Sugarcane Bioenergy Inquiry 2025

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Licella Submission

Inquiry into Sugarcane Bioenergy Opportunities in Queensland

To:

Mr Stephen Bennett MP

Chair - Primary Industries and Resources Committee, Member for Burnett

Parliament House, Brisbane, QLD 4000

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For further information on Licella, please visit: www.licella.com

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About Licella

Licella is a pioneering Australian technology company and global leader in **hydrothermal liquefaction (HTL)** - a proven and commercially deployed process that converts low-cost, low-carbon biomass residues into bio-oil. The bio-oil from Licella's proprietary **Cat-HTR™ (Catalytic Hydrothermal Reactor)** platform is upgraded into **low carbon liquid fuels (biofuels)** and bio-chemicals, including sustainable aviation fuel (SAF), renewable diesel, and maritime biofuels. These drop-in fossil replacement products support national fuel security and emissions reduction in hard-to-abate sectors such as aviation, shipping, and heavy transport.

Licella's first commercial-scale facility, developed under its wholly owned subsidiary Arbios Biotech, is in early operations in Prince George, Canada. The Chuntoh Ghuna facility is the world's largest HTL plant for biofuels. In Australia, Licella's Commercial Demonstration Facility in NSW has validated the technology's flexibility across a wide range of biomass feedstocks across both wood and agricultural residues, including sugarcane bagasse.

Project Swift – SAF from Sugarcane Residues Feasibility Study

Licella is developing Project Swift, an innovative biorefinery in regional Queensland that will apply its Cat-HTR™ technology to convert sugarcane residues, particularly bagasse, into significant volumes of biofuels including SAF. The facility will focus on second-generation feedstocks: non-edible, residual biomass streams from existing industry that are currently underutilised, burnt in paddocks, or used inefficiently in energy co-generation.

Project Swift is being delivered in collaboration with strategic partners including Shell, Isis Central Sugar Mill (ICSM) in the Bundaberg region, and global investors such as the Mitsubishi Chemical Group (via Diamond Edge Ventures). The project has received funding support from the Australian Renewable Energy Agency (ARENA) under its Advancing Renewables Program.

In addition to its environmental impact, Project Swift is expected to deliver significant economic and regional development benefits. The proposed biorefinery will create skilled jobs in regional Queensland, stimulate local supply chains, and attract infrastructure investment to sugar-producing communities. By leveraging existing agricultural assets and partnering with local stakeholders, the project will help revitalise regional economies while positioning Queensland as a leader in advanced biofuels production.

Licella is finalising the Pre-FEED (Pre-Front End Engineering and Design) phase and advancing toward the FEED stage, with a Final Investment Decision (FID) targeted for late 2026 and construction expected to commence in 2027.

Project Swift is expected to serve as a blueprint for future biofuel developments across Queensland and Australia. It will generate practical learnings in feedstock aggregation, regulatory approvals, SAF certification, and stakeholder engagement, enabling rapid replication in other sugar-producing regions such as the Burdekin.

More information: www.licella.com/project-swift

2. Executive Summary

Thank you for the opportunity to submit feedback to the Queensland Parliament's Primary Industries and Resources Committee inquiry into sugarcane bioenergy opportunities in Queensland.

Licella welcomes the Committee's recognition of the strategic role biofuels can play in diversifying Queensland's sugar industry, strengthening national fuel security, and driving regional economic development. With abundant sugarcane residues and Australian-developed technology, Queensland is uniquely positioned to lead in sustainable fuel production.

To realise this opportunity, Licella recommends:

- **Prioritising investment in advanced biofuels** as the core strategy to diversify the sugar industry and support national fuel security.
- **Upgrading cogeneration systems** to improve efficiency and free up bagasse for biofuel production.
- **Developing a coordinated feedstock strategy** to allocate high-value residues (like bagasse) to biofuels and lower-value feedstocks (like tops and trash) to energy generation.
- **Ensuring inclusive policy and investment** that support all viable biofuel technologies, including hydrothermal liquefaction (HTL), to de-risk investment and expand feedstock options.
- **Investing in R&D** to improve the suitability of sugarcane tops and trash as a feedstock for biofuels by addressing chlorine, silica, and ash content, and to develop scalable pre-treatment and blending strategies.
- **Planning for regional growth**, including strategic land rezoning, workforce development, accommodation, and logistics, and streamlined approvals to support the rollout of biorefineries.
- **Scaling supporting industries and infrastructure, particularly renewable energy supply,** to meet the power demands of electrified mills and advanced biofuel facilities.
- **Building the industry on second-generation (non-edible) feedstocks** to ensure sustainability, scalability, and strong social licence.

Licella's **Project Swift** exemplifies the opportunity to scale a world-leading biofuels industry. The proposed biorefinery will apply Licella's Australian-developed **Cat-HTR™ hydrothermal liquefaction (HTL)** technology to convert biomass residues, including bagasse, into low carbon liquid fuels.

The project is being delivered in collaboration with strategic partners including **Shell, Isis Central Sugar Mill (ICSM)** in the Bundaberg region, and with funding support from the **Australian Renewable Energy Agency (ARENA)**. Project Swift is expected to deliver broad regional benefits, including the creating of skilled jobs, stimulation of local supply chains, and attraction of infrastructure investment to Queensland's sugar-producing regions.

3. Role of Cogeneration

The role and benefits of sugar cogeneration in Queensland's electricity generation mix, including existing capacity and potential for expansion.

The opportunity for growth in cogeneration lies not in burning more bagasse, but in improving the efficiency with which it is used. Bagasse is currently important to mill operations as the main source of process steam via boilers; however, it is also an ideal low carbon feedstock, aggregated at scale, for biofuel production. By upgrading to high-efficiency cogeneration systems, mills can continue to meet their steam requirements, while liberating significant quantities of bagasse for higher-value, low carbon biofuel production. This shift will support the long-term viability of mills and the overall diversification of Queensland's sugar industry.

Efficiency requirements for cogeneration

Process steam remains the backbone of sugar mill operations, with much of Queensland's sugar mill infrastructure utilising low-pressure process heat from inefficient bagasse consumption. Transitioning to modern high-pressure cogeneration, or electrified process steam systems, would reduce fibre demand and improve energy recovery from bagasse. However, with the current low internal rate of return (IRR), such capital-intensive upgrades are difficult to finance through the private sector. This underscores the importance of targeted government support to de-risk investment and enable higher efficiency cogeneration.

Economic viability of grid supply

The economics of exporting cogenerated electricity into the grid are challenging with the increasing penetration of low cost solar, wind and battery generation. For grid export to be viable, cost of feedstock delivery needs to decrease, and the price of electricity would need to be significantly higher than is typically achieved in current wholesale markets. These thresholds are rarely met, which limits the competitiveness of grid export under current conditions. The more practical pathway is to use cogenerated electricity behind the meter, offsetting the mill's own power demand and providing green power to co-located biorefinery projects. Without efficiency upgrades and targeted policy support, exporting to the grid remains constrained, and bagasse is better positioned for internal energy use and as a feedstock for biofuels including SAF.

4. Barriers to Increased Bioenergy Production

Market, regulatory, and infrastructure barriers to increased bioenergy production from sugar.

Competing uses of potential feedstock and no allocation framework

Agricultural residues, such as bagasse, are a high potential feedstock for biofuels as they provide aggregated volume, are low carbon and do not compete with food production. However, many of these biomass residues (including bagasse) are combusted for energy generation. Without a coordinated feedstock strategy, these feedstocks will continue to be locked in existing supply chains. A robust policy framework for biofuels can underpin appropriate investment into more efficient co-generation at sugar mills, which could liberate significant quantities of bagasse as feedstock to build a thriving biofuels sector in Queensland.

Infrastructure Barriers

Licella is working with the **Isis Central Sugar Mill (ICSM)** in the Bundaberg region as its proposed site and feedstock partner for Project Swift. ICSM was established in 1894, making it over 130 years old. It has played an essential role in the Wide Bay Burnett region's economic development, but its ageing infrastructure is a key barrier to increasing bioenergy production. Mills of this age were not designed with modern energy integration or biofuel pathways in mind, which poses challenges for efficiency, productivity, and adaptability - making it harder to free up the volumes of feedstock required for biofuel production. Investment is needed to ensure that sugar mills like ICSM can be both economically sustainable over the long-term and can participate in the bioenergy opportunity. Investment in upgrading the mill's infrastructure would allow for improved efficiency in the mill's co-generation, liberating significant quantities of bagasse for biofuel production.

High Production Cost and Access to Capital

Increasing the scale of investment available to projects from the Queensland Government (particularly to help de-risk first of kind biofuel facilities) is critical to attract private co-investment. The production of biofuels, particularly SAF, will benefit from economies of scale, so achieving efficient scale along the value chain will be critical. Investment into expanding green energy and green hydrogen is also a critical enabling factor to realise the biofuel opportunity for Queensland.

Regulatory Barriers

A lack of regulatory certainty remains a key barrier to building a domestic biofuels industry. For projects well advanced in their feasibility phase, like Project Swift, the availability and clarity of enabling regulatory frameworks plays a critical role in securing investment. A lack of clear policy settings, at the Federal and State level, increases perceived risks for investors, making it harder for biofuel projects to secure long-term offtake agreements and reach a Final Investment Decision (FID).

5. National Security and Defence

Opportunities to align sugar biofuel production with national security and Defence liquid fuel needs.

Australia relies heavily on liquid fuels for more than half its final energy demand. This is particularly the case for the transport sector, which accounts for ~70% of Australia's consumption of refined liquid fuel products.[1] Renewable liquid fuel (biofuel) demand is forecast to expand by 38 billion litres over 2023-2028, a near 30% increase from the last five-year period.[2] Although the demand for liquid fuels increases, Australia's refining capacity has declined 70% over the last two decades. Currently, Asia supplies a majority of liquid fuel imports.[3]

HTL technology can convert a wide range of lignocellulosic feedstocks, including sugarcane residues, into biofuels including renewable diesel for heavy road transport and the maritime industry, and SAF. This flexibility is particularly valuable in supporting national fuel security, helping to unlock significant volumes of biomass residues for biofuels that reduce our over-reliance on imported liquid fuels.

[1] Commonwealth of Australia, Low Carbon Liquid Fuels – A future made in Australia (2024)
[2] International Energy Agency (IEA), Transport biofuels, (2024)
[3] Bioenergy Australia, Securing our Fuel Future: Resilience Through Low Carbon Liquid Fuels (2025)

6. Policy Settings to De-risk Biofuel Investment

Policy and funding mechanisms to de-risk investment in cogeneration and biofuels by manufacturers and growers, including examples of successful policy implementation from overseas and other industries.

Policy support for mill upgrading

Investing in sugar mills as a critical part of the biofuels value chain: Investment in upgrading of mill cogeneration efficiency and productivity can liberate significant quantities of bagasse to scale a domestic biofuels industry and support the long-term viability of the sugar industry.

Incentivise to electrify where possible: Where heat and power can be electrified or met with renewable power alternatives (e.g. solar PV), this should be the priority (rather than burning feedstocks suitable for low carbon biofuel production). This approach supports diversification of the sugar industry into biofuels, while allowing for strategic allocation of feedstocks unsuitable for biofuel production towards cogeneration, where electrification isn't possible.

National Feedstock Strategy

Licella supports a **National Feedstock Strategy with a use hierarchy:** Prioritise and direct low carbon feedstocks towards hard-to-abate sectors, including aviation, heavy transport and shipping. By allocating a priority use hierarchy, biomass residues well suited for low carbon biofuel production can be re-directed (both through investment in co-generation efficiency and by supplementation with lower value feedstocks for co-generation).

Without appropriate investment and policy setting, the availability of feedstock for biofuels will be significantly constrained. With Queensland producing 30 million tonnes of cane annually, bagasse can provide wide-scale low carbon feedstock to support investment into regional biorefineries.[4]

International Example – UK Biomass Strategy: Priority Use of Biomass

The *UK Biomass Strategy (2023)* outlines a clear framework for directing biomass towards sectors where it delivers the greatest carbon abatement, particularly in hard-to-decarbonise industries such as aviation, maritime transport, and industrial processes.[5]

Key principles from the UK strategy include:

- **Strategic Allocation of Biomass**: Biomass is not treated as a generic renewable resource but is allocated based on its carbon abatement potential and resource efficiency. This ensures that high-value biomass is not diverted to low-impact uses.
- **Support for Advanced Biofuels**: The UK prioritises the use of biomass for low carbon liquid fuels (LCLF), especially in sectors lacking viable electrification alternatives. This aligns with Australia's need to support regional biorefineries and decarbonise transport.
- **Sustainability and Domestic Supply**: The strategy emphasises sustainable sourcing and the development of domestic biomass supply chains, reducing reliance on imports and enhancing

[4] Australian Government. (2023). Sugar - DAFF
[5] UK Government – Department for Energy Security & Net Zero. (2023). Biomass Strategy

energy security—an approach highly relevant to Australia's abundant agricultural residues like bagasse.

- **Investment Signals and Policy Certainty**: The UK government provides clear policy signals and investment frameworks to encourage private sector participation in biomass innovation and infrastructure. This is critical for Australia, where feedstock availability alone is insufficient without supportive policy and investment.

Ensure policy is supportive of all commercially deployed biofuel pathways

Licella urges the Queensland Government to advocate for inclusive national biofuel and feedstock policy that recognises all commercially deployed technologies, including HTL. The current emphasis on HEFA excludes sugarcane-based feedstocks like bagasse, which are not compatible with that pathway. HTL, by contrast, can process a wide range of lignocellulosic residues and is commercially deployed and demonstrated. Supporting multiple pathways will expand Queensland's feedstock base, reduce investment risk, and ensure the sugar industry can fully participate in the emerging biofuels sector.

Guarantee of Origin (GO) scheme

The Guarantee of Origin (GO) scheme is a voluntary framework for emissions accounting of products and certification of renewable electricity. It supports the Australian Government's Future Made in Australia plan to attract investment in low carbon products and renewable electricity. The Australian Government's expansion of the GO scheme for low carbon liquid fuels (biofuels) is a critical step toward enabling market confidence and investment into biofuels.[6] However, the current focus on the HEFA (hydroprocessed-esters and fatty acids) pathway only risks excluding and undermining confidence in other pathways being commercially deployed such as HTL and Alcohol-to-Jet (AtJ). HTL, including Licella's Cat-HTR™ platform, can produce LCLF from lignocellulosic feedstock (such as bagasse) unlike HEFA. Timely recognition of these pathways within the GO scheme is essential for Australian projects, including those within Queensland, to reach FID. Without recognition under the GO scheme, biorefinery projects will struggle to secure long-term offtake agreements for their biofuel products.

[6] Australian Government. (2025). Guarantee of Origin

7. Research & Development

The R&D agenda to underpin a world leading sugar-led bioenergy industry.

For projects like Project Swift, R&D into the preparation of sugarcane-derived feedstocks for biofuel production is critical to unlocking their full potential volume. Alongside bagasse, sugarcane tops (leaves) and trash present an opportunity as low carbon and abundant feedstocks, but present additional challenges (including chlorine, silica and ash content) that must be addressed before they can be reliably incorporated into large-scale biofuel production. These challenges are currently being investigated as part of feasibility phase of Licella's Project Swift.

Unlocking sugarcane tops and trash as a feedstock – preparation and chlorine content

Tops (leaves) and trash make up about 30% of the sugarcane crop weight.[7] While leaving this material on the field supports soil health, studies indicate that only around half is required to deliver those benefits, potentially freeing up 15% of the crop weight as biomass. The challenge lies in collection, optimising methods for capturing and handling leaves at scale are still under development, with research being conducted in Brazil. Supporting similar R&D in Australia will be essential to unlock these residues as a feedstock for biofuel, maximising total biomass availability from the sugar sector.

One of the key issues with tops and trash is the elevated levels of chlorine content compared to bagasse. Chlorine is highly corrosive, if left unprocessed it can damage equipment, forcing the use of higher-grade (and higher cost) materials. Research from Sugarcane Renewable Electricity (SUCRE) Project found that washing can remove 93% of chlorine, but this introduces an additional processing step and operational complexity.[8] R&D and investment in feedstock preparation studies is required to unlock these aggregated residues and maximise biofuel production.

Challenges with bagasse stockpile storage

Licella has conducted bagasse storage studies as part of Project Swift. These studies found that bagasse exits the mill at around 50% moisture and is typically stored in large open-air stockpiles. Both these factors drive microbial activity within bagasse stockpiles, creating two main issues:

- Loss of usable feedstock material – also known as dry matter loss.
- Greenhouse gas (GHG) emissions – including CO_2, CH_4, and small amounts of N_2O

Licella's feedstock studies and published industry data (including by IEA Bioenergy[9]), suggest that significant breakdown of the bagasse in open-air stockpiles can occur within weeks, with up to 30–50% dry matter loss over several months if left unmanaged. The loss of mass and energy value reduces 'steam-on-cane' efficiency and forces higher fibre burn rates to meet the same energy demand, leaving less bagasse available for higher-value uses such as biofuels.

At the same time, microbial activity in stockpiles generates significant GHG emissions. The outer layers of the stockpile have aerobic zones and emit CO_2. Inside the pile, parts with little or no oxygen (called anaerobic zones) form, where methane (CH_4) and nitrous oxide (N_2O) is produced.[10] Methane and nitrous oxide are particularly concerning due to their high global warming potential (GWP). GWP measures how much heat a GHG traps in the atmosphere compared to CO_2 over 100 years: methane has 28 times the GWP of CO_2, while N_2O is 265 times higher.[11] These emissions can offset much of the

[7] Lignocellulosic Biomass to Liquid Biofuels. (2020). Pretreatment of lignocellulosic sugarcane leaves and tops for bioethanol production
[8] SUCRE. (2020). Project BRA/10/G61 – SUCRE – Sugarcane Renewable Electricity
[9] IEA Bioenergy Task 43. (2019). Dry matter losses during biomass storage.
[10] BMC Biotechnology. (2020). A snapshot of microbial diversity and function in an undisturbed sugarcane bagasse pile.
[11] Clean Energy Regulator. (2024). Global Warming Potential

carbon benefit claimed for cogeneration. Preventing degradation requires drying bagasse, but this is both energy and capital-intensive, particularly in humid climates. Ultimately, reliance on large stockpiles undermines cogeneration efficiency and reduces the quantity of bagasse that could otherwise be directed to biofuel production.

Reduction of silica and ash content of feedstock

Silica and ash content presents an equally significant barrier to utilising certain biomass feedstocks from sugarcane. Due to the abrasive nature, high silica and ash levels increase wear and tear on plant equipment, raise mill mud volumes, and in severe cases can cause unplanned shutdown of mills. Licella's own studies have found that fine ash has a detrimental effect on plant equipment. Investment into R&D into reducing the silica and ash content of sugarcane biomass would improve project efficiency and significantly reduce plant costs (both at the mill and within feedstock processing steps at the biofuel facilities).

Identifying alternative feedstocks for cogeneration

To unlock the full potential of bagasse for biofuel, without significant investment in mill upgrades, alternative feedstocks for cogeneration must be identified to fill the gap in renewable power supply. Forestry residues present a major opportunity as a feedstock for bioenergy, 82% of land clearing activity in the 2020-21 year occurred in Category X land.[12,13] There is the opportunity for private native forests (PNF) on this land to be managed to deliver both biodiversity benefits and significant volumes of biomass residues for bioenergy. The government's proposed Category F designation would enable this land to start generating sustainable biomass residues, whilst improving environmental outcomes if done correctly.[14,15] Utilising these forestry residues provides an alternative feedstock for cogeneration and is also a low carbon feedstock for biofuels in the non-crushing season (avoiding need to stockpile bagasse).

Summary of R&D priorities related to feedstock from sugarcane

The following R&D priorities support maximising the availability and suitability of sugarcane residues as a scalable feedstock for biofuels in Queensland:

- **Develop and trial cost-effective pre-treatment methods at scale:** Laboratory results show promise in washing and leaching methods to reduce chlorine in tops and trash, but these processes must be proven at commercial scale to demonstrate efficiency, water use, and integration with existing operations. Scaling trials are essential to reduce technical and financial risk for industry adoption.
- **Quantify long-term impacts on mill performance:** R&D should focus on how effective ash reduction can extend equipment life, lower maintenance costs, and reduce downtime – making a strong business case for investment in pre-treatment.
- **Optimise blending strategies:** Research is needed into how different proportions of bagasse, cane trash, and other residues (such as forestry) can be blended to manage ash without compromising throughput or product quality. This is critical for ensuring flexibility in feedstock supply.

[12] Queensland Government. (2021). 2020-21 SLATS Report
[13] Category X – Areas that are not generally regulated by the vegetation management laws.
[14] Category F – A proposed vegetation classification in Queensland that enables sustainable management practices in Private Native Forests (PNF)
[15] QLD Government. (2024). Media Statement

8. Land Use and Regional Development

Strategic land use and regional development considerations affecting cane growing and sugar manufacturing capacity.

Land rezoning and approvals

Rezoning of land is essential to allow biofuel projects to proceed in strategic regional areas. Sites with strong potential for co-location (such as near sugar mills) are currently zoned for agricultural use only, restricting development of new biofuel facilities. The current process of securing rezoning approvals is lengthy and complex, creating uncertainty for project developers and delaying project timelines. Without government support, projects that could deliver significant economic and environmental benefits risk being stalled.

To address this, state and local governments should work together to:

- **Facilitate rezoning** of suitable sites from agricultural to mixed-use or industrial to support biofuel project development.
- **Introduce fast-tracked approvals pathways** for bioenergy projects, reflecting their role in regional diversification and emissions reduction.
- **Coordinate planning processes** across levels of government to provide clear, consistent guidance to avoid unnecessary delays

Workforce and skills

Large-scale biofuel projects, like Licella's Project Swift, have the potential for significant job creation in regional Queensland. Project Swift has the potential to create ~300 construction jobs, and 100 new jobs during operations. For these economic benefits to be realised locally, workforce planning must focus on upskilling the existing and emerging Wide Bay Burnett workforce. Investment in TAFE courses, apprenticeships, and specialist training programs can help build the skills needed for advanced biofuel operations, ensuring employment growth is embedded within the regional community.

Accommodation pressure

According to Bundaberg Regional Council, the Bundaberg region is already at capacity for short-term accommodation. The demand for hotel rooms in Bundaberg is expected to increase from 458 rooms in 2022 to 1,600 rooms by 2032.[16] The arrival of a large construction workforce could strain an already limited accommodation supply. Without proactive planning, this could create housing pressure on residents and risk deterring skilled workers from relocating to the region. Coordinated planning with local councils, housing providers, and State Government is essential to expand capacity and ensure affordable accommodation is available for both workers and the community.

A comparable example can be seen in Rockhampton, where the Queensland Government has committed $4.3 million from its $2 billion Residential Activation Fund to support the construction of a critical infrastructure project which will unlock 505 new homes. [17] This investment by government will ease pressure on the housing market and supporting regional growth. However, to meet short-term needs, additional solutions such as manufactured housing and temporary accommodation must be considered alongside long-term development.

[16] Bundaberg Regional Council. (2025). Feedback needed on hotel demand
[17] QLD Government. (2025). Residential Activation Fund to unlock a further 500 new homes in Rockhampton

Transport and logistics

Efficient movement of feedstock (sugarcane and its residues) is central to low carbon biofuel production. Currently, a heavy reliance on trucking adds cost, emissions, and congestion to the Bruce Highway. Additional rail lines and upgrades would allow more feedstock to be moved efficiently and at lower cost. Improved logistics infrastructure also creates broader benefits for regional Queensland, enhancing competitiveness across other agricultural and industrial sectors.

Renewable energy supply

The electrification of mills and integration of advanced biofuel facilities will increase demand for renewable power. For Project Swift and other bioenergy projects to succeed, Queensland's regional grid will need upgrades alongside further investment in solar, wind, and storage. Ensuring reliable, low-cost renewable power supply is not only critical for decarbonisation goals but also for attracting and retaining large-scale industrial projects in regional areas.

9. Benefits for Growers

Benefits for growers in diversification opportunities.

Queensland's growers have an opportunity to benefit from the diversification of the industry into the biofuel sector, while still maintaining their core business of sugar production. Growers are well-positioned to benefit from new, high-value revenue streams through residue-based biofuel production, like that offered by pathways such as HTL.

Biofuels support diversification and long-term viability of the sugar industry

Leveraging sugarcane residues as a feedstock for biofuel production allows the sugar industry to maintain its primary market in sugar, while opening new diversification opportunities that strengthen the industry's long-term viability. These residues are part of a mature supply chain, providing an efficient foundation for feedstock aggregation without major disruption to existing operations.

The additional revenue would provide the mill with additional capital to help maintain mill reliability and ensure appropriate season length crushing, so that crops are harvested at their peak. The reliability of the mill is central to the whole value chain. If the mill suffers unplanned downtime, growers are directly affected as the cane waiting in the paddock or on trains begins to deteriorate in sugar content, reducing returns, whilst harvesting schedules are disrupted increasing costs. Breakdowns can also extend the crushing season further into the year. If harvesting is extended too far into the year, it shortens the growing window for the next crop, which reduces yields in the following season. Lower yields not only impact the profitability of individual growers but also reduce the availability of residues like bagasse for biofuel production, creating a negative cycle.

By creating new revenue streams through residues, mills can reinvest in essential maintenance and upgrades that minimise breakdowns and increase throughput capacity. This ensures that the crop is crushed within the optimal timeframe, protecting both sugar recovery and the quality of residues for biofuels. In this way, revenue diversification directly strengthens the productivity of the sugar industry, supports grower incomes, and stabilises the feedstock supply needed to scale Queensland's biofuel industry.

10. Food vs Fuel

Fuel production should not compromise food security

The "food vs fuel" debate is a well-established concern that can impact public and stakeholder support for biofuel projects. It questions whether land and crops that could be used for food are instead diverted into fuel production. This concern is especially relevant for **first-generation feedstocks** (such as canola) which are edible and often grown on arable land. In addition to food competition, these crops can drive indirect land-use change, increase emissions, and reduce biodiversity. To obtain and maintain a social license to operate, it is critical that feedstocks for biofuels are not seen as compromising food security. As such, it is important to focus on **second-generation feedstocks** that are non-edible and come from residues (such as bagasse), that combine abundant supply with a high emission reduction benefit.[18]

Challenges with first-generation feedstocks

Even when first-generation feedstocks come from wastes, like used cooking oil or tallow, they face growing supply constraints. As global demand rises, these sources will become increasingly limited and therefore expensive. Furthermore, edible oils generally have higher lifecycle emissions and are less likely to meet stringent sustainability standards set by international frameworks such as CORSIA.[19]

Although Australia's policy landscape for biofuels is still being developed, international policies have placed restrictions and strict criteria for first-generation biofuels. While canola is not banned under the EU Renewable Energy Directive (RED II), it must meet strict criteria on land use and emissions. The newer ReFuelEU Aviation Regulation takes this further by explicitly excluding first-generation feedstocks from meeting SAF blending mandates.[20]

Under ReFuelEU Aviation regulations

- SAF blending targets – 2% in 2025, scaling to 70% by 2050.
- Only fuels from Annex IV Part A & B feedstocks are eligible – such as agricultural residues, forestry residues, or renewable electricity.
- HEFA from canola and other food crops is excluded

This global regulatory shift reflects a growing consensus that first-generation biofuels cannot be a foundation of a credible, sustainable fuel industry.

CORSIA LCA identified that SAF produced from canola only provides an 18% carbon intensity reduction compared to conventional fossil-based jet fuel – whereas leveraging agricultural or forestry residues have a carbon reduction value of up to 90%. [21]

Benefits of second-generation feedstocks

Australia's comparative advantage lies in second-generation feedstocks, such as agricultural residues (including those from the sugar industry) and forestry by-products.

[18] ICAO. (2025). CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels
[19] CORSIA, or the Carbon Offsetting and Reduction Scheme for International Aviation, is a global scheme, developed by the International Civil Aviation Organization (ICAO), designed to address CO_2 emissions from international flights by requiring airlines to offset any growth in emissions above a certain baseline.
[20] European Commission. (2021). ReFuelEU Aviation
[21] CSIRO. (2019). Sustainable aviation fuel roadmap

The key benefits of second-generation feedstocks are:

- **No food security risk:** Unlike first-generation edible crops (e.g. canola), residues are non-food materials. Using them as feedstocks for biofuels avoids diverting land or crops from food production, strengthening the social licence for an emerging biofuels sector.
- **No direct land use change:** Sugarcane residues are by-products of existing production systems and do not require new land to be cultivated
- **No indirect land use change (ILUC):** Using residues avoids displacement of food production and the associated risk of converting grasslands or other uncultivated areas.
- **Lower carbon intensity (CI):** Second-generation feedstocks, including bagasse, carry lower lifecycle emissions by avoiding new land-clearing and biodiversity loss as reflected in CORSIA's Eligible Fuels LCA.[22]. Therefore, they reduce the overall CI of the biofuel product, increasing the value of the fuel produced
- **Greater fuel value:** Producing low-CI fuels from residues increases their commercial attractiveness, as markets, investors, and end users are increasingly seeking fuels with stronger sustainability credentials and long-term scalability.

[22] ICAO (2025). CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels

11. Conclusion

Thank you for the opportunity to contribute to the Inquiry into Sugarcane Bioenergy Opportunities in Queensland.

Licella commends the Committee for recognising the strategic role of biofuels in driving regional development, supporting fuel security, and diversifying Queensland's sugar industry. With abundant sugarcane residues and Australian-developed technology, Queensland is uniquely positioned to lead in sustainable fuel production.

To realise this opportunity, targeted investment and coordinated policy are essential.

Licella recommends:

- **Prioritising investment in advanced biofuels** as the primary pathway to diversify the sugar industry and strengthen national fuel security.
- **Upgrading cogeneration systems** to improve efficiency and free up bagasse for higher-value biofuel production, rather than increasing combustion volumes.
- **Developing a coordinated feedstock strategy** to direct high-value residues like bagasse to biofuels and lower-value materials to energy generation.
- **Ensuring inclusive policy and certification frameworks** that support all viable biofuel technologies, including hydrothermal liquefaction (HTL).
- **Investing in R&D** to improve the suitability of sugarcane tops and trash as a feedstock for biofuels by addressing chlorine, silica, and ash content.
- **Planning for regional growth**, including land rezoning, workforce development, accommodation, logistics, and streamlined approvals.
- **Scaling supporting industries and infrastructure, particularly renewable energy supply**, to meet the demands of advanced biorefineries and ensure long-term industry viability.
- **Building the industry on second-generation feedstocks** to ensure sustainability, scalability, and strong social licence.

With the right policy settings and investment, Queensland can unlock a globally significant biofuels industry - creating jobs, driving regional development, and underpinning national fuel security while supporting diversification of a thriving Queensland sugar sector.

Licella's Project Swift demonstrates how Queensland can lead in advanced biofuels, offering a scalable model for regional development and national fuel resilience.