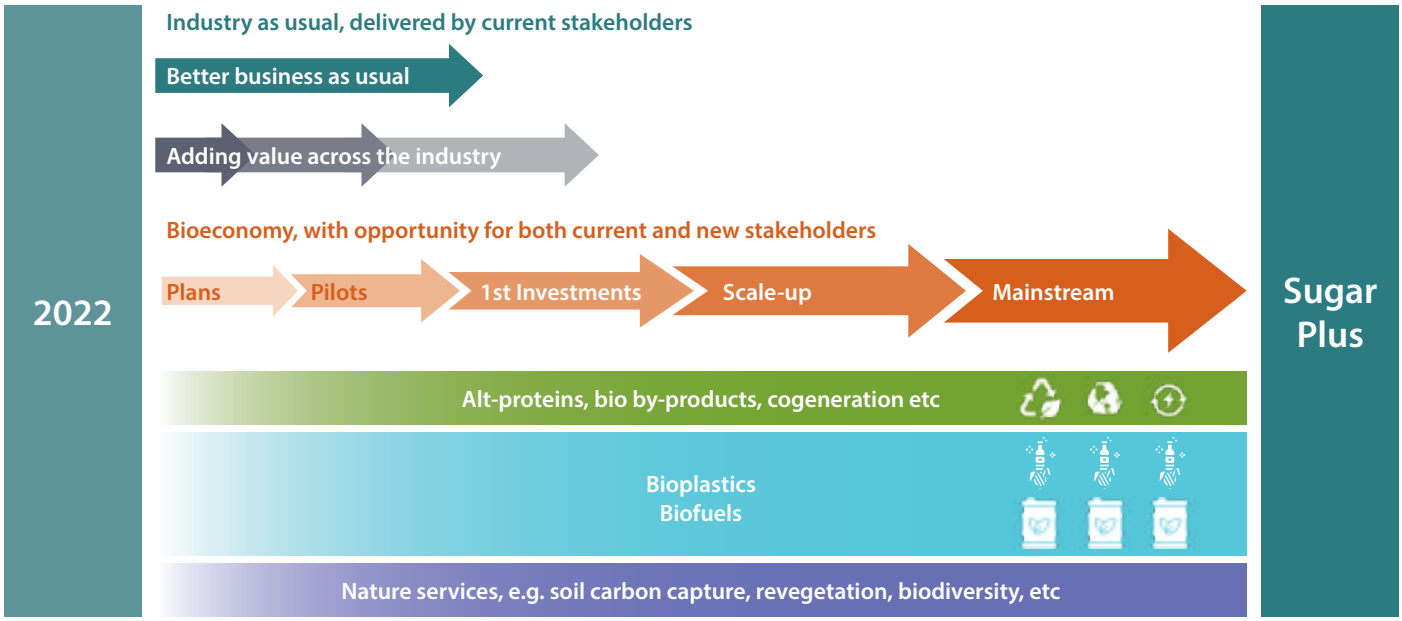
Sugar Plus

Fuelling the Future of Food, Energy and Fabrication

July 2022

The Sugar Plus vision

Our vision is to become a vibrant, transforming industry, sustainably producing sugar and bioproducts at the heart of regional communities. This will enable exploration of the potential to position the industry at the heart of Australia's future bioeconomy, enabled by supportive government policy settings and new investment. Realising this vision and maximising this opportunity requires a strong focus on environmental benefits across the value chain.



This would make Australia a bioeconomy powerhouse, centred on the sugar industry

- **Exceptional Infrastructure**
- **A major domestic bioplastics industry**
- **Growing aviation fuel self-sufficiency**
- **Sustainable communities**

History of initiative

- **September 2020** Development of Sugar Plus concept
- **June 2021** SRA and CRCNA commence partnership
- **August 2021** Formation of project Steering Committee
- **July 2022** Launch of Sugar Plus vision and roadmap
- **Q2 2022** Taskforces defined and implementation commences

Keys to success

- **Industry collaboration**
- **New technologies**
- **New business models**
- **New infrastructure**
- **Government policy support**

July 2022

Fellow industry participants,

Fuelling the Future of Food, Energy and Fabrication – Australia's sugarcane Roadmap

The future of our industry is bright, but it is not without challenge. That's why representatives from across the industry's value chain have come together to co-develop this roadmap, setting out how we can collaborate to strengthen and expand our important industry over the medium to long term.

Our history and value chain are complex. While we have come a long way – and have many attributes which are enviable relative to other agricultural commodities in Australia – the world and its people, tastes, preferences and ways of farming and doing business continue to evolve.

The industry in Australia must keep up, and make the most of the huge opportunities in front of us.

The sugarcane plant is one of the most resilient and adaptable plants on Earth – it is the perfect ingredient to help fuel the future of Food, Energy and Fabrication:

Food is where it all starts – raw sugar will continue to play an important role in feeding the world over the long term, and sugar is an important feedstock for the new generation of animal-free foods;

Energy that builds on current co-generated power and ethanol production to provide the next frontier of sustainable mobility and power – the sugarcane plant is one of the best natural sources for transforming into renewable energy and biofuels for heavy transport and aviation; and

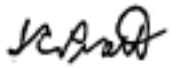
Fabrication for the future – making products that enable a more sustainable way of life, including much-needed replacements for the many plastic items that are produced and used every day.

Our industry knows that these opportunities need to be pursued in a sustainable manner. We are committed to growth pathways that look after our people, the products we produce, and the planet.

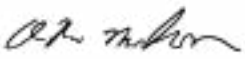
To realise the Sugar Plus vision, this roadmap sets out measures to strengthen and build our industry, whilst charting a path to a bigger, bolder future for the businesses and communities at the heart of our industry's future in Australia. While some parts of this roadmap are focused on **better business-as-usual** and **adding value** to current operations across the value chain, other parts are about the steps we need to take to unlock the vast opportunities presented by the **bioeconomy**.

Realising the opportunities will take significant effort and collaborative action across the industry, supported by our partners in the State and Federal governments. The undersigned stand together in common support of this industry roadmap.

Yours sincerely,

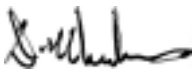


John Pratt
Chairman,
Australian Sugar Milling Council



Owen Menkens
Chairman,
CANEGROWERS

Ricky Mio
President,
AgForce Cane



Don Murday
Chairman,
Australian Cane Farmers Association

Industry organisations acknowledge and thank Pottinger for its role in engaging across the industry supply chain and developing this roadmap on our behalf. We also thank and acknowledge our funding partners and collaborators who are identified below.

The CRCNA is funded as part of the Australian Government's Cooperative Research Centre Program (CRC-P)

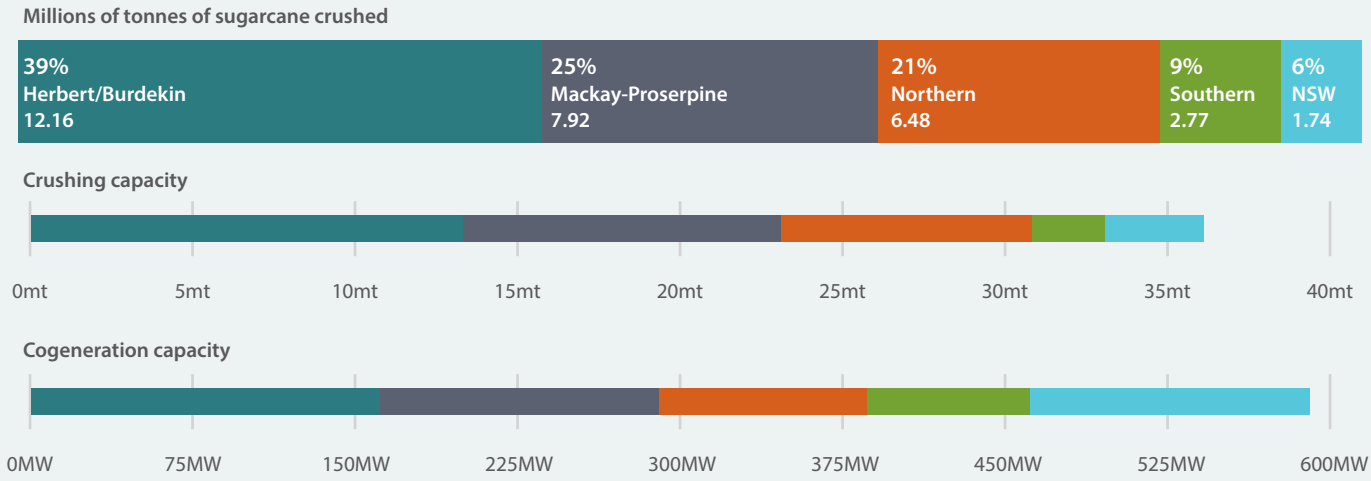
Our industry is critical to Australian agriculture

Raw sugar derived from sugarcane is Queensland's second largest agricultural export

400k	4k	23k	4k	c.$4bn
Hectares of farmland	Sugarcane growers	Direct and indirect jobs	Industry businesses	Supply chain GDP contribution

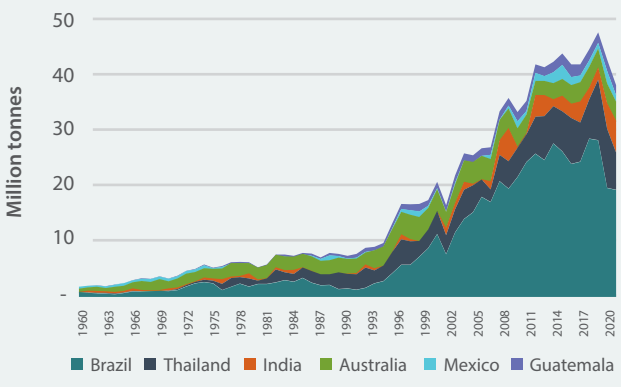
Sugarcane is grown between Mossman in Queensland and northern NSW and processed in 22 mills

Figures for the 2020 season, by region



Australia is a leading sugar exporter

Total export volumes for top six sugar exporters



Sugar and sugarcane have many uses

Examples of current end uses

- Drinks
- Baking
- Domestic use
- Food ingredients
- Medicine
- Cosmetics
- Alcohol
- Bioethanol
- Cogeneration

The industry benefits from a strong and well-established supply chain

Participants in the industry supply chain

Growers → Harvesters → Mills → Cogen → Refiners (local) → Marketing (raw) → Terminals → Refiners (offshore) → End users (wholesale) → End users (retail)

Research, Development and Extension

We face significant risks and opportunities

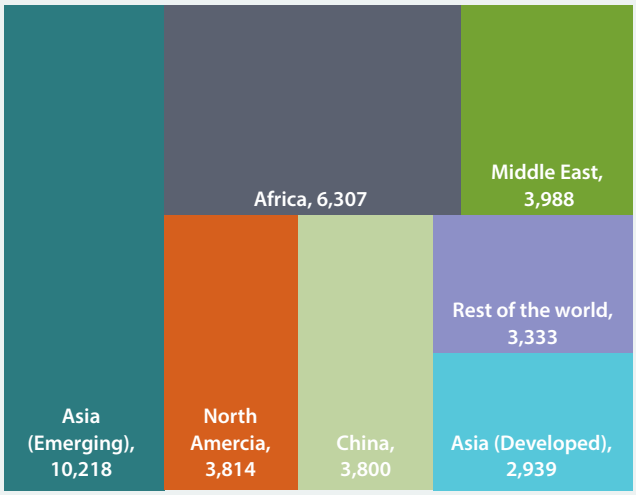
Our industry has faced significant challenges over the last 20 years

Many of these factors are outside of the control of industry stakeholders

- Weather volatility
- Price volatility
- Biosecurity, pests and diseases
- Competing land use
- Environmental risks
- Competition from other sources

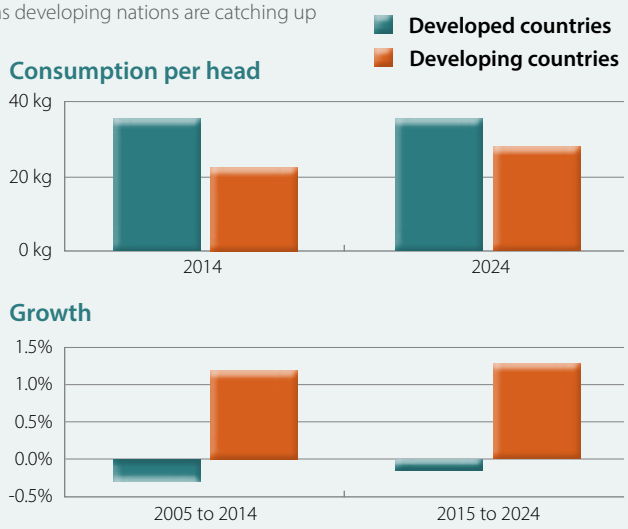
Global demand for sugar continues to increase

Top raw sugar importing regions (tonnes, 2020)



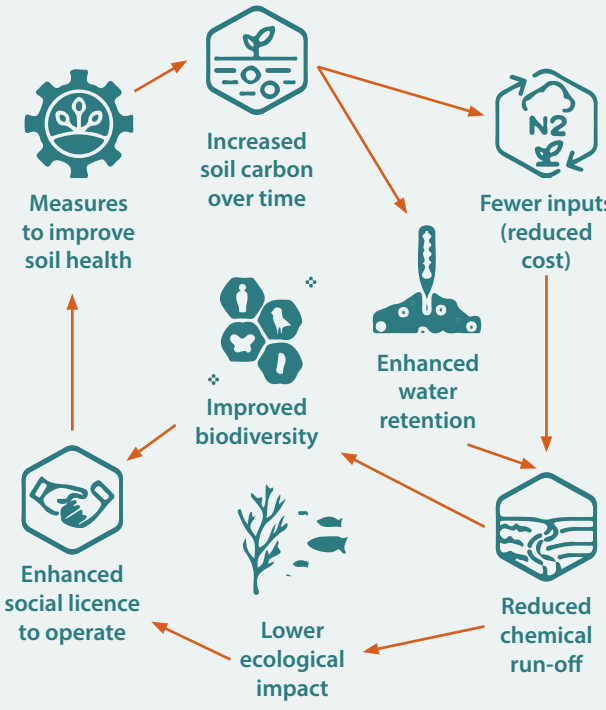
Sugar consumption is decreasing in developed countries

as developing nations are catching up



Environmental impact matters

Farmers are guardians of the environment



The regional bioeconomy offers huge upside

Sugarcane is an important bioproduct feedstock

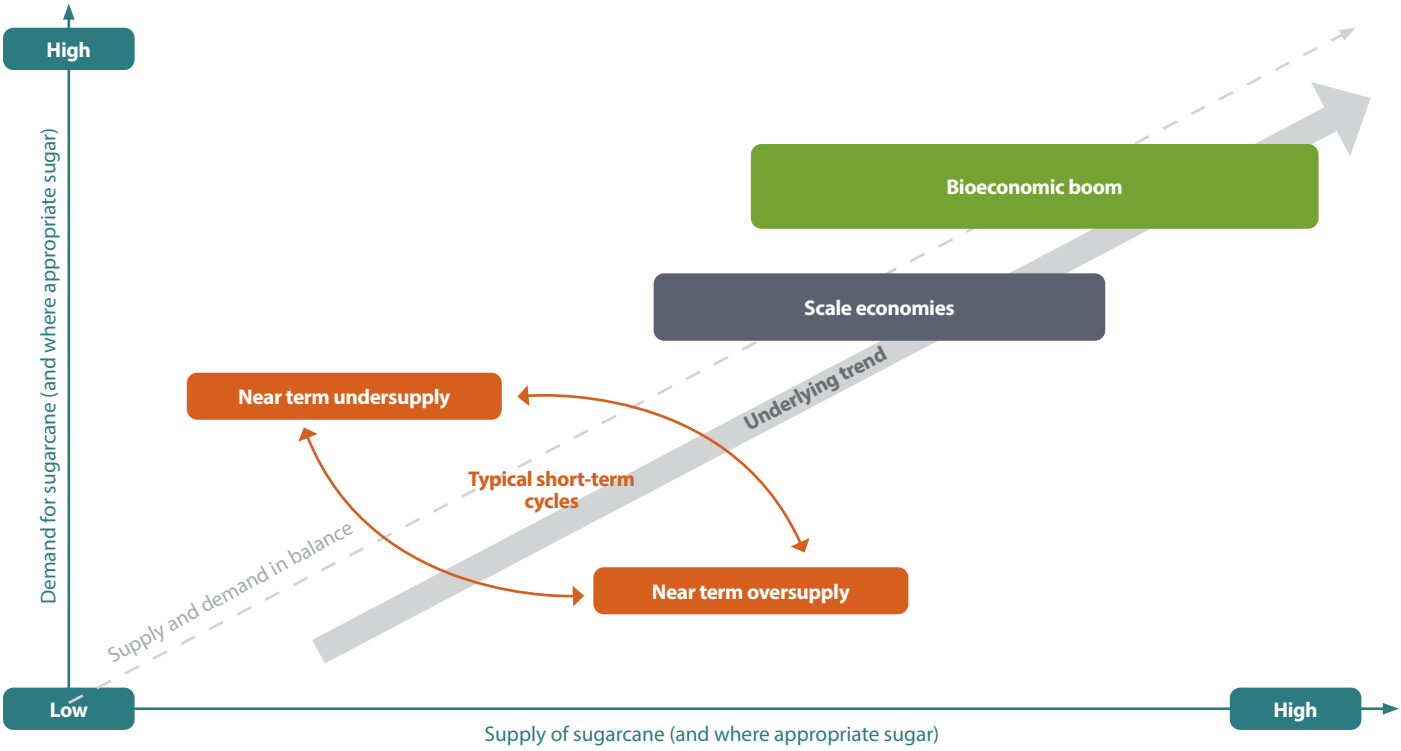
- Bioplastics
- Biofuels
- Alt-proteins

The Sugar Plus vision represents potential for substantial long-term growth by expanding activities to address the very large bioeconomy markets, which can be created with the right collaboration across the industry and the right public policy support. The scale of this opportunity is enormous, as sugarcane and sugar are attractive and sustainable hydrocarbon feedstocks.

Three broad trends are driving development

These trends set the context for the industry over the short, medium and long term

- **Oversupply <> undersupply cycles (Business as usual)**
- **The ongoing drive for scale and efficiency (Development as usual)**
- **A bioeconomic boom (A once in a lifetime opportunity)**



Near term: short term price cycles

The industry will continue to swing from periods of short-term undersupply (and stronger sugar and sugarcane prices) and short-term oversupply (and weaker prices). This may be caused by a variety of factors, including expanded output from Brazil or other major exporting nations, weather-related crop losses in key exporting nations, and/or new domestic crops in major importing nations.

Medium term: ongoing slow growth in overall demand

The underlying trend of slow increases in global demand for sugar is likely to continue, with ongoing pressure for all operators to continue to improve operational efficiency to remain competitive. This places less efficient growing regions under increasing pressure. Meanwhile, global price volatility remains consistent with historic trends as demand grows slowly.

Longer term: substantial increase in demand from the bioeconomy

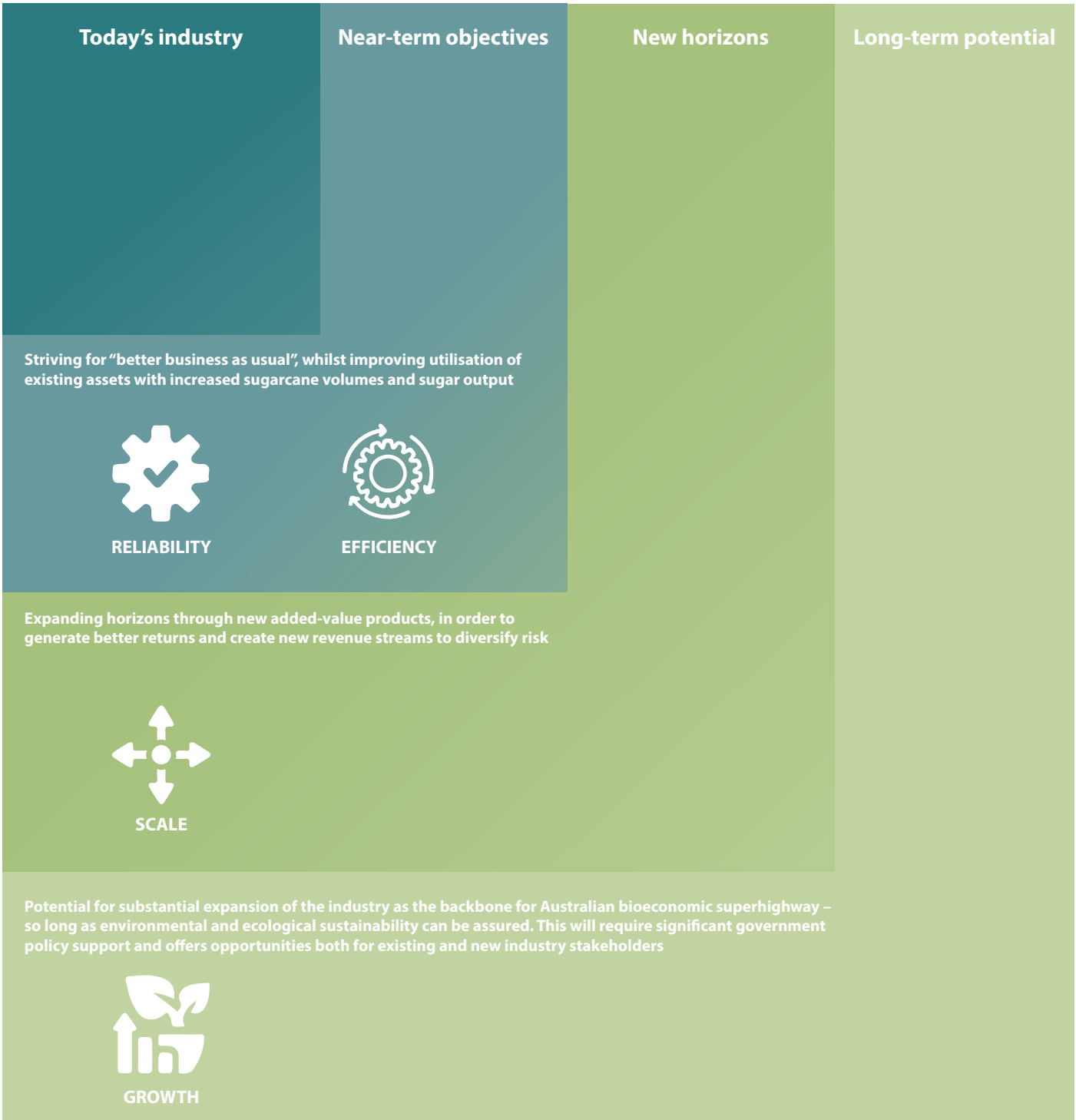
Demand for *sustainable* hydrocarbons from farming rather than the fossil fuel industry will likely increase significantly over the next 10 to 20 years, especially for bioplastics and biofuels for heavy transport and/or aviation. This would increase demand for sugarcane-derived products dramatically, benefiting countries with the capacity to expand the harvest and that invest in processing infrastructure.

The Sugar Plus vision addresses these trends

The Sugar Plus vision aims to improve the efficiency and reliability of the industry in the near term, and to provide a platform to achieve substantial growth over the medium to long term.

The focus is not on volume per se, but on improving industry profitability, whilst also ensuring that there is a continued focus on ensuring environmental benefits across the entire value chain.

Many of the measures required to achieve the vision are already well understood, and accordingly there is a strong emphasis on catalysing and supporting collaborative action across the industry.



The required measures address four broad topics

Farms

Mill Area

"The mill needs to be reliable, so that I don't have to delay my harvest or lose sugar content. Reliability will give us confidence to invest and grow more."	**Reliability**	"We need to know enough cane is being grown so the mill can make use of its capacity and continue to invest in maintenance and improvement."
"I need to know that my cane will be processed cost-effectively, so I get the best possible price."	**Efficiency**	"We need to process cane as efficiently as possible to minimise stood-over cane/maximise sugar production from available crop."
"We need sufficient land under cane and cane volume to justify the cost of inputs and harvesting."	**Scale**	"We have a very large fixed cost base and maintenance capex, so we need to process a minimum volume of cane to remain viable."
"We need to participate in the upside from new products and sources of revenue beyond sugar."	**Growth**	"We need new sources of revenue to make the overall business more profitable and cost-effective."

The roadmap reflects three core principles

The objectives of this roadmap

The roadmap describes the Sugar Plus vision and sets out an initial framework through which the entire industry can work together to deliver the vision, based on the three broad principles outlined below.

It also illustrates the role that the industry can play in supporting Australia's long term economic development, including the importance of agricultural production in helping the transition to net zero across numerous industries.

Additive to Australian agriculture

Implementation should not be disruptive to today's industry and is not designed to displace existing sugarcane and raw sugar production. Rather, the objective is to increase value added per hectare over the near to medium term , and through this maximise the opportunity to expand sugarcane production substantially over the medium to long term to meet emerging demand for new sustainable hydrocarbon sources.

1. Economically sustainable for all stakeholders

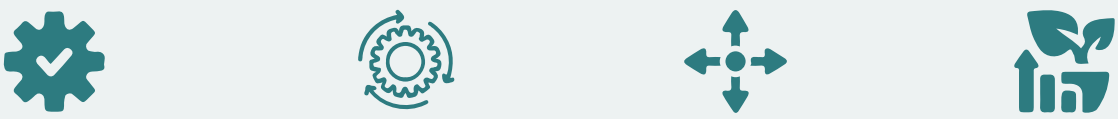
All proposed developments must be economically sustainable for all relevant stakeholders over the medium to long term

2. Environmentally responsible along the entire value chain

The extent of expansion of agriculture that would be required to enable Australia to reach net zero emissions highlights the importance of ensuring that the natural environment is protected

3. Near-term measures improve reliability and efficiency to create significant long-term opportunity

This document summarises the near-term steps required to meet the industry's collective goals



The bioeconomy offers an enormous opportunity

Most nations have committed to "Net Zero" by 2050

This will require radical redesign of many areas of most economies

- **Replacement of fossil fuels**
- **Food chain sustainability**
- **Capture of CO2 and sequestration**

Alternative sources of hydrocarbons will be needed to meet this goal

Hydrocarbons will still be needed for bioplastics, some fuels and other uses

- **Bioplastics**
- **Heavy transport**
- **Alt protein feedstocks**

The technologies required to deliver these products are already available

Sugar can be converted into bioethanol, from which polyethylene (the largest type of plastic in use) can be made (other processes are possible)

1kg sucrose → **0.68L ethanol** → **0.33kg plastic**

Australian demand alone for heavy fuels and plastics is substantial

Feedstock for proteins will be modest as many can be sourced directly from plants (and meats are c. 70% water)	Aviation 10,000m	Packaging 1,100m
	Shipping 14,000m	Construction 525m
	Diesel 30,000m	Other 1,875m
<1m tonnes	**54,000 million litres**	**3,500 million kg**

Even modest adoption of biofuels and bioplastics equates to a substantial amount of sugar

Proportion of current demand for aviation fuel	Proportion of current demand for plastic met through sugarcane: 20%	35%	50%
20%	5.1m tonnes	6.7m tonnes	8.3m tonnes
35%	7.3m tonnes	8.9m tonnes	10.5m tonnes
50%	9.5m tonnes	11.1m tonnes	12.7m tonnes

Current Australian sugar production is approximately 4.3m tonnes a year

Domestic Australian demand alone will be huge

Australia's current domestic market alone would create massive demand

The figures below are in millions of kg/litres of end-product

Alt-protein feedstocks

Aviation fuel

Bioplastics

Even a modest share in these segments requires substantial feedstock

One illustrative example is provided below

Alt-protein feedstocks

Aviation fuel

Bioplastics

The industry can be a key feedstock provider

Potential demand is illustrated in millions of tonnes of sugar equivalent

This example implies cane land expansion of c. 4.1% per year to 2050

Although a high target, both Brazil and Thailand achieved similar growth, enabled by strong government policy support over the long term

Australian target

Brazil 1975 to 1985

Thailand 2001 to 2020

Delivery would require strong policy action and national co-ordination

National policy to create demand

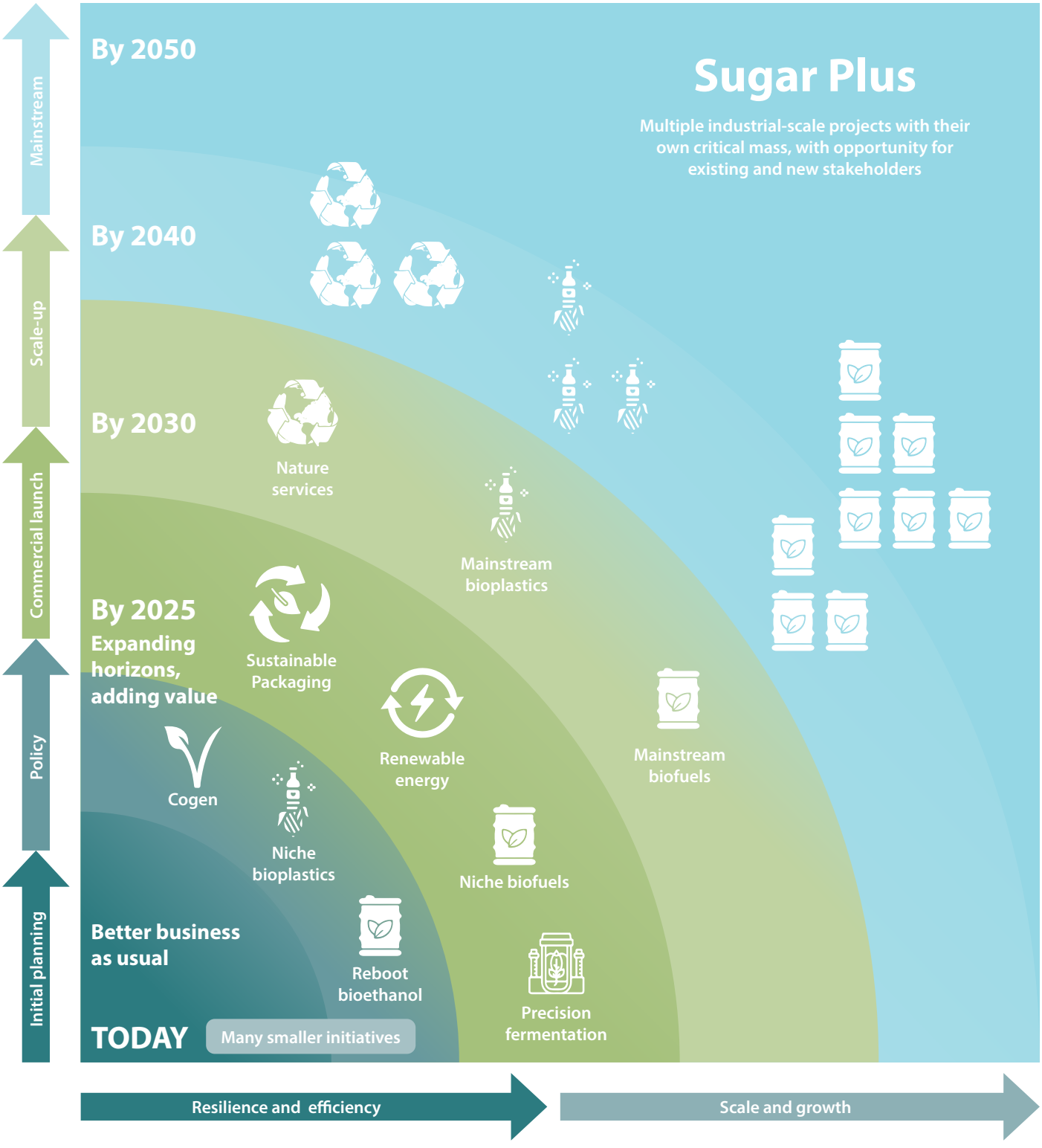
Industrial scale to ensure efficiency

Strong measures to protect the environment

The Sugar Plus vision aims to unlock this potential

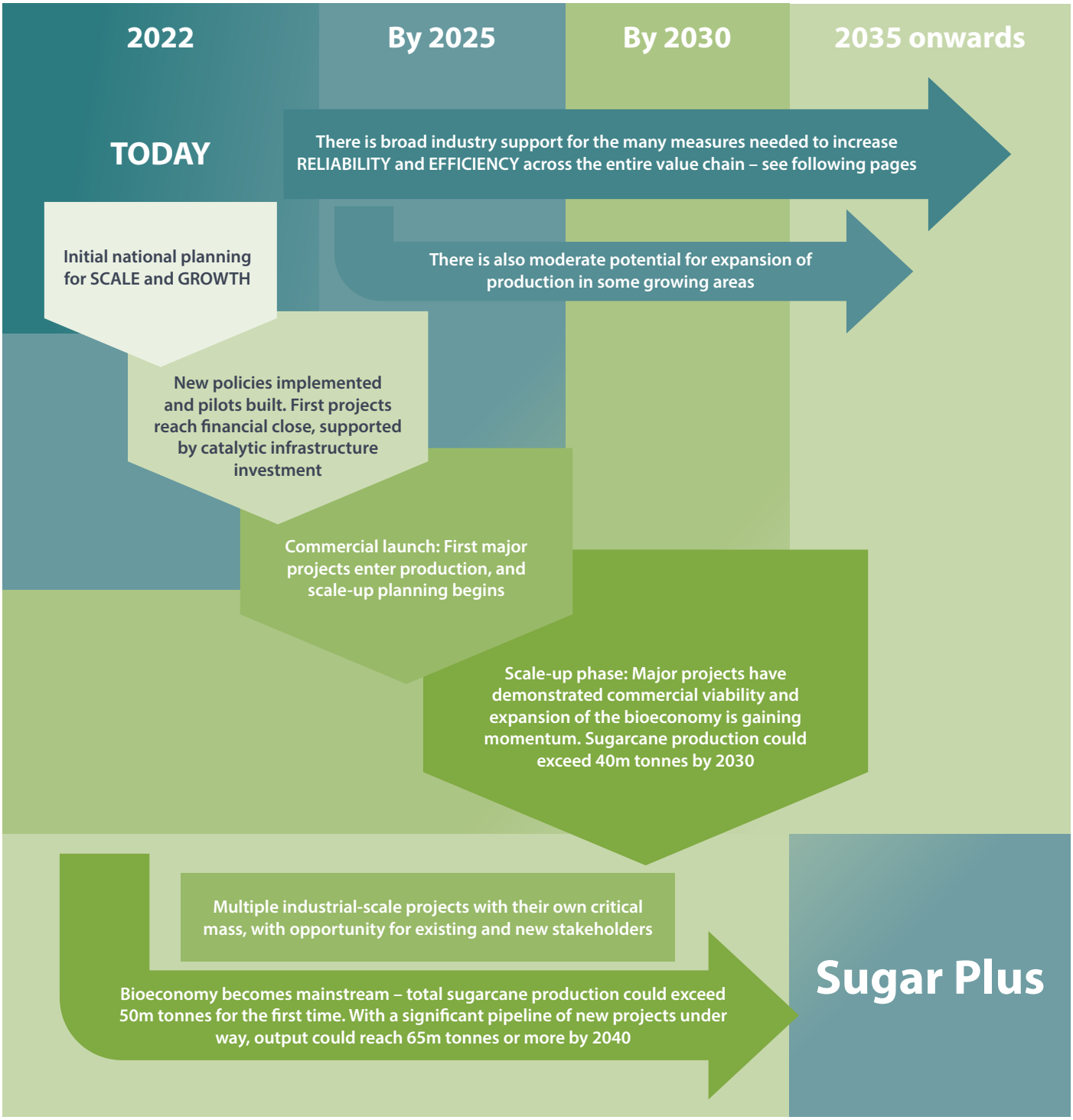
Our industry can position itself at the centre of an Australian Bioeconomy Superhighway

The near-term focus is to maximise the reliability and efficiency of existing production, whilst simultaneously improving environmental performance in an economically sustainable manner. This provides the platform on which the industry can expand to provide an ecologically sustainable domestic source of hydrocarbons so that Australia can meet 2050 net zero targets. Over the long term, this could create a substantially larger industry, whilst also enabling Australia to become increasingly self-sufficient, thus improving both economic resilience and national security.



This will ensure a thriving and sustainable industry

To become a vibrant, transforming industry, sustainably producing sugar and bioproducts at the heart of regional communities, we need to work hard to fix some things which are right in front of us while planning for the bigger picture. This means sustainably improving reliability and efficiency in our own businesses and throughout the supply chain now and taking steps to supercharge the roll-out of bioeconomy initiatives. Delivering the vision will require strong policy support to ensure demand and national co-ordination to deliver industrial-scale developments and support the development of critical infrastructure.



The actions needed today are broadly agreed

Many on-farm initiatives can improve yields and expand sugarcane production

Collaboration amongst local farmers is important to overall industry efficiency

Mills provide critical infrastructure and a focal point for regional initiatives

Reliability	Improve agronomic practices Improve varietal selection process Develop succession plans	Defend and grow land under sugarcane Improve access to inputs	Support sugarcane land expansion Asset renewal programme (vertical and horizontal expansion) Transport efficiency review
Efficiency	Complementary crops Adopt new varietals/technology Better price risk management	Leverage group buying power Farming best practice initiatives Succession support/land transfer Equipment sharing	Long term mill efficiency initiatives Water efficiency initiatives Support soil health and crop rotation
Scale	Alternative farming structures Reinvestment programme Business training to improve decision making	Support for new farmers Leasing land Support land consolidation	Incentivise sugarcane growing Productivity boards training programme (upskill advisors) Evolve long-term investment plans
Growth	Adopt new farming technology Data to improve efficiency and profitability Diversify income sources	Advocacy – build support for the industry Improve access to finance Attract new talent to the sector	Improve varietal development and adoption strategies Invest in new value add products Facilitate local industry collaboration

This will ensure a thriving and sustainable industry

Some initiatives require national co-ordination and/or policy/ regulatory change

Reliability

Promote operational resilience education
Data driven risk management
Ensure plant breeding innovation
Detailed profile of industry participants to support decision making
Consolidation of industry data to improve quality

Efficiency

Agricultural best practice incentives
Resources to support industry collaboration
Assist on-farm productivity
Data and tools to support decision-making
Incentivise on-farm technology adoption
Promote more efficient water use

Scale

Government/industry working groups to provide support and leadership nationally
Sustainability framework for agriculture
Global competitive analysis to understand Australia's competitive advantage
Analysis on competing land uses
Incentivise sustainable expansion of industry

Growth

Implement bioplastics plan to reduce waste
New/improved water infrastructure
Industry in-bound investment document
Review foreign investment rules for the industry and resolve investment barriers
Develop biofuels plan addressing needs of various sectors
Support the wider bioeconomy

The industry has a history of innovating to succeed

Examples of successful implementation of new approaches to improve reliability and efficiency and to drive industry scale and growth are evident across the industry. While there are notable industry scale achievements, it has been largely up to individuals to drive most changes with widespread adoption of initiatives slow to follow.

Key – examples of past successful implementation of new approaches and current endeavours

Land	Agronomic practices	Diversification	Bioeconomy

Australia's six bulk raw sugar terminals are the envy of the world's raw sugar industries

Mechanical sugarcane harvesting – green cane harvesting & green cane trash blanketing. Over 85% of Qld's sugarcane is now harvested green

QUT researchers are creating biofuels, green chemicals and other bioproducts using biomass feedstocks in Mackay

Licella is working with UQ, Burdekin Renewable Fuels to test conversion of sugarcane waste into biofuels with the potential for marine and aviation uses

Stephen Accornero from Ingham has been successfully and profitably planting corn while increasing his sugarcane yield

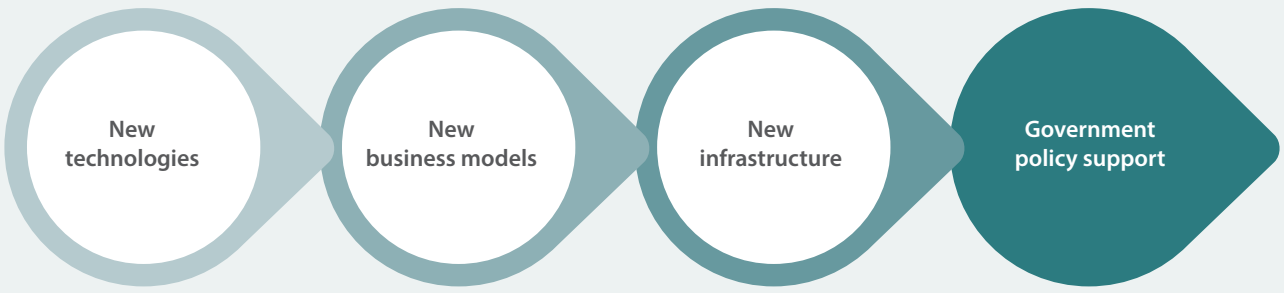
Gary Townsend at Townsend Industries in Mackay is aiming to develop a range of biopackaging from sugarcane with CRCNA's backing

Steve Kirby at ACF is behind a programme to improve profitability through land consolidation and scale economies

Andrew Balmer is optimising his water use by recording irrigation data using a smart phone app in the Burdekin

Dr. Stephen Cox is examining industry and policy settings required for new products and applications within industrial biotechnology and biofuels

Meanwhile, creating an Australian bioeconomy superhighway will require collaboration between many stakeholders



The Sugar Plus vision is to inspire collaborative action

Individual opportunities are well understood

There are numerous barriers to action

Collaboration is essential to unlock progress

There is strong support amongst stakeholders for the importance of acting on these opportunities

"The industry needs a shared vision that goes beyond sugar that everyone can rally behind."

"We need an aspirational target for sugarcane production volume and a plan to get there."

There is also broad recognition that collaboration is required to overcome the barriers to action

Confidence in mill reliability	Access to water and cost	Confidence in crop size	Absence of industry vision
Willingness to change	Willingness to collaborate	Lack of national policy	No clear national plan
Visibility of profitability	Lack of co-ordination	Cost of infrastructure	Lack of policy support
Access to capital and land	Need for leadership	Returns on new investment	Resolve investment barriers

Actions must focus primarily on long-term return investment, not on short-term revenue impact

Revenue per hectare is a poor metric

Decisions should account for all operating costs…

…as well as the extent of capital investment

Implications for risks should also be factored in

Trust needs to be rebuilt between stakeholders to overcome the complexity of the value chain

"Sugar is not enough. Our industry is well positioned to capitalise on very significant opportunities but in order to do so we must see past our individual differences and work collaboratively."

Local, regional and national support is needed today

Overview

On the following pages, we set out the various measures that could be implemented to address risks and unlock opportunities within the industry. These range from relatively modest measures that can be implemented by individual farms with minimal cost through to large-scale, national initiatives that would require substantial investment and coordinated policy support. These summaries also highlight the extent of collaboration that may be required with other stakeholders, as well as the likely timescale required to achieve meaningful impact. Innovation will be central to many actions at all levels.

Actions that can be taken at the individual farm level

Some measures can readily be implemented by individual farms. The majority of these measures require modest investment amounts and can be implemented in the short term. The payback period tends to be relatively low. Information about programmes linked to these measures is abundant, e.g. SIX EASY STEPS or Smartcane BMP. Many of these initiatives have already been implemented by growers across the country.

Actions that can be taken at the local community level

A variety of measures can be implemented amongst local communities, including through collaboration between farmers, local communities and local/regional government bodies. These include a range of measures that can support a vibrant farming ecosystem and can help to ensure retention of skills and business ownership within the local community.

Actions that require regional coordination and/or the support of a mill

Some measures must be initiated by mill owners and/or require collaboration between farmers and downstream infrastructure operators (including mills). There are also various measures which will benefit from regional policy support.

Actions that require national leadership and coordination

There are a variety of measures that can benefit the industry nationally. Examples include actions related to education and awareness of key topics, as well as matters related to innovation and best practice (including R&D and data). In addition, there are measures which require government policy and regulatory changes and (for the largest opportunities) may require financial incentives too, at least at the outset.

Measures requiring action taken on-farm

The following list of actions can be undertaken by individual farms across different growing regions. These measures have the potential to increase the resilience of on-farm businesses independently of actions implemented at other points in the value chain.

Degree of collaboration that is required and stakeholders involved

Low	Moderate	High

	Typical timing
Agronomic practices: Increase productivity by e.g. adopting Smartcane BMP/SIX EASY STEPS. Get in touch with your agronomist/productivity board to get implementation advice	Now
Varietal selection: Increase productivity crop resilience. Consult with your productivity board and SRA to define which varietals are optimal for each block of your paddock(s)	Now
Price risk management: Improve business resilience by using price risk management tools, with support from your financial advisor, marketing company or peak body	Now
Complementary crops: Improve resilience and efficiency – farm complementary rotational crops. Consult productivity board/agronomist/DAF on best options	Now
Reinvestment programme: Leverage profits from good years to carry out targeted investments and grow your business and increase your business resilience	Now
Business training: Get a better understanding of your profitability to improve decision making. Reach out to your peak body for course(s) recommendations	Near term
Succession planning: Ensure an orderly transition of your business. Engage and work with your financial advisor to discuss and establish future plans for your farm	Near term
Alternative farming structures: Consider leasing and/or share farming options to increase your profitability. Your peak body can provide additional details on this matter	Near term
Diversify income sources: Develop new revenues from agricultural carbon capture, and nature/biodiversity services, reef credits, as well as new forms of off-farm income	Medium term
Energy and water management: Improve productivity and efficiency by effectively using your water allocation. Optimise water use through recycling on farm	Medium term
New technology: Improve your efficiency and profitability by adopting new technology. Consult with your peak body on opportunities	Medium term
Data: Improve your efficiency and profitability by using data to support your decision-making. Consult your peak body for ideas on how to use data in your farm	Medium term

Resources

1. Smartcane BMP
2. SIX EASY STEPS
3. QBWOS
4. Sugarcane Industry RD&E Strategy
5. DAF - AgTech
6. Reef Trust Resources
7. AgForce Reef Regulations
8. Nutrient management

Measures requiring community collaboration

These initiatives usually require a degree of collaboration amongst local communities/farms as they largely rely on access to scale economies. Some larger farms may be able to implement some or all of these initiative on their own account.

Degree of collaboration that is required and stakeholders involved

Low	Moderate	High

	Typical timing
Defend and grow land under cane: Advocate for and support the maintenance of existing sugarcane land and protect suitable land for future sugarcane expansion	Now
Farming best practice initiatives: Invest in the implementation of farming best practices that improve productivity in the medium to long-term, e.g. soil health	Now
Attract new talent to the sector: Develop a strategy to attract young people to the industry and ensure the continuity of supply chain operations	Now
Advocacy: Secure government support for priority areas (as needed). Start with a review of current gov. support for the industry versus potential applications and resulting benefits	Now
Equipment sharing: Lower unit cost of planting and harvesting. Form a co-op with growers and millers that secures discounts on bulk equipment orders and leasing equipment	Now
Support for new farmers: Make it easy for new entrants to acquire and operate farms by developing resources on "getting started" plus provide grants/incentives to get started	Near term
Improve access to finance: Facilitate acquisition of new land and use of better farming practices. Create a capital pooling mechanism for the benefit of the industry/region	Near term
Improve access to inputs: Lower unit cost of planting and production. Form a co-op with growers and millers that secures discounts on bulk orders for inputs (e.g. fertiliser)	Near term
Leverage group buying power: Lower the unit cost of planting and harvesting through e.g. the formation of a co-op that negotiates bulk discounts on behalf of members	Medium term
Succession support: Facilitate the transfer of land and operation from retiring to new growers through e.g. the formation of a land bank or leasing programme	Medium term
Leasing land: Increase productivity by facilitating land access to interested growers through partnership with financing company that facilitates leasing agreements	Medium term
Support land consolidation: Implement policy changes that facilitate orderly consolidation of cane land. Assess role of tech as an enabler (e.g. autonomous vehicles)	Medium term

Resources

1. Qld Gov loans
2. Drone/ mapping tech
3. RIC Loans
4. Help farmers protect the reef
5. Reef protection
6. Project Cane Changer

Measures requiring mill area action

These initiatives require a degree of regional co-ordination, including both support from local government and/or from a mill or other regional infrastructure provider. Some of the actions may require external financial and/or government policy and/or regulatory amendments.

Degree of collaboration that is required and stakeholders involved

Low	Moderate	High

	Typical timing
Facilitate local industry collaboration: Form local industry representative working group(s) of millers, growers and collaborationresearchers to work on industry priorities	Now
Improve varietal development and adoption strategies: Ensure the right varieties are grown at each block in each region and the right information is used to support decisions	Now
Develop financial mechanisms to incentivise cane growing: To increase land under cane and/or adoption of best practices through a financing scheme led by local industry	Now
Productivity boards training programme: Ensure standardisation and quality of varietals advice provided by productivity boards by developing a training programme	Near term
Water efficiency: Increase production volume by increasing water use efficiency through assessment of economic benefits of increased water use	Near term
Asset renewal programme: Ensure milling assets are maintained to an appropriate standard. Devise a plan with requisite investment needs and funding plan	Medium term
Support soil health: Improve land productivity by incentivising growers' adoption of best practices and crop rotation targeting soil health	Medium term
Evolve long term investment plans: Increase reliability of mills to optimise processing time via ongoing investment, in close collaboration with growers	Medium term
Support cane land expansion: Devise incentives to encourage growers to enter the industry and other growers to expand, retaining capital in the industry	Medium term
Transport efficiency: Ensure efficient utilisation of transport assets. Review existing logistics and define reinvestment plans and potential for improvements	Medium term
Long term mill efficiency improvement initiatives: Monitor and continue to implement global best practices for sugar milling	Medium term
Invest in new value add products: Define new models/structures that enable investment and value sharing with appropriate commercial risk/reward allocations	Medium term

Resources

1. Mackay biohub
2. Queensland's Biofutures 10-Year Action Plan and Roadmap
3. Queensland Government loans
4. A pathway to sustainable cane supply
5. Milling Sector Bioenergy Agenda Report

National collaboration will be essential

There are various initiatives that require whole-of-industry co-ordination and collaboration, and/or which need significant external investment. The development of this roadmap has shown parties from along the value chain are able to come together in mutual support of their common interests, despite their differences. Maintaining this level of cooperation and momentum and then extending it to engage with State and Federal Government on major policy initiatives is a critical next step.

Education and awareness	**Operational resilience:** Develop national curriculum in relation to operational resilience for the whole industry's supply chain
	Resources for collaboration: Develop resources to support collaboration with the industry
	Work with government: Through the definition of working groups that result in support and leadership at State and Federal levels
	Detailed profile of industry participants: Commission a behavioural study of industry participants to understand decision-making processes and create tailored programmes
	Global competitiveness analysis: International benchmarking exercise to understand and leverage Australia´s competitive advantages
	Sustainable agriculture: Develop a comprehensive sustainable agriculture policy and education materials on e.g. farm carbon capture opportunities, soil health etc
National innovation and best practice, including R&D and data	**Data driven risk management:** Develop national data benchmarks for different parts of the supply chain that enhance risk management practices
	Plant breeding innovation: Ensure innovations in plant breeding are trialled by the industry to shorten variety development cycle times whilst simultaneously improving yield
	Industry in-bound investment document: Commission a report that analyses and presents the commercial case for investment into the industry
	On-farm technology adoption: Develop a technology guide/education materials for growers outlining efficiencies/benefits of new tech solutions deployed on-farm
	Data and tools that support decision making: Develop a series of data analysis and visualisation tools that support farmers´ business decision making
	Enhance modelling via national consolidation of data: Enhance the power of predictive modelling by collecting, consolidating and improving the quality of industry data

Resources

1. Queensland Reef Water Quality Programme
2. ABARES financial performance of sugarcane farms
3. ABARES survey of Australian sugar cane businesses
4. Sugar Policy Insights

This will include government policy support

The near-term aspirations of the Sugar Plus vision can largely be achieved within existing policy frameworks, although some regulatory barriers to investment will need to be amended or removed. Delivering on the much wider opportunity to support Australia's transition to net zero will require a step-change increase in agricultural production, significant investment in new infrastructure, and widespread adoption of measures to enhance environmental and ecological sustainability. Significant government policy support will be required to encourage and enable this transition, especially in relation to the large-scale projects required to establish a significant bioeconomy. The latter are highlighted in blue below and merit dedicated workstreams (see following pages).

- **Incentivise best practice:** Invest in industry best practices, review current funding provided and continue to support e.g. Smartcane BMP and/or other programmes
- **Diversification and investment:** Consider alternative approaches and policy settings that facilitate value adding diversification initiatives. Ensure policy/regulatory settings are appropriate to encourage large scale capital investments
- **Assist on-farm productivity:** Increase farm-level productivity by improving government capital loan schemes to further acknowledge farm-level efficiencies
- **Incentivise sustainable expansion of the industry:** Develop a whole-of-industry "ask" to government in relation to policy changes required to support industry
- **Water optimisation:** Analyse existing infrastructure and irrigation schemes to develop a water optimisation strategy to support new cane land, including eg new infrastructure
- **Efficient water use through water trading/water markets:** Develop/enhance a water trading scheme that maximises the utilisation and efficient allocation of water permits
- **Review FIRB rules for the industry:** Foster foreign investment by reviewing and considering improvements to current FIRB rules for the industry
- **Competing land use analysis:** Commission a report to understand current and future uses of land in the coastal strip to understand the competitive forces and land trajectory
- **Bioplastics:** Develop a comprehensive national bioplastics plan, building on existing national plans to reduce plastic waste (the National Plastics Plan)
- **Biofuels:** Develop a comprehensive national biofuels plan that addresses the needs of the aviation sector and, as appropriate, also includes bunker fuels/gas oil and diesel
- **Large scale ecological optimisation:** Develop plans for how best to ensure new large-scale agricultural production is ecologically sustainable, including (eg) measures that ensure offsetting increases in biodiversity in other locations
- **The wider bioeconomy:** Develop a comprehensive national bioeconomy plan that links investment in bioplastics and biofuels with other areas of opportunity in the bioeconomy and facilitates development of related infrastructure

Resources

1. Whitsundays Biofutures
2. Mackay biorefinery
3. Queensland Biofutures roadmap
4. RSB – Global Sustainability Framework
5. Australia's Bioenergy Roadmap
6. Bio-based Building Blocks and Polymers

Collaborative leadership will be vital for success

There are many supply-side measures to be implemented in the near to medium term, both by individual growers and groups of growers, as well as at a mill-area level. We outline below how stakeholders across the industry could work together to implement the required measures.

	Near term opportunities (impact by 2025)		
Primary objectives	**Optimising production and processing** • Increase profitability of production • Increase efficiency along the entire value chain • Reduce overall environmental footprint	**Leveraging the strength of the supply chain** • Ensure optimal use of existing assets • Explore alternative forms to leverage assets • Maximise value achieved all along value chain	**Adding value to existing production** • Increase overall economic value added • Secure new local demand for high quality feedstock • Identify new revenue streams to diversify risk
Initial national planning	Establish a national working group to provide overall co-ordination		
Regional and local planning	Establish/finalise priorities at each mill area and establish regional action teams		
	Establish/finalise mechanisms for sharing experience between regions		
	Establish/refine resources to support local initiatives by farmers/groups of farmers		
Implementation of initiatives	Develop a detailed profile of industry stakeholders		
	Initial pilots and trials	Initial pilots and trials	Develop business plans for a set of pilot projects
	Review experience and adapt as needed	Review experience and adapt as needed	Deliver pilots
	Roll-out within relevant communities	Adopt measures along value chain	Review experience and adapt as needed
Expansion and improvement	Build support for larger-scale initiatives	Secure funding to pursue larger/ new projects	Secure increased funding to support expansion
	Identify priorities and develop business cases	Identify opportunities to complement supply chain	Scale up successful projects/ initiatives
	Implement larger scale-initiatives	Deploy plan to maximise supply chain value	Continue to identify new value added products

Major initiatives require national co-ordination

The larger initiatives related to development of a national bioeconomy will require national coordination and carefully targeted policy support. In addition to the opportunities related to biofuels and bioplastics, a strong focus will be needed on developing the infrastructure required to support long-term growth, whilst also ensuring environmental and ecological sustainability.

Medium term opportunities (impact by 2030)		Longer term		
Establishing a national biofuels industry	**Establishing a national bioplastics industry**	**Infrastructure and environment**	**Future of fabrication**	**Primary objectives**
• Reboot the domestic biofuels sector • Become a major supplier of biofuel for aviation • Reduce national dependence on imports	• Launch a domestic bioplastics industry • Become a major supplier of domestic bioplastics • Create new value-added activities onshore	• Optimise industry infrastructure • Support significant industry expansion • Environmental and ecological sustainability	• Watching brief on emerging bioproducts (i.e. beyond biofuels and bioplastics) • Prioritise opportunities and business case development	
Set up biofuels task force	**Bioplastics task force**	**2050 task force**	**Establish task force and define scope of activities in more detail**	**Initial planning**
Establish initial priorities and develop commercial business cases	**Establish initial priorities and develop commercial business cases**	**Validate potential scale of opportunity and environmental barriers**		
In parallel, identify policy support measures that would be needed	**In parallel, identify policy support measures that would be needed**	**Identify how best to realise the opportunity**		
Implement proposed policy measures	**Implement proposed policy measures**	**Detailed feasibility studies**	**Identify opportunities and support stakeholder engagement and development of business models**	**Preparation**
Create implementation consortia and progress feasibility studies	**Create implementation consortia and progress feasibility studies**	**Design phase (agronomy, infrastructure, environment)**		
Secure finance and launch pilot projects	**Secure finance and launch pilot projects**	**Finalise delivery model and proposed partner(s)**		
Following successful pilots, commission and build full-scale projects	**Following successful pilots, commission and build full-scale projects**	**Construction and initial operations**	**Construction and operation of pilot production facilities**	**Launch**
Expansion around initial projects and in additional locations	**Expansion around initial projects and in additional locations**	**Further long-term expansion**	**Further investment and manufacturing scale-up**	**Scale-up**

Success can be tracked using six high level measures

The success metrics provide a simple and straightforward way of measuring whether the industry is making sufficient progress towards the objectives set out in the Sugar Plus vision. They are thus intended to be straightforward in nature and easy to collate, as quantitative as possible (so that they do not rely on judgement or qualitative elements) and as simple as possible to interpret.

The measures track overall progress that is relevant to the entire value chain. These are first order measures for the entire industry – there will be more detailed leading and lagging indicators that are relevant to individual segments and local priorities.

1

RELIABILITY – Processing time

Processing time as a percentage of total crushing time after allowing for wet weather (in line with Bonsucro's international standard for reliability, increased by 10% against Bonsucro's stated target of >75%).

>85%

Processing time / total crushing time

2

EFFICIENCY – Return on total assets

The overall efficiency with which assets are used can be measured by calculating the return on total assets, i.e. the pre-tax profit generated in a given period, divided by the total assets used to generate that return.

Larger scale projects: 10% to 12%

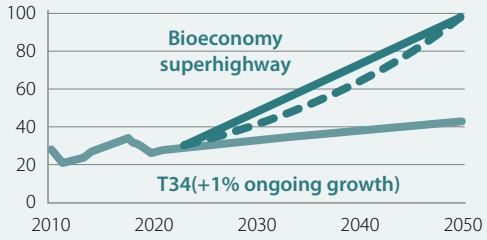
Smaller scale projects: 12% to 15%

(Subject to risk profile)

3

SCALE – Total volume of cane harvested

This is a very simple measure that captures output at the most fundamental level (i.e. is not directly affected by commodity prices). Importantly, as bioeconomy activity grows, a greater proportion of cane will be processed into bioplastics and biofuels, which may not involve the production of sugar as an intermediate stage.



4

GROWTH – Total capital invested in major projects

This should include both an estimate of the value of net increases in land under cane (e.g. using standardised valuation metrics) as well as investment in both industry infrastructure and capital equipment. This investment will be the critical lead indicator of whether sufficient resources are being deployed quickly enough to deliver the vision.

A$3bn to A$4bn of cumulative capital investment by 2030

5

STAKEHOLDERS – Industry-wide engagement

We recommend that the industry conducts an annual survey of relevant stakeholders, with the objective of generating a single measure of industry support for ongoing implementation of the vision. This would be tracked over time – ultimately the most important element being whether engagement is increasing over time.

Score should increase over time

6

SUSTAINABLE IMPACT

– contribution to CO_2 reduction

The establishment of substantial bioeconomy activity will contribute significantly to elimination of net CO_2 emissions, measurable using a suitable accreditation standard. The industry will establish and adopt appropriate science-based targets that measure the overall impact on CO_2 emissions as well as the achievement of other environmental goals.

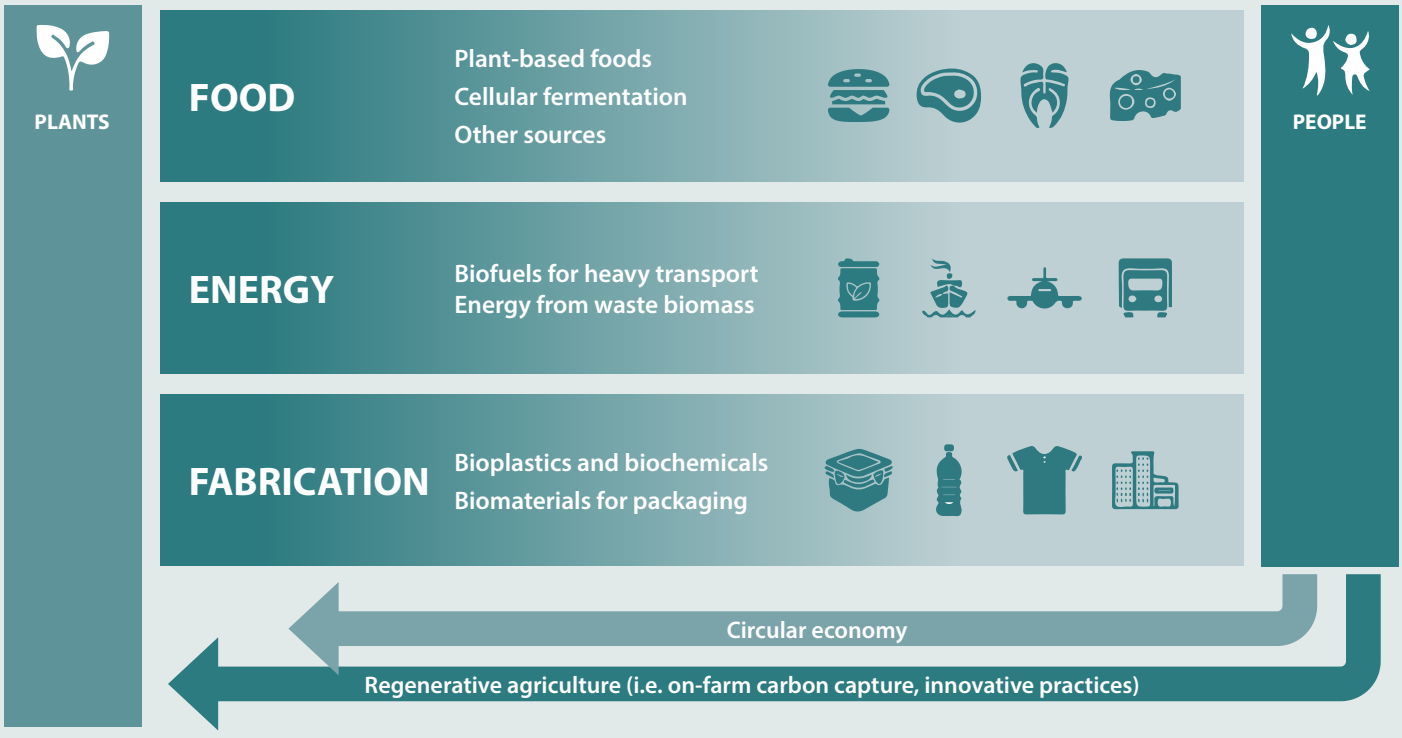
Overall contribution to reduction in national CO_2 emissions

In addition, science-based targets to measure other environmental goals

Positioning Australia as a bioeconomy powerhouse

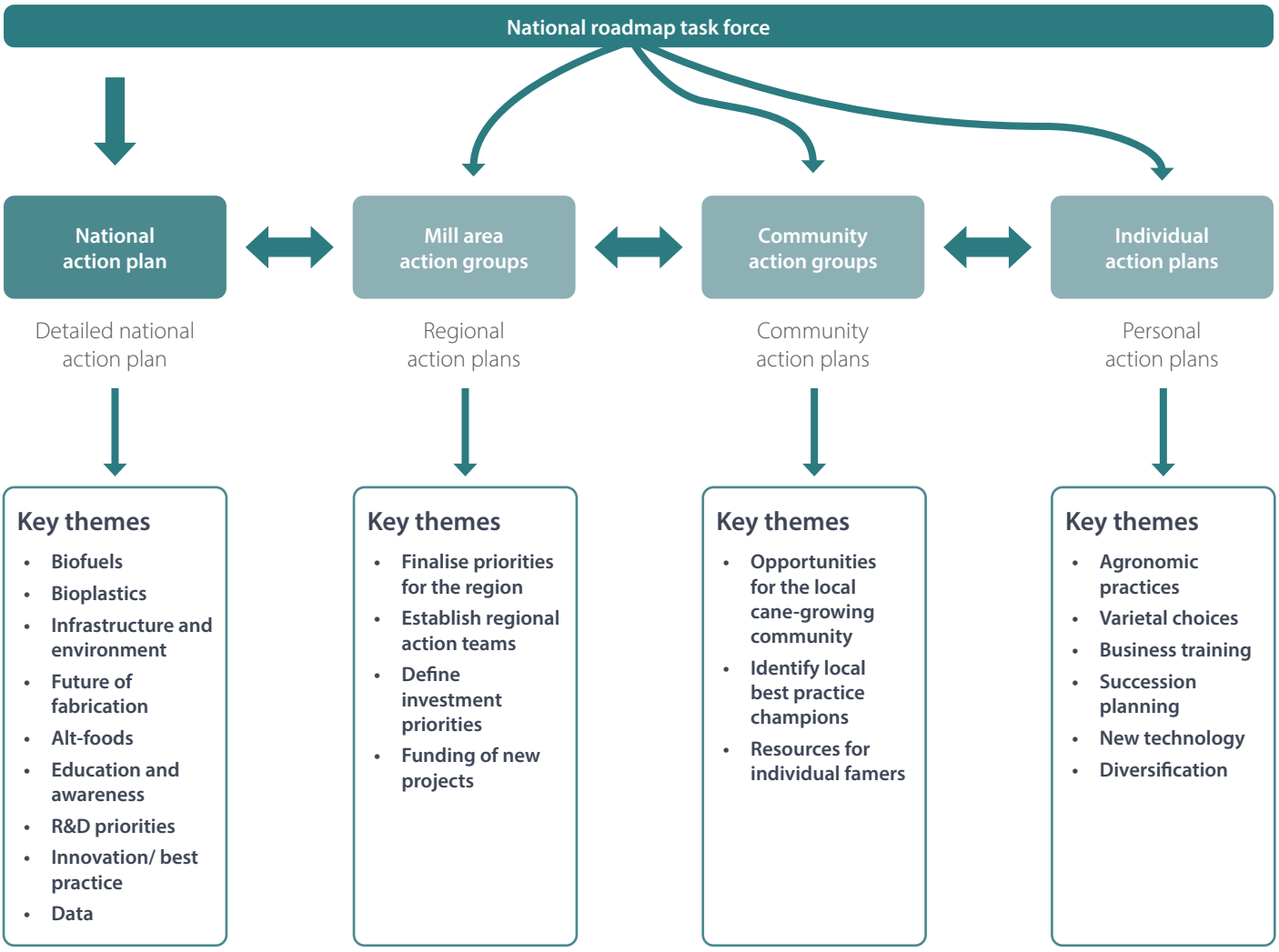
Achievement of these goals could dramatically increase the size of the Australian industry, with significant benefits for regional and rural communities. Whilst the implied growth is high, similar industry expansion has been achieved in other major growing regions, including Brazil and Thailand, over multi-decadal periods.

Delivery of the vision will also position Australia as a bioeconomy powerhouse, enabling the production of many different types of product from plant-based feedstocks as illustrated below. In doing so, it will be essential to ensure environmental and ecological sustainability.



Sound governance is critical to the roadmap's success

This project is the beginning of a collaboration-focused (rather than advocacy-focused) leadership effort to secure industry support, identify local champions and take the first steps towards the vision. Coordinated, long-term stewardship of this roadmap will be essential by leaders within the industry across the value chain.



Our key funding body and representatives of industry organisations have been instrumental in delivering the Sugar Plus vision and roadmap. Thanks also to Pottinger for their support in engaging across the industry supply chain to coordinate and draft the roadmap on behalf of industry.

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Want to know more?

Industry representative organisations will establish a series of working groups to drive progress and realisation of Sugar Plus. For more information, or to get involved, contact your industry representative organisation.

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