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A Global Perspective on Biofuels

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Presentation Outline

1. Global Overview
2. Global Regulations and its Impact on the Biofuels Industry
3. Drivers, Challenges, and Future Trends
4. Sustainable Aviation Fuels
5. Conclusion

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Global Overview

The Current Market

- First generation Biofuels continue to dominate
  - 15% - Biomass-based
  - 8% - Ethanol
- Increasing interest in advanced biofuels and SAF – dependent on policy, subsidies, and mandates.
- Upward trend
  - Increasing 3.3% annually in the last decade. (OECD)

Global Mandates & Actual and Estimated Annual Production

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		Production of Biodiesel in Million MT by Year (Actual & Estimated)						
Region/Country	**Mandate (diesel)**	**2024 (Actual)**	**2025 (Estimated)**	**2026 (Estimated)**	**2027 (Estimated)**	**2028 (Estimated)**	**2029 (Estimated)**	**2030 (Estimated)**
European Union	Member-state GHG/renewable quotas; typical blends B7–B10; Annex IX caps (no single EU-wide %).	13.89	14.15	14.31	14.47	14.63	14.8	14.96
United States	No fixed %; national RFS volumes (D4/D5) + state programs (e.g., MN B20 summer; LCFS crediting).	13.66	13	13.92	14.91	15.97	17.11	18.33
Indonesia	B35 in 2024; B40 rollout in 2025; B50 signalled for 2026 (policy-dependent).	11.43	12.76	16.73	16.95	17.17	17.39	17.61
Argentina	National B7.5 (law); occasional higher blends regionally.	1.16	1.23	1.32	1.42	1.53	1.64	1.76
Brazil	B14 from Mar 2024; B15 implemented Aug 2025; law targets B20 by 2030.	7.83	8.45	9.05	9.69	10.37	11.1	11.88
Malaysia	B10 nationwide; B20 in certain regions; pilots expanding (e.g., airports/ports).	1.39	1.41	1.5	1.6	1.7	1.82	1.94
Thailand	B7 typical; temporarily reduced to B5 from Nov 21, 2024, through early 2025.	1.56	1.41	1.47	1.54	1.61	1.68	1.76
Colombia	B10 nationwide (some actors above).	0.71	0.75	0.77	0.8	0.82	0.85	0.88
India	Indicative B5 by 2030; current ~0.5–1% blending; IS:1460 allows up to B7.	0.2	0.63	0.78	0.95	1.17	1.43	1.76
China	No national mandate; pilots (e.g., Shanghai B10; shipping B24 pilots).	2.64	2.29	2.49	2.72	2.96	3.23	3.52

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The European Union

Biofuels Landscape

- EU is the **world's largest biodiesel producer**, mainly from rapeseed oil, waste oils, and imported feedstocks (soy, palm).
- Ethanol production exists but is smaller compared to the U.S. or Brazil.
- Strong sustainability standards under the **Renewable Energy Directive (RED III)**.

Subsidies & Support

- **Blending mandates**: Minimum share of renewable fuels in transport (14% by 2030).
- **Tax exemptions/reductions**: Member states can exempt biofuels from excise taxes.
- **Sustainability certification**: Subsidies/incentives available only for certified low-ILUC (indirect land-use change) biofuels.
- **R&D support**: EU Horizon Europe funds advanced biofuels projects.
- **Cap on food-based biofuels**: First-gen fuels limited to 7% of transport energy.

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The United States of America

The USA

- **Biofuel type**: Corn ethanol, soy biodiesel, renewable diesel.
- **Subsidies & Support**:
  - **Renewable Fuel Standard (RFS)**: Obligates refiners to blend set volumes of biofuels.
  - **Tax credits**:
    - Biodiesel Tax Credit ($1/gal).
    - Sustainable Aviation Fuel (SAF) Credit ($1.25/gal)- Qualifying SAF must reduce GHG emissions by 50% (2022 Inflation Reduction Act).
  - **Loan guarantees & grants**: USDA programs (Higher Blends Infrastructure Incentive Program) for biofuel infrastructure.

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Asia

China

- **Biofuel type**: Corn ethanol, cassava ethanol, biodiesel from waste oils.
- **Subsidies & Support**:
  - Pilot programs for **E10 ethanol blends** (not nationwide).
  - **Government subsidies** for ethanol plants (though reduced after 2017 due to food security concerns).
  - Support shifting toward **advanced biofuels and waste-based biodiesel**.

India

- **Biofuel type**: Ethanol from sugarcane, maize; biodiesel from non-edible oils and used cooking oil.
- **Subsidies & Support**:
  - **Ethanol Blending Program**: Target of **20% blending by 2025**.
  - **Price guarantees**: Government fixes attractive procurement prices for ethanol.
  - **Soft loans**: To expand ethanol distilleries.
  - Excise duty waivers on ethanol-blended fuels.
  - Biodiesel blending target B5 expected to be increased to B10 (~10million MT of Biodiesel required)

Southeast Asia

- **Biofuel type**: Palm oil-based biodiesel.
- **Subsidies & Support**:
  - **Indonesia**: B40 mandate (~13.6million MT/year [APROBI]); subsidies funded by palm oil export levies.
  - **Malaysia**: B10 national mandate for transport and B7 for industry (~1.2Million MT/ year [MBA]). Likely to move to B20 for transport.
  - **Thailand**: B5 biodiesel mandate. Incentives for ethanol (cassava, sugarcane) and biodiesel; government price controls.

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South America

Brazil

- **Ethanol from sugarcane**:
  - World's **second-largest ethanol producer** (after the U.S.).
  - High efficiency: sugarcane ethanol has among the **lowest carbon footprints** of any biofuel.
  - Widespread adoption: Flex-fuel cars can run on gasoline, ethanol, or blends.
- **Policy**: Proálcool Program (1970s) pioneered large-scale ethanol use; RenovaBio (2017) incentivizes carbon intensity reductions.
- **Biodiesel**: Produced mainly from soybean oil; mandated blending rates are increasing.

Argentina

- **Soy-based biodiesel**: Among the world's largest exporters.
- **Domestic policy**: Mandates blending biodiesel into diesel; however, export restrictions and global trade disputes sometimes affect growth.
- **Challenges**: Heavy reliance on soy monocultures raises sustainability concerns.

Colombia

- **Ethanol**: Produced from sugarcane; mainly for domestic blending mandates.
- **Biodiesel**: Palm oil-based biodiesel industry; contributes to rural development and enables the country to capitalize on the crop's potential.

Paraguay & Others

- **Paraguay**: Expanding ethanol production from sugarcane and maize.
- **Chile, Peru, Uruguay**: Smaller-scale projects; policies are less consistent compared to Brazil and Argentina.

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Global Regulations and its Impact on the Biofuels Industry

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Understanding the EU Deforestation Regulation (EUDR)

- **Purpose:** Aims to minimize the EU's contribution to global deforestation and forest degradation.
- **Key Commodities:** Covers palm oil, soy, wood, cocoa, coffee, rubber, and cattle, and their derived products.
- **Core Mandate:** Prohibits placing products on the EU market unless they are:
- **Deforestation-free:** Produced on land not deforested after December 31, 2020.
- **Legally produced:** Compliant with the laws of the country of production.
- **Due Diligence Obligation:** Companies must conduct rigorous due diligence to verify compliance.
- **Effective Dates:**
  - **December 30, 2025:** Large and medium-sized companies.
  - **June 30, 2026:** Micro and small enterprises.

The Renewable Energy Directive III (RED III)

- **Evolution from RED II:** Latest EU directive (Directive (EU) 2023/2413) boosting renewable energy targets to 42.5% by 2030.
- **Key Impact on Palm Oil:**
  - **Reinforced Phase-Out:** Confirms the gradual phase-out of high indirect land-use change (ILUC) risk biofuels (including palm oil) from EU renewable energy targets by 2030.
  - **Stricter Criteria:** Imposes more rigorous sustainability and GHG emission saving criteria for all biofuels and bioliquids.
- **Combined Pressure with EUDR:**
  - **RED III:** Targets sustainability of biomass for energy (e.g., palm oil for biofuels) due to ILUC risks.
  - **EUDR:** Mandates deforestation-free supply chains for all covered commodities, including palm oil, regardless of end-use.

Increase in the Need for Supply Chain Transparency

- **Challenge:** Biofuel supply chains are often fragmented, with multiple intermediaries from plantation to end product.
- **Technological Solutions:**
  - **Blockchain Technology:** Creates an immutable and transparent ledger of all transactions and data points across the supply chain, from farmer to refinery.
  - **Digital Platforms & Databases:** Centralized systems to manage supplier information, certifications, and compliance data.
  - **API Integrations:** Connecting various systems (ERP, traceability, EU-DDS) for seamless data flow.
- **Outcome:** Enhanced visibility into the origin and journey of biofuels, enabling proactive risk identification and mitigation.

Technology as an Enabler for EUDR Compliance

- The complexity of global biofuels supply chains necessitates advanced technological solutions. Traditional manual processes are insufficient for the stringent demands of EUDR.
- Technology empowers companies to:
  - Gather and verify data at scale.
  - Assess and mitigate risks effectively.
  - Demonstrate verifiable compliance.

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Drivers, Challenges, and Future Trends

Drivers of Global Biofuel Trends

- **Energy security**: Reduce reliance on imported fossil fuels.
- **Climate policy**: Lower lifecycle greenhouse gas emissions compared to fossil fuels.
- **Rural development**: Job creation and income in agricultural regions.
- **Transport sector**: Key role in decarbonizing aviation, shipping, and heavy-duty transport where electrification is harder.

Challenges faced in the sector

- **Food vs. fuel**: Competing with food crops for land and water.
- **Environmental impact**: Deforestation, biodiversity loss, fertilizer use.
- **Economic competitiveness**: Often requires subsidies or mandates to compete with fossil fuels.
- **Technological hurdles**: Scaling advanced biofuels remains difficult.

Future Trends

- Rising demand for certified sustainable biofuels
- Sustainable Aviation fuels (SAF) as a new frontier
- Huge potential in second-generation biofuels (residues, bagasse)
- Regional integration opportunities

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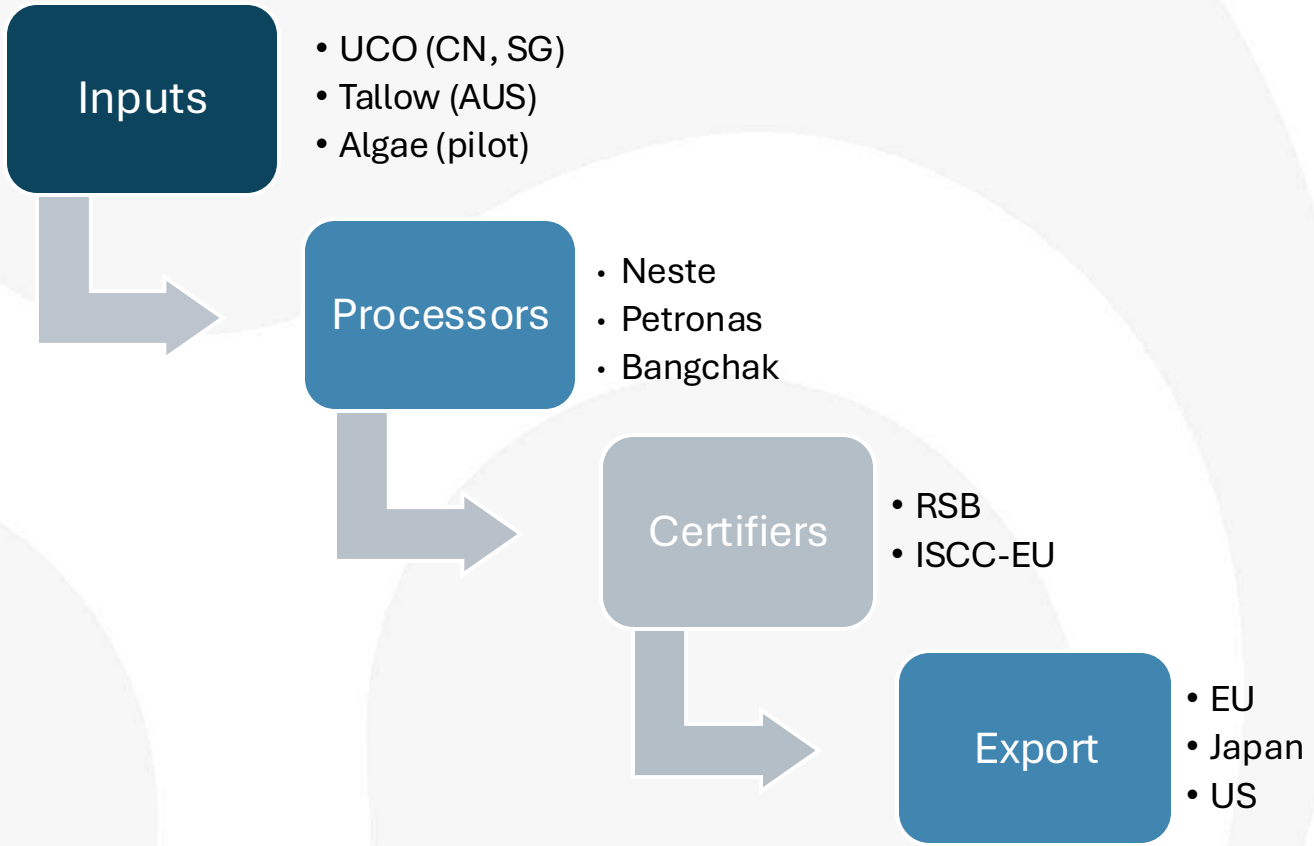
Sustainable Aviation Fuels

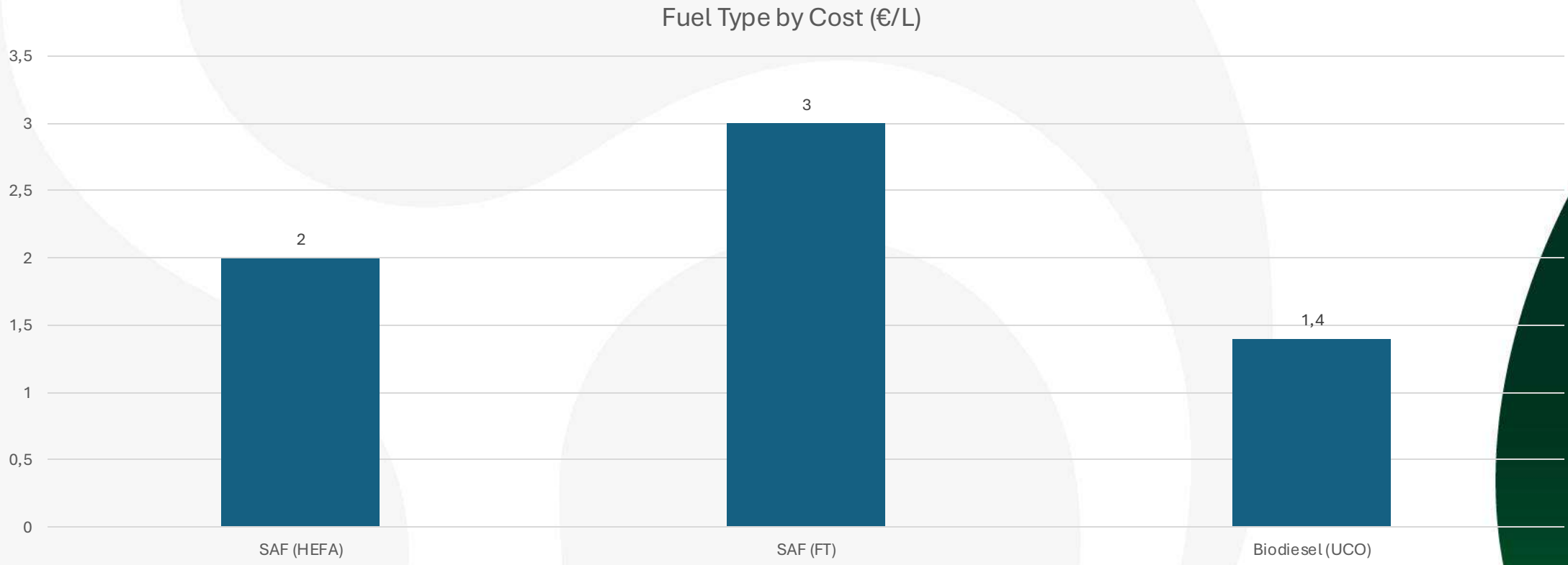
Current Status & Demand Outlook

- **Current Status (2024)**
  - ~1 million tonnes produced (≈0.3% of jet fuel demand). (IATA)
  - 1,150% growth since 2021, but still minimal. (BCG)
- **Demand Outlook (SkyNRG)**
  - **2030**: 15–17 Mt (≈5% of jet fuel).
  - **2035**: ~40 Mt demand vs ~18 Mt supply (large gap).
  - **2050**: Up to 12–19% of jet fuel demand.

SAF Feedstock Supply Chain



SAF vs Biodiesel Cost Comparison



Mandate Map (Blending % and Years)

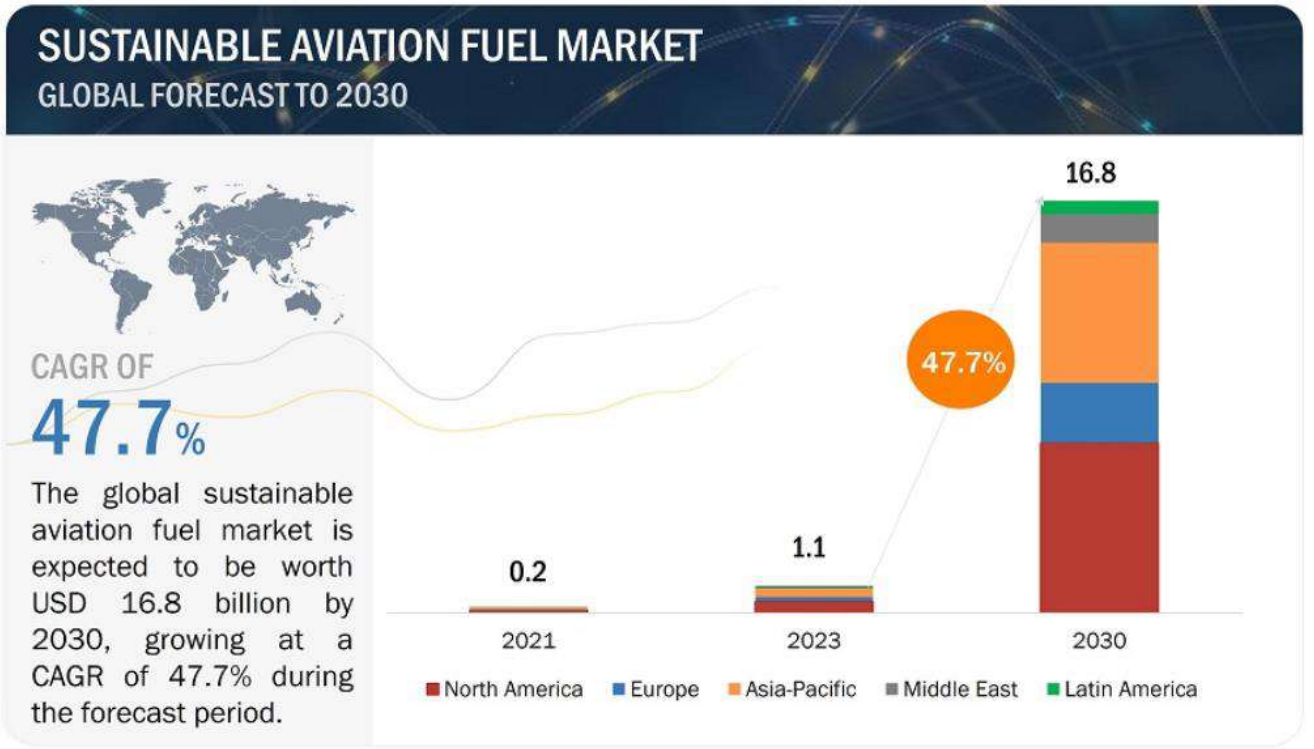
Region	SAF Mandate	Biodiesel Mandate
EU	2% by 2025 → 6% by 2030	14% RED II target
Indonesia	5% SAF by 2025	40% biodiesel
Malaysia	1% SAF pilot	B30
US	35B gal SAF by 2050	State-based

Key Barriers

- **Investment:** 3–5x costlier than conventional jet fuel.
- **Feedstock Availability:** Limited feedstocks (mainly HEFA today).
- Underinvestment in new capacity.

Opportunities

- **Strategic Targets:** Strong airline/net-zero commitments.
- **Policy Driven:** Rising mandates (EU, UK, U.S., Asia).
- **New R&D:** Scale-up of advanced tech (e-SAF, power-to-liquid).
- **New Entrant Advantage:** Early Entry into the market ensures higher margins and secures access to raw materials.



Source : MarketsandMarkets

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Conclusion

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Key Takeaways

- **Biofuels matter globally**: key to transport decarbonization, energy security, and rural development.
- **Challenges**: land use competition, sustainability risks, high production costs, and tech scale-up hurdles.
- **Sustainable Aviation Fuel (SAF)**:
  - Demand growing from ~1million MT today to 15–17million MT by 2030 and ~40million MT by 2035.
  - Production lags—large supply gap expected.
  - Needs $20–45B in investment, stronger policy signals, and advanced feedstocks.

Regional Dynamics

- **Regional dynamics**:
  - **South America**: biofuel powerhouse (Brazil's sugarcane ethanol, Argentina's soy biodiesel).
  - **EU**: strong sustainability rules, phasing down food-based fuels, heavy R&D focus.
  - **U.S. & Brazil**: rely on blending mandates, tax incentives, and carbon credit systems.
  - **Asia**: mixed—India accelerating ethanol, Southeast Asia leaning on palm biodiesel, China cautious on food-based fuels.

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Thank You

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