

Rethinking Waste

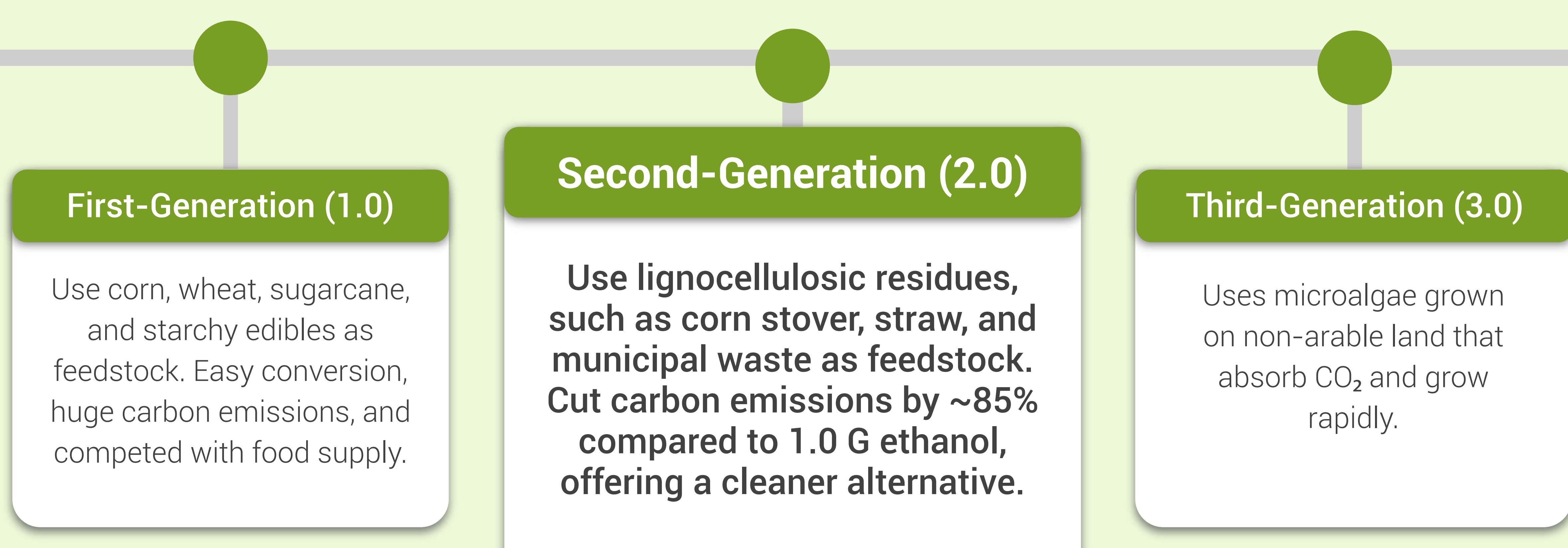
How Bio-Based Feedstocks Are Powering the Future of Biofuels 2.0

What if the real breakthrough in sustainable fuels isn't growing more crops—but reimagining our waste?

Second-generation biofuels (2.0) are proving that agricultural residues and waste can power a clean energy future.

The Biofuel Revolution:

Charting the Transformations in Ethanol Production

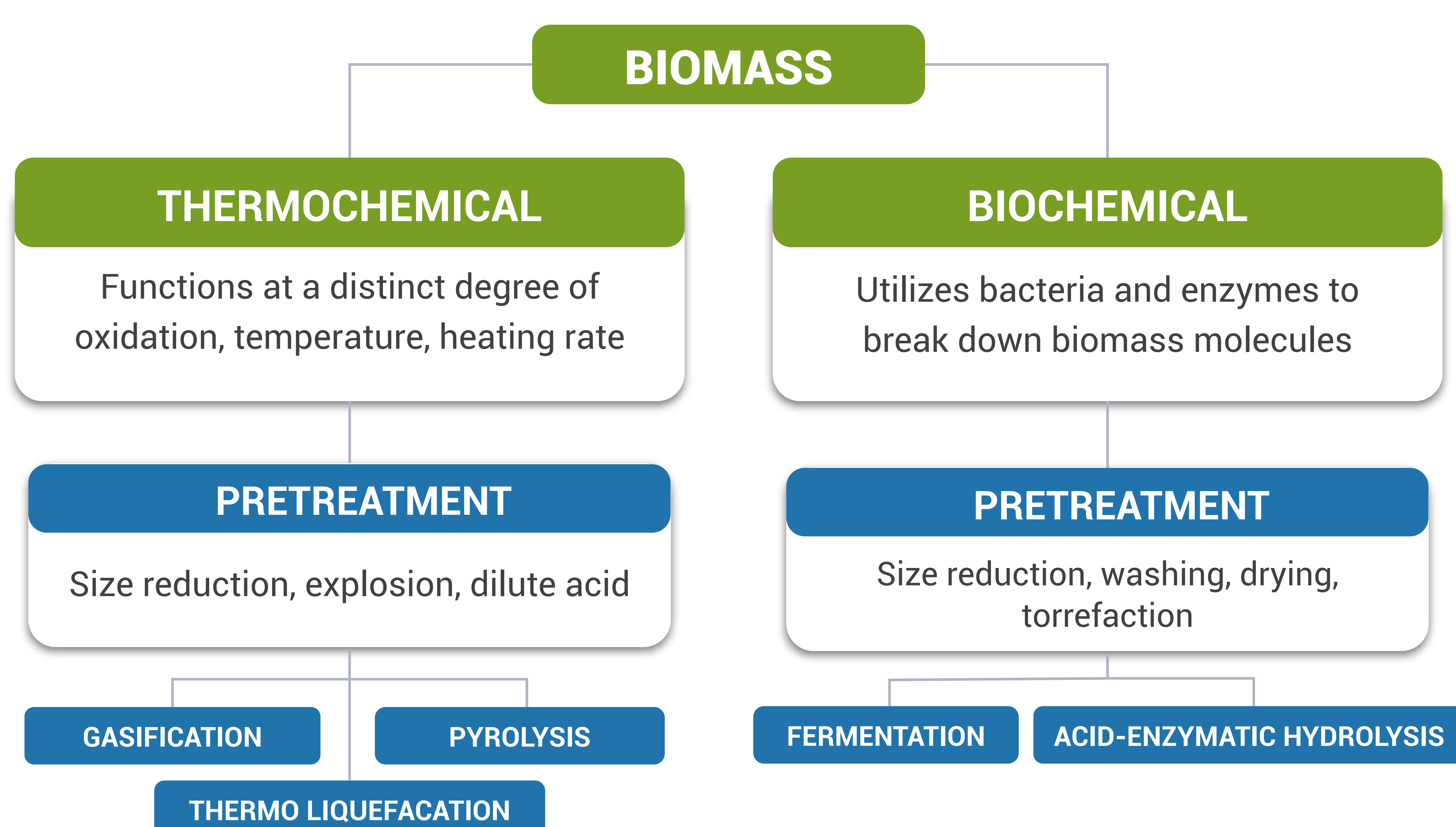


If biofuels generation 1.0 was about convenience and 2.0 is about conscience—then the real question is, how exactly does waste turn into wealth?

From Biomass to Bioethanol:

Feedstock & Pathways of 2G Ethanol Production

Ethanol generation 2.0 utilizes lignocellulosic biomass to turn agricultural, forestry, and urban residues into sustainable fuel through biochemical and thermochemical pathways.



This transformation isn't theoretical—it's unfolding today, powered by the leading companies redefining waste as wealth.

Driving the Shift:

Key Players in 2G Ethanol Advancement

| Company | Headquarters | Product | Raw material |
|----------------|--------------------|-----------------|--------------------------------------------------------------------------------|
| BETARENEWABLES | Italy | ● Ethanol | Agricultural Residue |
| BlueFire | Irvine, California | ● Ethanol | Urban trash, rice and wheat straws, wood waste and other agricultural residues |
| CLARIANT | Switzerland | ● Ethanol | lignocellulosic feedstock |
| raízen | São Paulo, Brazil | ● Ethanol | Sugarcane bagasse and straw |
| Blue | Florida, USA | ● Ethanol ● SAF | Cellulosic feedstock |
| GranBio | Brazil | ● Ethanol ● SAF | Sugarcane straw and bagasse |
| praj | India | ● Ethanol ● CBG | Agricultural Residue and energy crops |
| alcoetra | Brazil | ● Ethanol | Molasses |
| BritishSugar | UK | ● Ethanol | Sugar beet residues |
| ABENGOA | Spain | ● Ethanol | Agricultural residue |
| Fiberight | UK | ● Ethanol | MSW, non-food waste |

| Company | Headquarters | Product | Raw material |
|---------|----------------------------|--------------------------------------------------------|--------------------------------------------------------------|
| Valero | San Antonio, United States | ● Bioethanol ● SAF | Recycled animal fats, used cooking oil and inedible corn oil |
| CEPSA | Madrid, Spain | ● Bioethanol ● SAF | Organic Waste or Forest Biomass |
| Chevron | USA | ● Bioethanol ● SAF | Rendered animal fat and used cooking oil |
| ADM | USA | ● Bioethanol ● SAF | Used cooking oils, rendered animal fats, algae oils |
| INEOS | USA | ● Bioethanol | Cellulosic raw material |
| PACIFIC | Hawaii, USA | ● Bioethanol | Used cooking oil |
| LDC | Netherlands | ● Bioethanol | Palm Fatty Acid Distillate, sugarcane residue |
| AEMETIS | California | ● Bioethanol ● SAF ● Biodiesel ● Renewable natural gas | Cellulosic sugar wood waste, used cooking oil |

As technology scales and policies evolve, bio-based energy is no longer an experiment—it's becoming the backbone of a circular carbon economy.

Regional Landscape for Biofuel 2.0 Market

- Canada**: Canada's Clean Fuels Fund, with a \$1.5 billion investment, offers significant support for expanding clean fuel production. It provides funding for biomass supply chains, feasibility studies, and logistics improvements for feedstocks like forest residues and agricultural waste.
- USA**: The USA has had the largest installed capacity for deployed second-generation biofuel facilities. In 2020, the production capacity for cellulosic biofuels was estimated to be around 20-25 million gallons per year.
- China**: The Chinese government has invested over \$1.2 billion, supporting R&D in this sector.
- India**: The Pradhan Mantri JI-VAN Yojana provides viability gap funding to boost 2G ethanol production in India. It supports twelve bio-ethanol projects using lignocellulosic biomass, with a financial outlay of ₹1,969.50 crore from 2018-2024, aiming to attract investment and increase 2G ethanol capacity.
- Brazil**: Brazil has an abundant supply of bagasse and straw, by-products of sugar mills, and around 70% of the biomass in these residues consists of fermentable sugars. This provides a valuable feedstock for scaling up second-generation biofuel production.
- Americas (USA & Brazil)**: The Americas (USA & Brazil) produce more than 80% of the global biodiesel and bioethanol production.

Scaling the Sustainable Future

Biofuels 2.0 aren't emerging—they're establishing a new industry standard.

The focus now: scaling impact, improving economics, and embedding sustainability into every litre of ethanol produced.

Ready to optimize your biofuel strategy?

Partner with us to advance process efficiencies, drive policy-aligned growth, and strengthen your foothold in the evolving clean energy value chain.