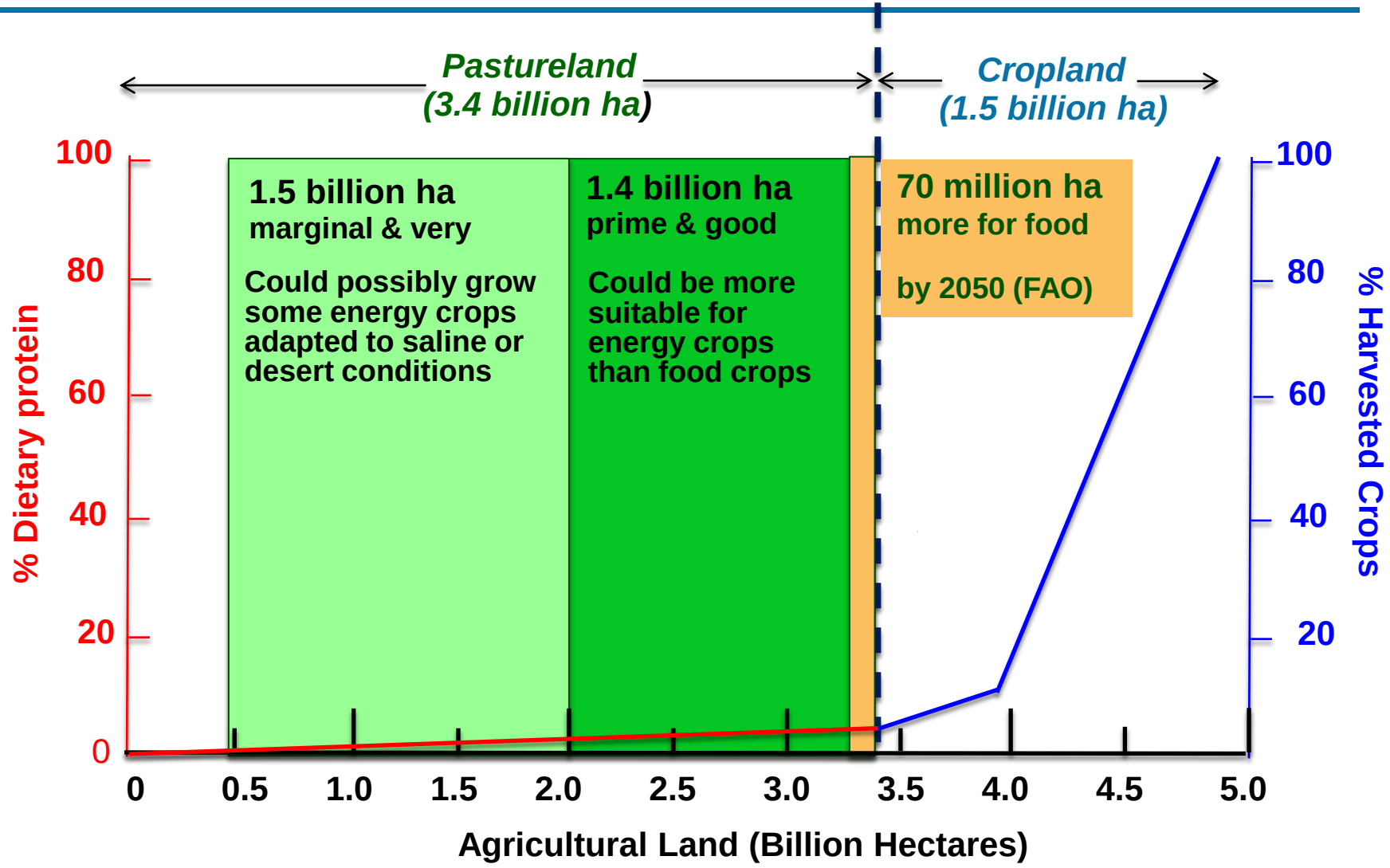
Ratio of Actual to Potential Yield for Maize (Year 2000)



Source: Global Agro-Ecological Zones

Pastureland Available Globally for Biofuel Crops



Expansion Measures: Higher Yields

Several measures can help **boost yields** . . . **Agricultural extension services can promote adoption of modern farming techniques** and development of good management practices at a local level, including agroforestry strategies for growing a mix of high-yielding food and fuel crops in different soils and climates. **Secure land tenure can give farmers financial incentives to manage their land for high yields while sustaining soil productivity**.

Best Practice Losses by Food Chain Stage

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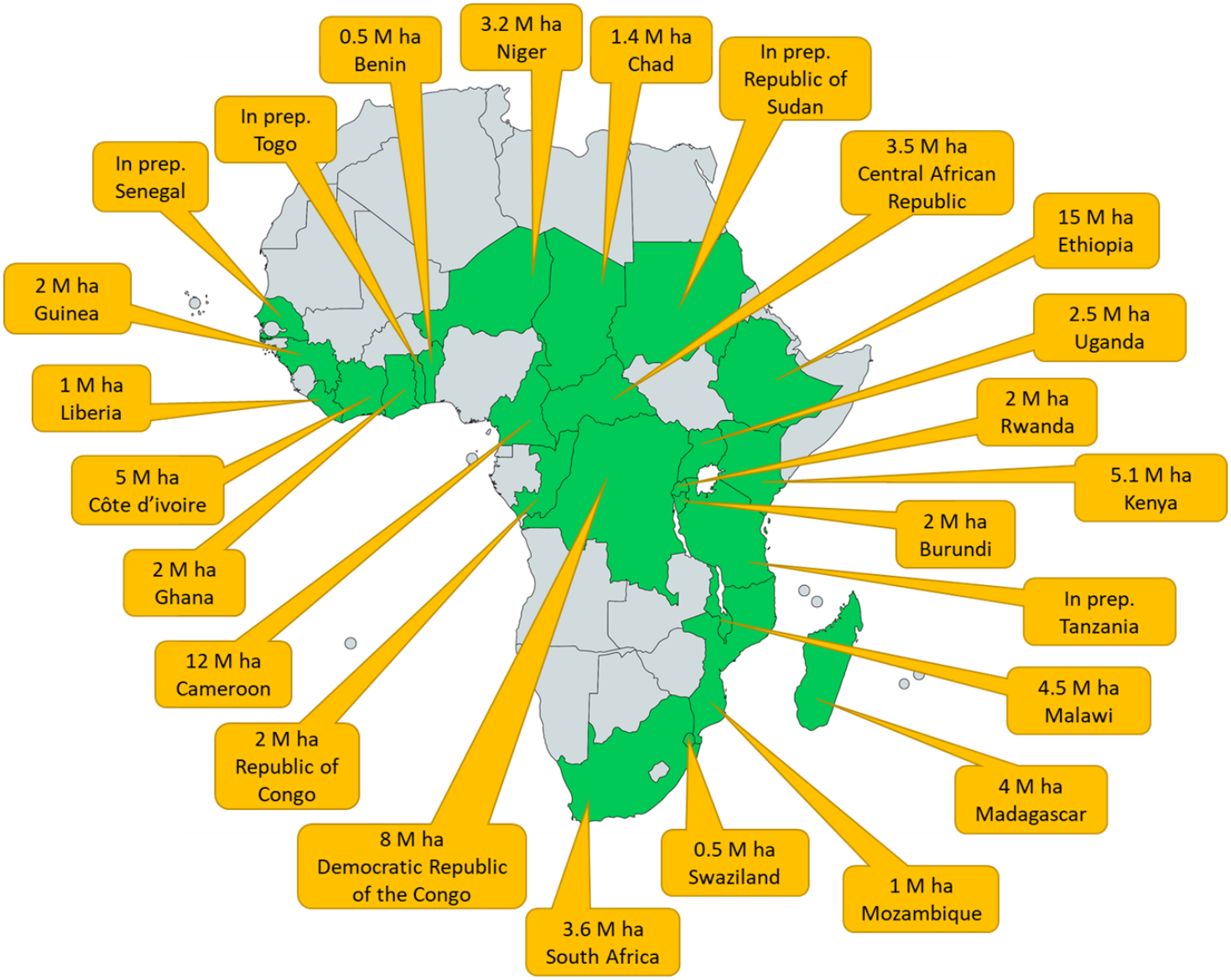
Food Type	Agricultural Production	Postharvest Handling & Storage	Processing and Packaging	Distribution: Supermarket Retail	Consumption
Cereals	2%	2%	3.5%	2%	1%
Roots & Tubers	6%	7%	10%	3%	2%
Oilseeds & Pulses	6%	0%	5%	1%	1%
Fruits & Vegetables	10%	4%	2%	8%	5%
Meat	2.9%	0.2%	5%	4%	2%
Milk	3.5%	0.5%	0.1%	0.5%	0.1%

Reduced Food Chain Waste and Losses

Food chain losses could be reduced by promoting good harvesting techniques, investing in storage and refrigeration facilities, developing transportation infrastructure to safely deliver food to markets, **discounting imperfect food items** to encourage their sale, **modifying labels** so food is not discarded prematurely, and **educating consumers** to better match food purchases to their needs.

Restoring Degraded Landscapes



Restoring Degraded Land

Use of degraded or marginal land is an option for biomass production that **helps restore soil productivity and avoids or mitigates competition for higher quality land. Economic incentives** to promote such land uses should be combined with dissemination of **information on suitable production systems** and experience from previous initiatives, while protecting vulnerable communities.

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Farm and Forest Residues

Other steps can support **better use of residues and waste from agriculture and forestry value chains**. Examples include incentives for sustainable use of residues, supported by **guidelines to ensure appropriate residue extraction rates** in different conditions. **Soft loans for machinery** can further support the ramping up of bioenergy systems that use residues and waste as feedstock… **Logistical approaches** for cost-effective harvesting and transport of … residues can be disseminated.

Conference on Decarbonising Transport

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Encourage Options with Low ILUC

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Regulations should adopt a transformative approach to Indirect Land Use Change (ILUC). Indirect Land Use Change (ILUC), while an important environmental concern and a key driver in European regulatory deliberations, is impossible to measure and hard to model. Thus, regulations should attempt to **steer investors towards options with low risk of ILUC, such as biofuels made from farm or forest residues, feedstocks grown on degraded land, or feedstocks with very high yields**. Such options are abundant in Europe and globally. Good policies can drive positive change and prevent ILUC, instead of assuming it.

Reward CO_2 Emissions Reductions

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An evidence-based approach is needed to ensure biofuel sustainability. The most effective way to reduce the costs and carbon emissions of biofuels is to **reward reductions in carbon emissions per unit of energy produced**. The preferred approach is to assess and **stimulate those feedstocks that have higher yields and those processes that are most cost, energy, and carbon-efficient**. Aside from specific support to promote new technologies…, regulatory distinctions between conventional and advanced biofuels, or between food and fuel crops, may not produce the best outcomes as low-emission, cost-effective approaches to low carbon fuel production often involve a mix of feedstocks and conversion processes.

Provide Stable Policy Support

Predictable, long-term policy support will be required to ensure bioenergy scaleup. Regulatory and policy support is required to ensure the reliable supply of low carbon transport fuels. This support can take the form of a relevant **market price for carbon emissions reductions, volumetric targets,** or a combination of the two. Support is also required to **reduce the costs of innovative conversion technologies** and bring them to industrial scale, as the capital costs of such technologies can be cut in half once several pilots are built. To be effective in eliciting investment, in view of the long period required for commercial operation, support frameworks should be reliable and predictable.

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