CropLife Brasil Submission on the COP30 Presidency Roadmap for Transitioning Away from Fossil Fuels

1. **What are the most critical barriers - whether physical, economic, financial, institutional, technological or social - preventing a transition away from fossil fuels?**

Recognition of biofuels and sustainable agriculture as a lever to promote energy transition

The Global Stocktake[1] paved a multilateral momentum to design ways to push forward energy transition, establishing a goal to triple renewable energy capacity globally up to 2030 and to transition away from fossil fuels in energy systems.

It is important to emphasize that the energy transition is already underway. The International Energy Agency (IEA) released a report at the end of 2025 indicating that "global renewable energy capacity is expected to double between now and 2030, increasing by 4,600 gigawatts (GW). This is roughly equivalent to adding the combined power generation capacity of China, the European Union, and Japan to the global energy mix. Solar photovoltaic energy accounts for nearly 80% of this global increase, followed by wind, hydropower, bioenergy, and geothermal energy. In more than 80% of countries worldwide, renewable energy capacity is expected to grow faster between 2025 and 2030 than in the previous five-year period".[2]

Despite the opportunities to increase renewables, there are challenges to advance and transform renewables sources into the main driver of energy for multiple purposes.

The "Delivering Sustainable Fuels, Pathway to 2035"[3], published by the IEA, states that sustainable fuels, including liquid biofuels, biogases, low-emissions hydrogen and hydrogen-based fuels, based on a technology-open approach, complement electrification and energy efficiency and are particularly important for sectors that continue to be reliant on fuel-based solutions such as aviation, shipping, and parts of road transport and industry.

Current estimates indicate that, with greater use of renewable electricity, liquid biofuels, biogases and renewable hydrogen and hydrogen-based fuels, renewable energy consumption in transport is expected to increase by 50% up to 2030.[4]
The International Renewable Energy Agency (IRENA) shows that tripling renewable capacity under the 1.5°C Scenario requires bioenergy to double by 2030 to nearly 310 GW.[5]

In this scenario, agriculture has a tremendous role to play when it comes to foster solutions to substitute fossil fuels. However, criticisms regarding biofuel production, based on concerns about deforestation, land degradation, clarity regarding carbon

[1] UNFCCC, 2023. Decision 1/CMA.5. Outcome of the first global stocktake. Available in: https://unfccc.int/documents/637073
[2] https://iea.blob.core.windows.net/assets/76ad6eac-2aa6-4c55-9a55-b8dc0dba9f9e/Renewables2025.pdf
[3] IEA, 2025. Delivering Sustainable Fuels, Pathway to 2035. Avaliable at: https://iea.blob.core.windows.net/assets/49afc3ce-527d-4637-bde5-005416afed24/DeliveringSustainableFuels.pdf
[4] IEA, 2025. Renewables 2025 – Analysis and forecasts to 2030. Available at: https://www.iea.org/reports/renewables-2025
[5] IRENA, 2025. Delivering on the UAE Consensus. Tracking Progress Toward Trripling Renewable Energy Capacity and Doubling Energy Efficiency by 2030. Available at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2025/Oct/IRENA_COP30_GRA_Tracking_the_UAE_Consensus_2025.pdf

footprint, and competition between food and fuel, downplay the importance of biofuels for the global decarbonization agenda.

Brazil is leading the process towards energy transition based on five decades of experience with ethanol and other agri-based bioenergy that accounts to 29% of the energy matrix, add to an additional 20% of renewables from other sources. Add to sugarcane and maize ethanol, biodiesel, biogas and biomethane are increasingly important as reliable and sustainable sources of energy transition in the transport sector. Moreover, the production of bioelectricity mainly from sugarcane bagasse and straw, generated around 21.218 GWh, representing 4% of the national consumption in 2024.

Sugarcane and corn ethanol represented 37 billion liters in 2024, and there are around 22 billion liters of idle capacity and extra 16 billion liters based on productivity gains and new corn mills already approved. Ethanol, derived from sugarcane and corn, stands out as a mature, low-carbon intensity solution with immediate expansion potential safeguarding land use change impacts and avoiding food security competition. The diversification of sustainable fuels, aligned with innovative technologies such as flex-fuel hybrid vehicles, a combination of electric and combustion engines, allows to diversify and increment the use of sustainable fuels as triggers to achieve mitigation outcomes and energy security.

The energy transition in the agricultural sector is directly associated with the ability to increase productive efficiency, optimize the use of inputs, and reduce the intensity of emissions in production systems. In this context, the limitation or delay in access to modern agricultural technologies constitutes a relevant structural barrier, since it:

- Restricts the potential for mitigating GHG in the agricultural sector;
- Compromises the achievement of sustainable productivity gains over time;
- Increases indirect pressure on the expansion of land use, with possible impacts on natural ecosystems.

International regulatory asynchrony has emerged as a significant structural barrier, delaying access to biotechnologies, bio-inputs, and other innovative solutions essential for accelerating this transformation.

Prolonged and complex technology assessment and approval processes in strategic markets increase the level of regulatory uncertainty and reduce the incentive for investment in research and development. Therefore, technologies that could contribute to reducing the use of more energy-intensive inputs, optimizing agricultural management, and increasing sustainable productivity take longer to reach producers. This delay compromises the speed of the transition to more emission-efficient production systems that are less dependent on indirect fossil fuel sources.

Furthermore, the disparity between national regulatory frameworks generates competitive distortions that impact the ability of different countries to simultaneously advance on decarbonization trajectories. In situations where the approval of biotechnologies occurs with significant lags between markets, global production and trade chains begin to operate under asymmetrical conditions of access to innovation. In this sense, international regulatory harmonization, based on scientific criteria and proportionate risk assessment approaches, constitutes a strategic element to enable the transition away from fossil fuels in the agricultural sector.

Greater institutional predictability tends to stimulate investments in low-carbon technologies, strengthen innovation ecosystems, and expand producers' access to tools capable of reducing the energy intensity and emissions of production systems. Promoting greater regulatory convergence, technical cooperation, and recognition of assessments among countries can, therefore, accelerate the diffusion of modern agricultural solutions and contribute concretely to the global objectives of climate mitigation and food security.

In this sense, the roadmap offers a great opportunity to recognize and agree that sustainable biofuels, based on high environmental standards, are fundamentally complementary as solutions to substitute fossil fuels.

Economic and financial barriers

The climate transition requires high volumes of investment in innovation, adaptation, and productive modernization. Expanding funding sources and fostering access to innovative tools that drive innovation and energy diversification is the focus of the climate agenda. The IEA estimates that investment in renewable energy must reach at least US$ 4.8 trillion per year by 2030, rising to more than US$ 5 trillion per year by 2030.

The Baku-Belém Roadmap for the US$ 1.3 trillion goal, which serves as a reference for exploring ways to mobilize resources and facilitate access, highlights that high financing costs are an obstacle that must be overcome. In developing countries, interest payments account for more than 50% of electricity costs, compared to less than 30% in Europe. It is estimated that a reduction of just 1% in financing rates would save US$ 140 billion annually, making capital-intensive projects viable.

The roadmap should invite countries aligned with sustainable biofuels as a solution towards energy transition to foster cooperation, technology transfer, financing, trade, and the promotion of renewable energy sources. This approach could be particularly useful in unlocking financial challenges associated with projects, including the role of Multilateral Development Banks, the financial market, and public financing policies.

Moreover, it is quite relevant to address the barriers to access financial resources to improve sustainable agriculture and the implementation of sustainable technologies that can deliver sustainable fuels.

Institutional and governance barriers

The energy and climate transition still faces challenges related to the integration of public policies. These include, for instance:

- Fragmentation between energy, agriculture, land use, and innovation policies
- Climate approaches that exclusively prioritize emissions reduction, without considering adaptation, productive and social co-benefits
- Absence of instruments that recognize the strategic role of agriculture in the implementation of the Paris Agreement.

The lack of internationally harmonized scientific metrics to measure the climate benefits of the sustainable intensification of agricultural production also constitutes a significant barrier to the energy transition in the sector. Strengthening science-based monitoring, reporting, and verification systems is therefore fundamental to ensuring greater regulatory predictability and recognition of agriculture's role as a provider of global climate solutions.

2. What potential levers, whether economic, financial, institutional, social or technological, exist for accelerating the implementation of the transitioning away commitment?

Technological innovation in agriculture

The transition to low carbon agriculture based on mitigation, adaptation na co-benefits approach, agricultural sector is directly related to the advancement and adoption of modern agricultural technologies capable of increasing productive efficiency, reducing indirect energy consumption, and mitigating GHGs. Technical evidence demonstrates that technological innovation constitutes one of the main structural instruments for promoting food systems that are more resilient to climate change and environmentally sustainable.

There is a technological pack, improved continuosly, that can support mitigation and adaptation in agriculture. Some examples comprise:

- Soil recovery and continuous management
- No tillage
- Biological nitrogen fixation
- Plant biotechnology
- Bio-inputs and biological solutions
- Advanced genetic improvement
- More efficient chemical pesticides with better toxicological and environmental profiles
- Digital agriculture and precision technologies
- Integrated production systems (such as Integrated agriculture, livestock and forests and sustainable intensive management)
- Agroforestry systems
- Conservation of native vegetation on farms

The experience accumulated in recent decades indicates that these technologies simultaneously contribute to increased productivity and reduced emission intensity per unit produced. In the case of agricultural biotechnology, for example, greater efficiency in pest and weed control has allowed for a reduction in the volume of inputs applied and the number of mechanized operations in the field, resulting in lower fossil fuel consumption. Estimates indicate that the adoption of these technologies has enabled a cumulative saving of approximately 565 million liters of fuel, associated with the reduction of agricultural spraying operations, directly contributing to the decrease in emissions in the sector.

Conservationist soil management technologies, such as the no-till system, also play a relevant role in reducing the energy intensity of agricultural production. By minimizing the need for mechanized soil preparation, this system reduces the number of machinery operations in the field and, consequently, the consumption of fossil fuels. In addition, it contributes to increased carbon sequestration in the soil and improved land use efficiency, consolidating itself as a practical climate mitigation strategy associated with the energy transition in the agricultural sector.

Furthermore, the productivity gains provided by technological innovation have reduced the need for expansion of agricultural land. Between 1998 and 2022, it is estimated that the adoption of biotechnologies prevented the incorporation of approximately 21.4 million additional hectares into the Brazilian production system to maintain current production levels, contributing to the indirect mitigation of emissions associated with changes in land use.

In the field of biological solutions, the growth in the use of bio-inputs has also played a relevant role in the transition to lower-carbon production systems. Technologies such as biofertilizers and microbial inoculants increase the efficiency of nutrient use, potentially reducing dependence on synthetic nitrogen fertilizers, whose production is strongly associated with the consumption of fossil fuels.

In an integrated way, the adoption of these technologies allows for the decoupling of agricultural production growth from the proportional increase in emissions, while strengthening the climate resilience of production systems and contributing to global food security. In this sense, technological innovation should be recognized as a central element in energy transition roadmaps applied to the agricultural sector.

The roadmap should recognize sustainable agriculture that delivers inputs to biofuels production at the basket of solutions that will allow countries tom ode away from fóssil fuels.

International regulatory harmonization

Convergence and cooperation between national and regional regulatory processes can play a decisive role in accelerating the adoption of sustainable agricultural technologies, contributing to the transition to lower-carbon production systems. International regulatory harmonization, when based on scientific criteria, risk assessment, and mutual recognition of technical evidence, has the potential to reduce barriers to innovation and broaden the global diffusion of solutions that promote energy efficiency gains and emission reductions in agriculture.

- In this context, greater convergence of regulatory procedures contributes to:
- Reducing costs and timeframes associated with the approval of new technologies
- Stimulating investments in agricultural research, development, and innovation
- Strengthening technological and scientific cooperation between countries
- Expanding the sustainable competitiveness of production systems

By favoring the faster dissemination of biotechnologies, bio-inputs, chemical pesticides, and precision digital solutions, regulatory harmonization can accelerate the modernization of agricultural systems, promoting productivity gains with lower relative consumption of fossil fuel-intensive inputs and less pressure on the expansion of land use.

For the benefits of technological innovation to be fully realized, it is essential that international regulatory processes consider the different agroecological, socioeconomic, and productive realities across regions, especially those associated with tropical agriculture. Production systems located in tropical environments present specific dynamics of climate, pest pressure, productive intensity, and crop diversity, which

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demand proportionate regulatory approaches, based on science and sensitive to local conditions.

Moreover, it is important to promote greater harmonization of the main environmental criteria associated with biofuel production. This includes key issues such as direct land use change (LUC), indirect land use change (iLUC), life cycle analysis (LCA), the use of second crops, the restoration of degraded lands for feedstock production, the use of biomass in industrial process, the use of fertilizers and biological inputs, among other relevant factors.

The growing number of voluntary sustainability standards used to certify biofuels may create disproportionate costs and barriers to market access. This challenge could be reduced through the establishment of clearer and more consistent parameters that define the core sustainability criteria required for biofuel production. A more harmonized framework would improve transparency, reduce compliance costs, and support the broader integration of sustainable biofuels across markets.

In this sense, promoting greater international regulatory cooperation does not imply the uniform adoption of normative models designed for different contexts, but rather the construction of convergent, predictable, and technically sound frameworks capable of stimulating innovation, expanding access to sustainable technologies, and contributing to decarbonization trajectories compatible with the productive realities of different countries.

3. **What country, regional or sector roadmap experiences, best practices, and lessons learned can be shared?**

Tropical agriculture as a platform for climate solutions

Brazil has significant experiences that demonstrate the potential of technological innovation in tropical agriculture to support the climate transition and contribute to reducing dependence on fossil fuels. The sector's recent trajectory highlights the ability to combine significant productivity gains, efficiency in the use of natural resources, and the development of production chains focused on renewable energy.

Among the main consolidated solutions are:

- Large-scale biological nitrogen fixation, reducing dependence on fossil-intensive synthetic nitrogen fertilizers;
- The increasing use of bio-inputs and biological solutions that improve the productive efficiency and environmental quality of agricultural systems;
- The expansion of integrated production systems, such as crop-livestock-forestry integration, which contribute to carbon sequestration and the sustainable intensification of land use;
- The high adoption of agricultural biotechnology and digital technologies, which increase productivity and reduce the indirect energy consumption of field operations.

In this context, the strategic role of agricultural crops geared towards bioenergy production, such as sugarcane and maize for ethanol production, also stands out. Their productive efficiency has been continuously expanded through genetic improvement, biotechnology, more efficient phytosanitary management, and precision agriculture. The increased productivity of these crops allows for the expansion of renewable energy supply without a proportional need for expansion of cultivated area, contributing to the mitigation of emissions and the diversification of the energy matrix.

The robust scientific base and the capacity for innovation oriented towards tropical conditions, with emphasis on the role of institutions such as Embrapa and the investments of the private sector in the development of new molecules, bio-inputs, and technological solutions adapted to tropical agriculture, have been decisive in consolidating the country as a reference in production systems with high climate efficiency.

The recent advancement of biotechnology and gene editing techniques further expands this potential, enabling the development of cultivars that are more tolerant to climatic stresses, with greater efficiency in nutrient use and better energy performance throughout the production chains. In this way, Brazilian tropical agriculture positions itself as a relevant platform for integrated solutions for climate mitigation, adaptation, and transition to renewable energy sources, simultaneously contributing to food and energy security on a global scale.

Public-private cooperation in innovation

Cooperation between research centers, the private sector, and public policy makers has played a significant role in the development and dissemination of technological solutions aimed at mitigating and adapting to climate change in the agricultural sector. The articulation between these actors contributes to accelerating the generation of applied knowledge, reducing risks associated with innovation, and expanding the reach of technologies capable of increasing productive efficiency and reducing the intensity of emissions in agricultural systems.

Encouraging the exchange of technical experiences, the sharing of scientific data, and the construction of joint research and development agendas strengthens innovation ecosystems and favors the adaptation of technologies to different agroecological realities. Well-structured public-private partnerships also facilitate technology transfer, producer training, and the implementation of sustainable practices on a large scale.

In this sense, promoting institutional environments that encourage technical and scientific cooperation between public and private institutions is a strategic element to accelerate the transition to more resilient, efficient, and less fossil fuel-dependent production systems.

Belém 4X Pledge on Sustainable Fuels

The Belém 4x initiative was launched at the pre-COP30 conference in October as a multi-country initiative aiming to at least quadruple the production and use of sustainable fuels by 2035 compared to 2024 levels.

Belém 4x was integrated into the Action Agenda, specifically axis 1, Transition in the energy, industry and transport sectors, with a solution focused on sustainable fuels.
The Ministerial Conference on Clean Energy (CEM), through the Action Plan for Fuels of the Future, will coordinate actions aimed at implementing Belém 4x.

To date, 24 countries have already endorsed the initiative (Brazil, Japan, Italy, India, Sudan, Myanmar, Armenia, Belarus, Chile, Netherlands, South Korea, Canada, Mozambique, Guinea, Panama, Maldives, Zambia, Mexico, Guatemala, Andorra, Cape Verde, Kenya, UAE). (Singapore). Additionally, organizations such as ICAO, UNIDO, Maersk, Toyota, UNICA, Bayer, and the Hydrogen Council expressed their support.

4. **How can a just, orderly and equitable transition best reflect the diverse realities of countries at different stages of development and with different degrees of dependence on fossil fuels?**

The global climate transition must consider different levels of economic development, distinct production structures, differentiated responsibilities, access to finance, among other characteristics.

The United Arab Emirates just transition work programme underscores that the principles of equity and common but differentiated responsibilities and respective capabilities should guide just transition efforts.

When it comes to sustainable fuels, it is relevant that the roadmap should recognize the solutions implemented by countries and support its connection to climate finance.

Acknowledgements

This submission was developed by CropLife Brasil with technical support from Agroicone.

Protocolo de assinaturas

Documento

Nome do envelope: COP30 Roadmap on Transitioning Away from Fossil Fuels_CropLife Brasil Contribution.

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Status: Finalizado

HASH TOTVS: 4B-D1-F3-4F-F8-42-55-B1-4C-F8-01-82-AF-14-20-90-56-F9-96-5C

SHA256: e99868f837b8e1ee43cff33ad63d0661c7092fd453deeb2a42e2cee3c05872db

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Status: Assinado eletronicamente

Tipo de Envio: Documento enviado por E-mail

Tipo de Autenticação: Utilizando validação de código enviado por E-mail

Visualizado em: 31/03/2026 11:56:46 - **Leitura completa em:** 31/03/2026 11:56:51

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