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TEN-YEAR R&D PLAN

2024 - 2034

SUGAR RESEARCH AUSTRALIA LIMITED

EXECUTIVE SUMMARY

Welcome to Sugar Research Australia's (SRA) Ten-Year Research and Development (R&D) Plan 2024-2034. This Plan charts our course for investment in research and development (R&D), aimed at addressing key issues and critical challenges faced by Australian sugarcane growers and millers.

Our purpose is clear: to bolster the industry's competitiveness, productiveness and sustainability through innovative R&D while benefiting the regional communities within which the industry is located.

Our vision is to be the trusted partner that shapes the future prosperity of the Australian sugarcane industry and its regional communities through ingenuity and innovation.

This R&D Plan aims to steer investment in research on behalf of the Australian sugarcane growers and millers and the Australian government to improve the productivity, profitability and sustainability of the industry.

To maximise the benefits for the industry, SRA will implement an integrated approach to direct its R&D investments across five R&D programs:

1. **Varieties:** Create the potential
2. **Agronomy and Farming Systems:** Achieve the potential
3. **Crop Protection:** Safeguard the potential
4. **Milling and Processing:** Deliver the potential
5. **Adoption:** Reach the potential

Five key principles guide our approach to implement this Plan: Focus on the long-term, promote adoption (R&D+E=A), be future-ready, build research capability and collaborate.

This R&D Plan is a culmination of collaborative efforts with industry and government stakeholders. Recognising the dynamic nature of our environment, this document serves as a living roadmap. We remain committed to ongoing engagement with our key partners, continuously learning and adapting to shape a prosperous future for the Australian sugarcane industry.

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Acknowledgement of Country

In the spirit of reconciliation, SRA acknowledges the Traditional Custodians of country and their unique cultural and spiritual relationships to the land, waters and seas and their rich contribution to society. We pay our respects to Elders past, present and emerging, and extend that respect to all Aboriginal and Torres Strait Islander peoples today.

Acknowledgements

SRA acknowledges and thanks its investors, including levy payers (sugarcane growers and millers), the Commonwealth Government and the Queensland Government.

Australian Government
Department of Agriculture, Fisheries and Forestry

Queensland Government

The R = Research, D = Development, E = Extension and A = Adoption equation is the key to this R&D Plan.

We aim to build strong connections between researchers, growers, and extension specialists and guide research investment to deliver practical solutions for growers, millers, and all stakeholders in the Australian sugarcane industry to address current and future challenges.

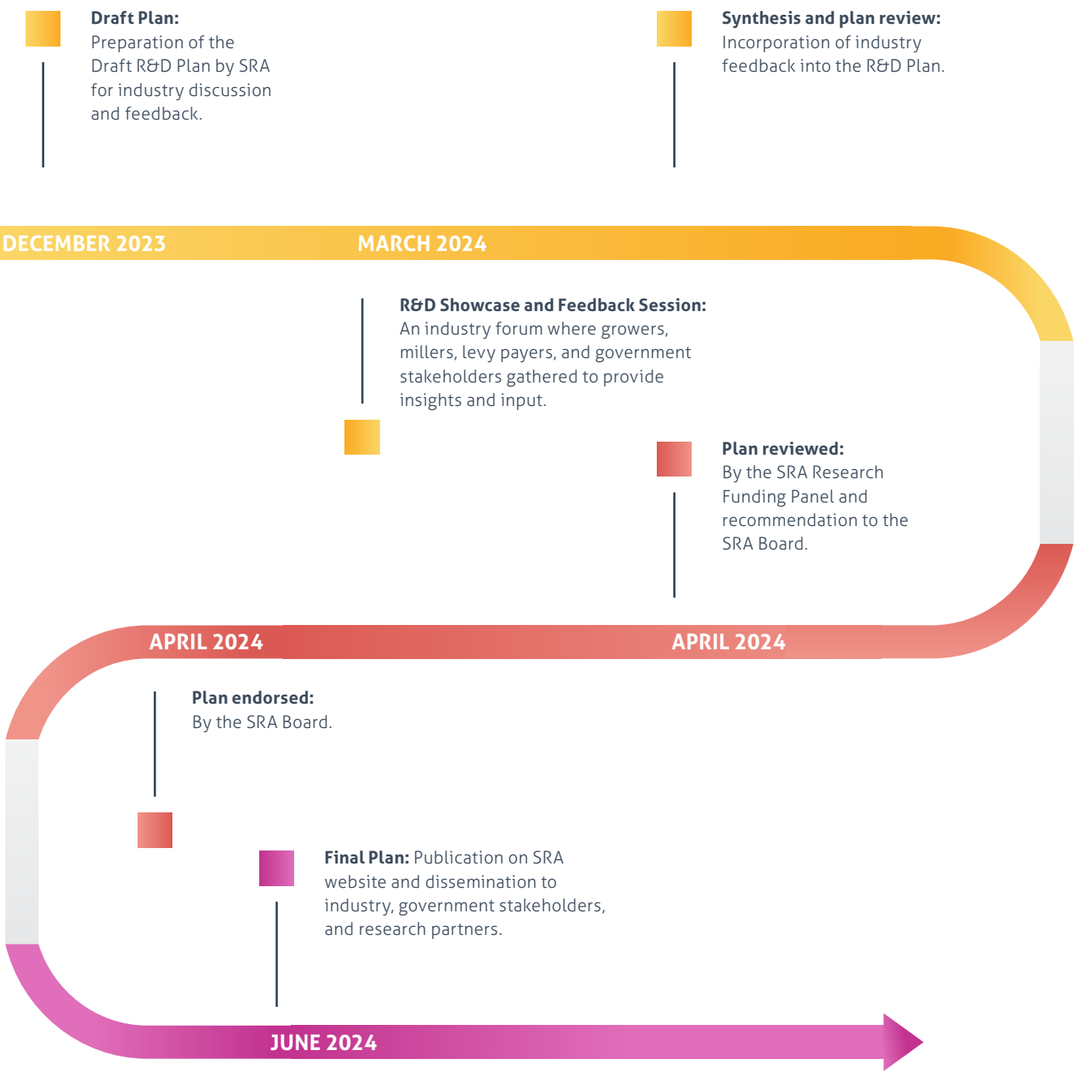
Contents

Our Industry
Engagement

SRA is committed to listening to and responding to the needs of industry and government stakeholders in shaping this R&D Plan to deliver impacts for the industry, as well as benefits for the broader Australian community.

We have gathered industry stakeholder feedback through an industry forum held with representatives from industry peak bodies (millers and growers), industry service providers and Federal and Queensland government stakeholders. Feedback was also received from industry stakeholders and research partners via written submissions. This feedback has been incorporated to fine-tune the Plan and ensure it reflects the needs and aspirations of our key stakeholders.

TIMELINE



R&D Plan
Overview

PURPOSE

We assist the Australian sugarcane industry to be competitive, productive and sustainable through innovative research and development.

VISION

Delivering Industry Benefit: A trusted partner shaping the future prosperity of the Australian sugarcane industry and regional communities through innovation and ingenuity.

R&D PROGRAMS: WHAT WE WANT TO DELIVER

To maximise the benefits for the industry, SRA will implement an integrated approach to direct its R&D investments across five R&D programs:

VARIETIES – Create the potential

Step-change in plant breeding.

New varieties with improved production and processing performance.

Correct variety adoption decisions.

AGRONOMY & FARMING SYSTEMS – Achieve the potential

Optimise agronomic inputs.

Improve sugarcane soil condition.

Integrate data, technology, and innovation.

Sustainable production.

CROP PROTECTION – Safeguard the potential

Sustainable management of pests.

Sustainable management of weeds.

Sustainable management of pathogens.

Biosecurity preparedness.

Data and emerging technology.

MILLING & PROCESSING – Deliver the potential

Optimise operations.

Highly skilled and professional workforce.

Opportunities for diversified income.

ADOPTION – Reach the potential

The right information.

Regional approaches.

Industry transformation.

Principles: How we will deliver

Five key principles guide our approach to implementing the Plan:

- **Focus on the long-term:** A consistent effort over ten years to improve all aspects of growing and milling Australian sugarcane will have lasting impacts.
- **Promote adoption (R&D+E=A):** Researchers, extension staff, growers, millers, and other stakeholders working together will ensure research addresses industry needs and has a clear pathway for on-farm and in-mill adoption and implementation.
- **Future ready:** Investing in data integration, emerging technologies (e.g. artificial intelligence and automation) and new bioproduct opportunities will secure the long-term viability of the industry.
- **Research capability:** Investing in world-leading researchers, infrastructure within SRA and its partners will sustain the industry's long-term success.
- **Collaboration:** Combining expertise, approaches and resources is essential accelerate to develop valuable solutions.

About
Sugar Research Australia

Sugar Research Australia (SRA) is the specialist research organisation for the Australian sugar industry established in 2013 as a company owned by sugarcane growers and millers. SRA serves as the declared Industry Services Body for the Australian sugarcane industry under the Sugar Research and Development Services Act 2013 (Cth). SRA was formed through the merger of two previous entities, the Sugar Research and Development Corporation (SRDC) and the Bureau of Sugar Experiment Stations (BSES) who had individually made significant contributions to the Australian sugar industry. By combining their experience, expertise, resources, and knowledge, SRA was created to drive innovation and sustainability in the industry. Unique to the research and development corporation (RDC) landscape, SRA operates an extensive network of research farms, laboratories, and offices throughout the industry's regions. This widespread presence ensures that SRA staff, as well as research and adoption efforts are accessible to all growers and millers. The primary source of funding for SRA's activities is the statutory sugarcane levy, which is paid by growers and millers to support research and development activities. SRA also receives matching funding and grants for eligible research and development activities from Commonwealth and Queensland government departments and agencies including the Australian Government's Department of Agriculture and Fisheries and Forestry (DAFF). The strategic direction and governance of SRA are overseen by a skills-based board. The Board is selected by an Independent Director Selection Committee, endorsed by Members at an Annual General Meeting, ensuring a high level of expertise and accountability in guiding the organisation.

KEY RESPONSIBILITIES

- Deliver cost-effective research and development services to the Australian sugarcane industry to enhance its viability, competitiveness, and sustainability.
- Carry out, coordinate, and provide investment for R&D activities in relation to the Australian sugarcane industry.
- Facilitate the dissemination, extension, adoption, and commercialisation of results of R&D activities.

KEY CAPABILITIES

With 130[i] staff across eight research stations and six farms, SRA is uniquely positioned with extensive in-house research and adoption capability across critical research disciplines, including sugarcane variety development, agronomy, entomology, pathology, soil, weed and environmental science.

- $42.8M investment in RD&A activities in 2023-24[ii].
- 10.3 to 1 long-term return on investment by SRA[iii].

SRA has an impressive track record of collaboration and an extensive network of international and national partners. SRA draws upon the combined capability of these partners to deliver high quality R&D to the industry and transfer scientific breakthroughs which happen in other sectors, seamlessly into the Australian sugarcane industry. In 2023-24 SRA has:

- 66 research investment and delivery partners.
- 205 funded research investigators.
- 10 higher research degree positions funded.

About
the industry

The Australian sugarcane industry is mainly located along Australia's north-eastern coastline, from Grafton in northern New South Wales to Mossman in Far North Queensland. Sugar production is one of Australia's largest rural industries. 95% of the raw sugar is produced in Queensland and 5% in northern New South Wales. Driven by higher prices, there is a projected 19% increase in sugarcane production values to reach $2.4 billion in 2023–24. This is despite a forecasted slight fall in production. Sugar export values are forecast to rise, driven by elevated prices due to factors such as port congestion affecting Brazilian exports, reduced production from key producers, and sustained global demand.

At the farm level, there has been a notable improvement in average financial performance. The confidence in the sugarcane industry's future is evident among growers and millers. Using the net sentiment scale of -100 to +100 (% positive sentiment minus % negative sentiment), in 2023 growers reported +78, while millers reported +97. These figures represent the highest recorded sentiments to date and mirror the improved economic and operating environment.

Figure 1 Sugarcane regions, Australia

Australian sugarcane industry snapshot

2020 HARVEST[V] (TEN-YEAR TREND ↘)

- 31.1 million tonnes of sugarcane were produced in 2020.
- 355 thousand hectares were harvested for sugarcane milling.
- 3,830 sugarcane businesses produced sugarcane.
- 24 sugar mills in Australia.
- 7.3 million tonnes of sugarcane were produced in the Burdekin, which is the largest sugarcane producing region in Australia.
- $1.3 billion value of sugar exports.
- $1.5 billion value of industry revenue (includes sugar, electricity, and molasses).
- 13.78 CCS / sugar content average.
- 89 average yield (tonnes cane per hectare).

2021 CONTRIBUTION TO QUEENSLAND ECONOMY[VI]

- $3.8 billion Gross Value Add (GVA) in Queensland.
- 19,673 people employed.

2020-2021 PERFORMANCE OF SUGARCANE FARMS[VII] (TEN-YEAR TREND ↗)

- 4% of Australian farms are sugarcane farms.
- $190,800 average cash income per farm in 2021-22.
- 2.7% average rate of return for Australian sugarcane farmers.

ADOPTION OF SRA'S R&D[VIII]

- 88% growers have used or plan to use SRA's Variety Guides to inform selection of new varieties to plant.
- 73% growers have used or plan to use SRA's SIX EASY STEPS® nutrient management program.
- 61% growers have used or plan to use SRA's Pathology Laboratory Service to assess plant material for disease.

Strategies and priorities

OUR STRATEGIC PLAN

SRA's Strategic Plan 2021-2026 puts the industry at the heart of decision-making, committing to strong collaboration and to growing industry satisfaction with, and adoption of, research and development that fosters productivity and growth. The SRA Strategic Plan outlines ambitious goals for the sugarcane industry, focusing on productivity, profitability and sustainability. This R&D Plan directly supports those goals by:

Guiding R&D investment: The Plan prioritises research areas that identify agreed industry needs.

Developing valuable solutions: The R&D focuses on creating and applying new knowledge, technologies, and tools that growers and millers can use to improve their operations.

Measuring progress: Clear performance indicators track the impact of research on industry goals like productivity, profitability, and sustainability.

SRA Strategic Plan 2021-26 Research Missions:

1. Profitable and productive
2. Resilient and enduring
3. Diversified and adaptable
4. Sustainable and efficient
5. Resourced and skilled

NATIONAL AND STATE PRIORITIES

It is key that SRA R&D investment contributes to delivering the Australian and Queensland government priorities. This Plan considers key priorities outlined in these strategic documents:

Federal Government:

- Priorities of the Minister for Agriculture, Fisheries and Forestry and Emergency Management (2023)
- National Agricultural Innovation Policy Statement (2021)
- Australian Government's Science and Research Priorities (2015)

Queensland Government:

- Queensland Department of Agriculture and Fisheries Sugarcane Strategic Objectives (2022)

Australian government priorities such as biosecurity, climate change and sustainability and First Nations engagement are embedded in this Ten-Year R&D Plan. Addressing these priorities will ensure R&D investment is strategic, collaborative, and targeted to improve profitability, productivity, competitiveness and preparedness for future opportunities and challenges.

Our strategic focus

In implementing this R&D Plan integrated approaches across five R&D programs will ensure SRA's R&D investment is effective in developing valuable solutions to benefit the industry. For each of the five R&D programs the rationale, priorities with specific objectives and key strategies along with key performance indicators are outlined. The overall benefits of investment in each R&D program and industry identified moonshot investments are outlined.

Varieties
– Create the potential

RATIONALE:

Long term genetic gain is a key lead indicator of breeding program performance. The SRA rate of genetic change has improved from being negative for the six-year period to the 2015 Final Assessment Trial (FAT) series, to a new benchmark of 1.03% with the addition of plant crop results from the 2021 FAT series. The 2% target set in the Strategic Plan 2021-26 is aspirational but not impossible. Continuous improvement in breeding strategy and tactics, along with adoption of new technologies will be required to achieve the target. Year on year genetic improvement ensures that future varieties have materially better performance than current varieties.

Alternative products and markets for sugarcane have been contemplated since the domestication of the crop. Global changes in energy markets and sustainability expectations are driving a new focus as recognised in the SugarPlus industry roadmap. SRA is uniquely placed to create different types of varieties and evaluate their productivity in conventional and unconventional situations. Information on the cost and potential production scale of alternative feedstocks will inform commercial planning for new opportunities.

Commercial production of new varieties is a lag indicator of breeding program performance and is a critical step in generating stakeholder value from breeding investment. The proportion of the crop from new varieties increased to 6.2% in 2022, up from a low point of 3.7% in 2020. Reliable information on the strengths and weaknesses of new varieties supports faster adoption, provided disease free planting material is available at an acceptable price.

SRA has a highly skilled and experienced plant breeding team. The business is entering a significant phase of staff turnover which will require succession planning, investment, and professional development to maintain the pipeline of genetic improvement that will deliver the varieties of the future.

PRIORITIES:

Priority 1
New traits, tools, and talent to support step change improvement in plant breeding

Objective

Develop new traits with allied biological information, new breeding and selection methods, and create a team to achieve significant improvements above current best practice in variety development.

Key Strategies

a. Train and maintain PhD graduates in advanced plant breeding and upskill technical staff.
b. Improve breeding methodology and selection efficiency with new technology such as sensor-based commercial cane sugar (CCS) estimation, improved genomic selection, and chromosome recombination efficiency.
c. Develop novel genetic variation and characterise existing genetic variation for current and emerging traits such as nematode resistance, juice colour, efficient biomass and bioenergy production, and ratoon crop performance.
d. Evaluate the application of automated processes to derisk the breeding program.
e. Evaluate the potential for energy cane with an initial focus on marginal production environments.

Priority 2
Creation of new varieties with improved production and processing performance

Objective

Develop new varieties that increase industry profitability through increased productivity, improved stability, and lower production risk.

Key Strategies

a. Conduct large scale crossing and selection with distributed regional evaluation and field trials in the target production environments.
b. Utilise the relative economic genetic value (rEGV) index to balance selection pressure and breeding outcomes to benefit the whole industry.
c. Maintain SRA's global network of collaboration and germplasm exchange.
d. Balance continuous improvement with new technology adoption to increase rates of genetic gain and generate high performance new varieties.

Priority 3
Support correct variety adoption decisions through performance information, grower engagement, and availability of planting material

Objective

Maximise the economic benefit of new varieties by supporting rapid adoption into appropriate production environments and agronomic situations.

Key Strategies

a. Production and dissemination of variety performance information in Fact Sheets, Variety Guides, and Cane Matters.
b. Develop and publish SPIDNet reporting tools to support variety adoption decisions by growers and advisors.
c. Provide on-farm grower engagement opportunities such as smut resistance demonstration, validation of nematode resistance, Regional Variety Trials, grower strip trials of new varieties, and support regional variety management groups.
d. Examine opportunities to produce additional performance information to support grower decision making such as suckering, maturity, and early vigour.
e. Support improved availability of planting material including a technical assessment and business case for synthetic seed technology and deployment of proprietary bioreactor technology to reduce tissue culture costs.

KEY PERFORMANCE INDICATORS:

OUTPUTS: Achieve 2% long term genetic gain per annum.

ADOPTION: 2% per annum increase in production of new varieties as a proportion of the crop.

IMPACT: 5% yield improvement from adoption of SRA varieties by 2034.

BENEFITS: By investing in a step-change in developing high-performing sugarcane varieties, this program aims to deliver a significant return on investment for all levy payers and the Australian government. Widespread adoption of these varieties will boost farm productivity, enhance milling efficiency, and unlock new market opportunities. Ultimately, a more secure and profitable sugarcane supply for the entire Australian industry will be achieved.

Agronomy and farming systems – Achieve the potential

RATIONALE:

The plateauing of sugarcane yield is a persistent challenge confronted by the sugarcane industry since the 1980s. The expansion of cane growing into more marginal soils amplifies this and combined with the escalating costs of production, sugarcane farming profitability is a significant and ongoing challenge. Most sugarcane is grown in the catchments of the Great Barrier Reef (GBR), a World Heritage Area listed under UNESCO. Minimising offsite environmental impacts, especially dissolved inorganic nitrogen, to the water quality in GBR catchments, remains a focal point. Consequently, over the past decade research on nitrogen management has been prioritised and technical knowledge and best management practises for nitrogen management have improved. It is now crucial to shift focus towards understanding other vital nutrient and soil health aspects that may have been overlooked. Actively addressing soil-related issues, including compaction, excessive tillage, poor soil biology, and imbalanced nutrition is required. While certain constraints related to soil health might not be immediately apparent, they can require substantial time for improvements to manifest.

Farming systems research generally involves a multidisciplinary whole-farm approach to overcoming productivity constraints. The application of general rules of thumb and guiding principles need to change to a site-specific focus and consider growers local environments and technology readiness. The opportunity lies in fostering the adoption of research findings, and to address this, research outputs should prioritise practical implementation, avoiding unnecessary complexity or substantial capital investment.

The industry's potential lies in supplying cane biomass for the conversion to emerging industries such as sustainable aviation fuels, bio-based materials and new foods and feed. Globally, evolving sustainability reporting including Environmental, Social, and Governance (ESG) policies poses a significant challenge for Australia, heavily reliant on exports. Other drivers such as emissions reduction targets, are expected to drive demand for data across enterprise, mills, and farms in the coming years. The rising demand for sustainably produced sugar, driven by commitments and sustainable sourcing targets from refiners and end users, intensifies pressure on Australian farmers to adapt to policy changes and investor expectations. To secure market access, insurance, financial support access to capital, farmers must be prepared to report their sustainability efforts, meeting evolving post-farm gate demands. This program combines multiple components, each designed to make incremental contributions towards the overarching goal of overcoming the yield plateau and realising a reduction in production costs. Farming systems refers to the combination of practices farmers use to achieve production goals.

PRIORITIES:

Priority 1
Optimise agronomic inputs

Objective

Overcome agronomic production constraints and optimise crop management for improved performance.

Key Strategies

a. Refine the management of macro and micro-nutrient inputs for improved productivity and profitability.
b. Optimise irrigation practices and drainage management to improve industry sustainability.
c. Optimise the production system when significant changes are introduced (planting methods, biomass varieties for diversification, climate change and variability and new environments).
d. Develop a functional green cane farming system in the Burdekin (moonshot)
e. Incorporation of promising next generation fertilisers, biostimulants and other emerging products into the sugarcane production system.

Priority 2
Improve sugarcane soil condition

Objective

Develop novel approaches to improve soil capital and reduce the impact of soil constraints.

Key Strategies

a. Establish and maintain long term soil health trial sites across regions as an industry resource for testing new practices and monitoring changes to soil condition.
b. Identify innovative practices to increase soil capital e.g. carbon in sugarcane farming systems.
c. Optimise the management of complimentary fallow crops, organic inputs, and soil amendments within the sugarcane production system.

Priority 3
Integrate data, technology, and innovation

Objective

Assess new technologies and systems for improved crop management and profitability

Key Strategies

a. Real-time measurement and analysis of soil and crop status.
b. Develop knowledge and systems to enable adoption of precision agriculture e.g. variable rate nutrient application within block.
c. Improve tools that support crop management decisions e.g. crop models and climate forecasting.
d. Investigate potential of autonomous farm management technologies.

Priority 4
Sustainable production

Objective

To improve and demonstrate sustainability credentials to maintain market access

Key Strategies

a. Extend robust science to inform science-based targets, specific R&D strategies (e.g. greenhouse gas emissions) and policy (e.g. nutrients and water quality).
b. Supporting growers and millers with tools e.g. carbon foot printing to improve their sustainability and reduce environmental impacts.
c. Collect and report data to support industry sustainability credentials e.g. greenhouse gas emissions, water quality, biodiversity, and contribution to regional communities.
d. Traceability and partnerships to demonstrate sustainability from farm to global value chain partners.
e. Build education and awareness of sugar sustainability credentials.

KEY PERFORMANCE INDICATORS:

OUTPUTS: New agronomic knowledge, technologies and guidelines developed per annum. Build awareness of sugar sustainability stories.

ADOPTION: Increased number of growers adopting improved agronomic technologies and practices per annum.

IMPACT: 10% improvement in crop yield or production efficiency gains from adoption of improved agronomic technologies and practices by 2034. 10% improvement in nutrient use efficiency by 2034. Reduce greenhouse gas emissions by 2034.

BENEFITS: By optimising agronomic inputs, improving natural capital and integrating data-driven technologies, this program aims to maximise yields and resource use efficiency for canegrowers. Demonstrating sustainability credentials aims to maintain and enhance market access for all Australian sugar millers and growers.

Crop protection
– Safeguard the potential

RATIONALE:

There are a wide range of diseases, weeds, and insects, both endemic and exotic, that do and can reduce the yield of sugarcane. Key endemic threats such as canegrubs, soldier fly, pachymetra root rot, ratoon stunting disease, and parasitic nematodes, each lead to estimated losses of between $25-$80 million p.a.[ix] Similarly, endemic weeds such as perennial grasses and vines collectively cost the industry an estimated $84 million p.a.[x] Even modest reductions in the yield losses from each of these threats will together lead to substantial benefits to the industry.

High priority exotic threats include several species of moth borer, grassy shoot and white leaf phytoplasmas and their vectors, and viruses such as sugarcane streak mosaic virus and vectors. Many of these are established in Papua New Guinea and Indonesia, where they cause yield losses of up to 70%[xi]. With their close proximity to Australia, and the potential for severe crop losses, several of these are rated as an extreme risk to the Australian sugarcane industry. There are also emerging diseases, pests, and weeds, which are becoming more widespread and causing increasing yield losses to the industry. There is the risk that they become major threats in the future, particularly when coupled with the effects of climate change.

It is imperative we improve our understanding of the nature of the key threats facing the industry, to enable the development of improved control strategies for these threats. Surveillance and diagnostic technologies will ensure that incursions are detected in a timely manner and the spread of emerging threats is monitored, and long-term management strategies that minimise environmental effects and embrace an integrated management approach will ensure the long-term sustainability of the industry.

PRIORITIES:

Priority 1
Sustainable management of pests

Objective

Development and adoption of long-term sustainable management approaches for endemic pests.

Key Strategies

a. Explore alternative management options for major endemic insect pests to reduce environmental and non-target impacts of chemical insecticides.
b. Develop and demonstrate alternative approaches to chemical use and effective management and monitoring approaches for invertebrate pests.
c. Identify effective and sustainable management and monitoring approaches for vertebrate pests.
d. Determine strategies to monitor, forecast risk and manage emerging pests including cross-collaboration with other industries for multi-host pests.
e. Develop forecasting tools to monitor the long-term impacts of climate change on existing and emerging pest outbreaks.
f. Develop and demonstrate integrated pest management (IPM) approaches for major endemic pests including effective risk assessment, monitoring, and targeted application of control methods.

Priority 2
Sustainable management of weeds

Objective

Development and adoption of long-term sustainable management approaches for established weeds.

Key Strategies

a. Effectively define distribution and scale of priority weeds by district, such as vines and perennial grasses.
b. Improve our understanding of the priority weeds (biology, ecology, seed dispersal) and develop sustainable weed control strategies integrating cultural, biological, genetic, and chemical approaches.
c. Enhance technologies to reduce off-target impacts while maintaining efficacy, in collaboration with commercial and other cropping industry partners.
d. Collaborate with other affected industries and local governmental agencies to limit the spread of emerging threats, such as Navua Sedge.
e. Develop and demonstrate integrated weed management (IWM) approaches for major weeds.

Priority 3
Sustainable management of pathogens

Objective

Development of long-term sustainable management approaches for pathogens.

Key Strategies

a. Define epidemiology, pathogenicity, and functional biology of emerging disease threats.
b. Develop and deploy disease monitoring for example RSD, smut virulence changes, and pachymetra.
c. Develop and deploy control strategies including cultural, chemical, alternative, and genetic solutions.
d. Explore novel genetic approaches to deliver other disease control solutions.
e. Develop molecular diagnostics for pathogenic and beneficial soil biology and understand relationships to other agronomic factors.

Priority 4
Biosecurity preparedness

Objective

To ensure that the industry is well prepared to respond to biosecurity threats in a timely manner and minimise their impact on productivity and profitability.

Key Strategies

a. Maintain and utilise the Industry Biosecurity Plan, supporting systems, to prioritise and proactively protect the industry from biosecurity threats.
b. Encourage and promote biosecurity preparedness on-farm including monitoring and reporting and the development and utilisation of the Farm Biosecurity Manual.
c. Contribute to the development of surveillance and diagnostics platforms fit for deployment in remote Northern Australia, and which enable timely detection of incursions before they become established.
d. Ensure that we understand the biology, ecology, and epidemiology of the highest priority exotic threats.
e. Develop effective approaches to control these threats, both for initial incursion response, and long –term management.

PRIORITIES (CONT):

Priority 5
Data and emerging technology

Objective

Maximise the efficiency of crop protection through better utilisation of data and emerging technologies.

Key Strategies

a. Collection and analysis of genomic data and use of data to make informed decisions about management approaches.
b. Undertake a scoping exercise to identify promising technologies and their application.
c. Use data and artificial intelligence (AI) for pest, weed and disease detection for targeted management.

KEY PERFORMANCE INDICATORS:

OUTPUTS: New knowledge/tactics across six priority insect, weed and/or pathogen targets by 2034.

ADOPTION:
1. Increased number of growers prepared for biosecurity threats per annum.
2. Increased number of growers adopting improved sustainable technologies and practices to manage pathogens, weeds, and insects per annum.
3. % increase in weighted average of disease resistance of commercial crop (including 7% improvement for pachymetra and 5% improvement for smut) by 2034.

IMPACT: 10% improvement in avoided losses due to pathogens, weeds, and insects by 2034.

BENEFITS: By developing and deploying sustainable pest, weed, and disease management strategies, this program aims to safeguard sugarcane yields from losses and ensure control methods are available to canegrowers now and in the future. Ensuring the industry's preparedness for biosecurity threats ultimately safeguards the industry from significant losses in yield to maintain a secure sugarcane supply to Australian mills.

Milling and processing
– Deliver the potential

RATIONALE:

Profitability in the milling sector is crucial as it impacts millers' ability to invest in maintenance, capital, and value-adding. Without adequate investment in these areas, operational efficiency may decline, posing risks to millers' viability and affecting the growing and harvesting sectors. The key factor impacting mill productivity is maximising the economic realisation of sugar from cane. Evidence suggests the Australian sugar milling sector faces significant challenges including rising costs, diminishing profits, aging equipment, and high turnover of staff. Pressure on maintenance and capital spending, alongside ownership shifts and declining technical performance among millers exacerbates uncertainties. Prioritising research efforts aimed at reducing costs and energy consumption while producing sugar from cane and increasing revenue from diversified production offers significant potential for productivity gains among millers. Ensuring effective dissemination and application of research findings and efforts to build and maintain a professional workforce within mills are crucial.

Despite ongoing challenges, positive steps towards securing long-term viability have been made, notably through a shift towards participation in the bioeconomy. The emerging opportunities, as outlined in the sugar industry's 2040 vision Sugar Plus[xii], include converting co-products like bagasse, molasses, sugarcane tops and trash into renewable electricity, biofuels like sustainable aviation fuels, green hydrogen, and bio-methane for example. This involves a heightened focus on cogeneration of electricity, including the establishment of large-scale generating plants, and implementing energy-efficient measures in associated mills. Additionally, research into diversifying cane-derived products and a growing interest among millers in this area are evident. Over the last decade, there has been a significant amount of funding in Australia directed towards sugarcane diversification. However, research often occurs separately from the sugarcane industry, limiting its translation into industry benefits. Queensland research institutions excel globally in this area, with strong academic, corporate, and international collaborations. Current research themes include biochemicals, bioplastics, advanced biofuels (including aviation fuels), and alternative proteins. While Australia boasts substantial research capabilities, the sugar industry currently lacks influence in guiding research. However, targeted industry investment can leverage additional funding sources. Aligning industry, policy, and research is crucial for translating research into diversification.

PRIORITIES:

Priority 1
Optimised operations for enhanced milling efficiency

Objective

Research to reduce costs, improve efficiency, and increase revenue in mills.

Key Strategies

a. Leverage new technologies for technical and labour efficiency and productivity, such as artificial intelligence, machine learning and new factory designs, new and improved sensor technology, integrating known best practices into automated systems, investigating automation in rail transport, and addressing key components of cane transport costs, including maintenance, operations, and transportation.
b. Improve the sustainability and energy efficiency of mills by exploring cost-effective solutions for net zero emissions, carbon abatement, waste reduction, and increasing bagasse availability for alternative uses.

Priority 2
Highly skilled and professional workforce

Objective

Invest in skills and technology development for mills.

Key Strategies

a. Embed research within milling businesses, foster a better understanding of technology within productive environments, and facilitate access to and interpretation of data for informed business decisions through participatory research.
b. Invest in skill development, including new training approaches to attract and retain a pool of skilled engineers and chemists, supervisors, operators and trainers, and cultivate an inclusive workforce e.g. by attracting female and Aboriginal and Torres Strait Islanders.
c. Facilitate knowledge transfer to enhance the adoption of milling operations best practices and decision making.

Priority 3
Opportunities for a diversified income

Objective

Explore opportunities for diversified revenue streams beyond raw sugar in the bioeconomy.

Key Strategies

a. Enhance industry awareness and capability to evaluate and trial new and emerging opportunities to diversify revenue streams in the bioeconomy.
b. Encourage collaborative effort along the supply chain to support generating additional revenue streams through value-added products.
c. Integrate the industry into the bioeconomy research and business landscape by strengthening industry connections and networks, and collaborating with partners to attract investments, resources, and capabilities.
d. Conduct research to support policy development to create a vibrant economic environment.
e. Co-invest in research to overcome techno-economic barriers to industry participation in the bioeconomy, including assessing, adapting, and piloting innovations and technologies to diversify income from sugarcane feedstocks.

KEY PERFORMANCE INDICATORS:

OUTPUTS: New capability and technologies for mills and processors per annum.

ADOPTION:
1. Increased number of mills adopting skills and technologies developed through SRA's research per annum.
2. Increased number of mills trialling and adopting innovations and technologies to diversify income by 2034.

IMPACT: 25% improvement in milling and processing productivity by 2034.

BENEFITS: By optimising mill operations, attracting and retaining a skilled regional workforce, and exploring bioeconomy opportunities, this program aims to boost the efficiency and reliability of mills and unlock new revenue streams for both canegrowers and Australian sugar mills. This aims to guarantee an efficient supply chain for today and a vibrant supply chain for the future.

Adoption
– Reach the potential

RATIONALE:

The current state of adoption in the sugarcane industry reflects a complex landscape with regional differences. Addressing the challenges in adopting current science, practices, techniques, and technologies requires a robust framework. This framework should provide clear and consistent messaging to growers and millers, improve the quality of information dissemination across the industry including knowledge, products, trials, and demonstrations delivered by multiple organisations. It should effectively connect experts to end-users. Adoption activities need to raise the knowledge and awareness of current science and evidence for best management practices, improve the trust and belief in data and recognise and respond to competing business pressures and regionally distinct adoption challenges. Diverse regional needs and the impact of these barriers underscore the necessity of tailored interventions for successful adoption. Working with industry stakeholders and commercial advisors is critical to success.

Sugar Research Australia's District Productivity Plans have been developed through consultation and engagement undertaken through SRA's Industry Services team. Development of the plans has involved participants across the sugar industry supply chain to identify constraints impacting productivity and profitability at the local level. Different sources of data have been used as inputs including grower ideas and contributions from past strategic workshops held with SRA, ABARES data, mill data, impact assessments and a variety of survey results. The plans highlight specific local issues with proposed solutions and actions to address them and are updated and reviewed annually to drive investment at a local level. Through the development and delivery of District Plans, SRA is actively exploring a regional approach to optimise the impact of research initiatives, accounting for the unique characteristics and capacities of each region and aiming for more effective adoption of sugarcane technologies and practices.

The use of tools such as observation plots, workshops, and variety walks has proven effective, enhancing grower confidence, and understanding, while publications like Cane Matters and demonstrations contribute to improved communication and the promotion of the latest research, practices, and technologies. Overall, this program aims to deliver the right information at the right time and in the right form.

PRIORITIES:

Priority 1
The right information

Objective

As a trusted source of information SRA invests in R&D, collaborates with industry to deliver a consistent message to support extension and encourage adoption.

Key Strategies

a. Continuous communication and feedback exchange between researchers, growers, millers and extension specialists throughout the R&D and extension process.
b. Research factors in and accounts for adoption considerations with clarity on its objectives, outputs, and industry impacts.
c. Research outputs and new information is disseminated clearly, comprehensively, and consistently.
d. Utilise the knowledge of experts in the relevant field to deliver advice to independent advisors on defined topics.
e. Maintaining engagement for the adoption of existing knowledge and best practices.
f. Collaborating with industry as partners in research projects to improve awareness and understanding of new knowledge and technologies to increase commercial and adoption readiness.
g. Maintaining a current and co-ordinated set of extension and adoption materials and updating with new knowledge and recommendations.

Priority 2
Regional approaches

Objective

Adopt tailored approaches in each region that suit growers and millers.

Key Strategies

a. Engage growers, millers, and other industry stakeholders to tailor research outputs for each district.
b. Explore innovative approaches, such as co-branded extension and information transfer models and products to establish a collaborative environment for district specific communication.
c. Expand the use of timely interactive demonstrations, including workshops, observation plots to provide growers and millers with hands-on experiences.
d. Optimise technologies (such as harvesters) for the local landscapes.
e. Lead a review of the extension model for growing and milling which aims to attract, train, and retain trusted extension staff across the industry.

Priority 3
Industry transformation

Objective

Achieve 40 million tonnes in <34 weeks of operation (moonshot).

Key Strategies

a. Collaborate along the value chain to transform (50% increase) industry profitability and productivity.
b. Lead a forum on data availability in the sugar industry, identifying proprietary and non-proprietary data sources, assessing data sufficiency, and potentially justifying investment in a team to manage data collection and analysis.
c. Overcome weather and climate challenges in growing and harvesting.

KEY PERFORMANCE INDICATORS:

OUTPUTS: Engage with 75% of levy payers per annum by 2034.

ADOPTION: >50% of growers and millers adopting knowledge, technologies, and practices from SRA's research by 2034.

IMPACT: 25% improvement in grower productivity by 2034.

BENEFITS: By tailoring information to regional needs, collaborating with industry stakeholders, and delivering research in clear and accessible formats, this program aims to bridge the gap between research and practice, empowering both growers and millers to adopt new technologies and practices.

Our R&D principles

FOCUS ON THE LONG-TERM

Many of the key challenges facing the Australian sugarcane industry are long-term and systemic. This Plan recognises the enduring nature of these challenges for growers and millers and takes a long-term perspective to guide consistent decision-making and efforts toward lasting change. This Plan has a deliberate emphasis on small gains across all aspects of growing and milling Australian sugarcane. If we improve everything by 1%— such as developing tools to support growers in adopting suitable varieties, matching nutrition to growth responses, producing disease resistance ratings for varieties, tailoring advice to each district, and exploring technologies to improve mill profitability — the envisioned outcome is that within ten years the Australian sugarcane industry will achieve unprecedented success. In concert, ambitious "moonshots", aiming to explore challenging, forward-looking research questions that can potentially transform the Australian sugarcane industry at the regional and district levels are embedded in the plan. The anticipated investment is 90% research and its translation and 10% moonshots to explore innovative and potentially transformational approaches and solutions.

PROMOTE ADOPTION (R&D+E=A)

A simple equation underpins this Plan: R&D+E=A. Research (R) uncovers new knowledge and solutions, and Development (D) transforms these discoveries into practical applications plus Extension (E) sharing knowledge and tools with growers and millers equals Adoption (A) widespread implementation for maximum impact. This approach emphasises a continuous feedback loop between researchers, growers, and extension specialists, ensuring research translates into real-world benefits. Annual research investment will be informed by industry needs, ensuring the development of solutions that address practical challenges faced by growers and millers. Extension and adoption considerations will be embedded into research projects from the outset, fostering a collaborative approach between researchers, extension staff, growers, millers, and other stakeholders. A clear pathway for on-farm and in-mill adoption will be "baked in" to research projects, which may involve developing practical tools, resources, and training programs to facilitate knowledge transfer and ensure successful implementation. Open communication and ongoing collaboration will be fostered throughout the R&D process, building trust, and ensuring stakeholders are actively engaged in research translation.

FUTURE READY

This principle emphasises the importance of research that prepares the sugarcane industry for a constantly evolving global landscape. Research on emerging challenges (e.g., changing climates and markets) and opportunities (e.g., new technologies, diversification) is integrated within the Plan. Research to maximise both sugar yield and content for existing markets while simultaneously supporting new bioproduct opportunities under the Sugar Plus agenda are both embedded. Investing in data integration and access across industry and research sources will be prioritised and cutting-edge technologies like artificial intelligence (AI), automation, and advanced data analysis techniques will be explored to inform decision-making. This approach leverages external funding opportunities and attracts new partnerships for broader industry development, including variety expansion, and prepares growers to supply feedstock and millers to meet evolving customer demands. We aim to equip growers and millers with the capability, knowledge, and technology to thrive in an environment of constant change.

RESEARCH CAPABILITY

This principle emphasises building and maintaining research capability, encompassing both human resources and infrastructure as the foundation for the industry's long-term success. Sustained research investment will support the attraction and retention of highly skilled researchers and collaborative and interdisciplinary research teams. We will explore opportunities to access specialised research infrastructure, support leadership development, learning and development pathways and cultivate strong partnerships with other research institutions to leverage diverse expertise and resources. Cutting-edge technologies like artificial intelligence (AI), automation, and advanced data analysis techniques will be explored to enhance our research capabilities. Our research will be supported by systems, such as project management, information and knowledge. Robust systems for project management, information and knowledge management, and a professional workforce ensure efficient knowledge transfer and technology adoption. We will also build multi-disciplinary research teams within SRA and with our research partners to integrate disciplines to facilitate a more comprehensive understanding of challenges and bring about valuable solutions.

COLLABORATION

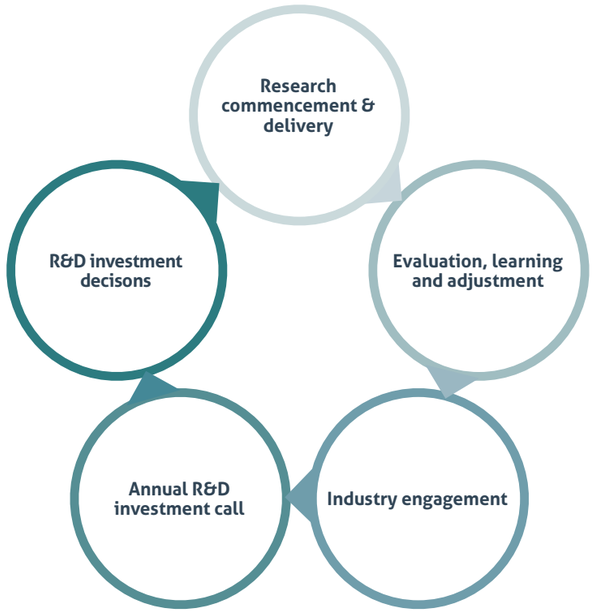
Collaboration taps into a wider range of knowledge and resources from industry stakeholders, research institutions, government bodies and international partners. We are committed to collaborating with industry partners, expanding relationships with key partners like Queensland Department of Agriculture and Fisheries, other Research and Development Corporations and engaging with commercial partners to accelerate the translation of research findings into practical applications.
We will collaborate with our industry throughout our research projects – prior to investment decisions, during the research and to promote adoption. We will explore opportunities for genuine collaborations with Aboriginal and Torres Strait Islander organisations in our research projects, seeking mutual benefits. In solving problems for industry we will need to work across the R&D program. Integrated approaches will be encouraged in the design and delivery of R&D.
For example, in protecting the crop from pests, genetic and technology solutions may be explored, and to improve processing efficiency – new varieties, their agronomy and adoption of harvest best practices may be explored together.

Our R&D investment

SRA aims to involve millers and growers and government investors effectively in R&D investment prioritisation and to continuously improve this process through evaluation, learning and adjustment. The aim is to maximise impact and benefits for the industry, ensuring the best value for both levy payers and government investors. In implementing this R&D Plan, SRA will implement a continuous annual R&D investment cycle with key components outlined as below:

- **Evaluation, learning and adjustment:** SRA will conduct an annual review of prior research activities, analysing progress made against R&D priorities and key performance indicators (KPIs). Independent experts may be engaged to provide additional evaluation and insights. Each year SRA will review the investment process, capturing stakeholder feedback and identifying areas for improvement. Throughout the year, feedback will be actively collected through surveys and workshops and consultation with industry stakeholders (growers, millers) and government representatives. Based on the evaluation findings, SRA will continuously refine the R&D investment process to ensure its effectiveness, accessibility, and responsiveness to industry needs.
- **Industry engagement:** SRA will engage with industry peak bodies and government representatives annually to both assess progress and establish annual R&D investment priorities. The mechanisms for industry and government consultation will be outlined in SRA's Consultation and engagement plan (in prep) and include:
  - An annual R&D forum which will involve SRA's Research Funding Panel, Canegrowers Board, Policy Council and Farm Inputs and Research Committee and the Australian Sugar Milling Council (ASMC) Board and Australian and Queensland government representatives.
  - Six-monthly tripartite meetings with the Australian Government, CANEGROWERS and ASMC.
  - Annual Regional Variety Committee meetings.
  - Annual District Planning process.
  - Regular meetings with Queensland government.
- **Annual R&D investment:** Annually SRA will invest in R&D research priorities established through industry consultation.
- **R&D investment decisions:** Research proposals will undergo review and shortlisting by the Research Funding Panel. Ultimately, the SRA Board will make R&D investment decisions based on agreed-upon annual investment priorities, ensuring a balanced portfolio of research projects addressing short-term needs and long-term strategic objectives.
- **Research commencement and delivery:** SRA will enter into contractual agreements with successful research teams, delineating project deliverables, timelines, and communication protocols. Progress of funded research projects will be actively monitored, with milestones and KPIs tracked. Regular progress reports submitted by researchers will be reviewed by SRA. Ongoing research activities and findings will be communicated to stakeholders through annual reports, dedicated websites, industry newsletters, and public presentations.

Figure 2 SRA Annual R&D Investment Cycle



Our Annual Operating Plan

Our Annual Operating Plan (AOP) serves as a comprehensive guide for implementing RD&A activities on a yearly basis. It provides practical information for growers, millers, and other industry and government stakeholders, outlining SRA's entire research portfolio and the expected outputs, outcomes, and impacts for the period. The AOP is developed based on insights from the Ten-Year R&D Plan, Strategic Plan, and government and industry priorities.

The AOP will detail annual investments and programs, which will be reported in the Annual Report. It also encompasses reporting on the entire research portfolio and aims to move towards forecasting over the course of ten years. Additionally, there will be a five-year review of the R&D Plan, including a timeseries analysis of our portfolio balance throughout its duration.

Our R&D evaluation

Annual evaluation of the R&D Plan is crucial for measuring its effectiveness, optimising budget allocation, and enhancing transparency in communicating impacts to industry and government investors. The performance of SRA's R&D Plan and investments will be evaluated at the project, program, and plan levels to assess to what extent they have contributed to impacts and enabled SRA to make adjustments to deliver greater return to investors. The R&D Plan is designed with a clear theory of change embedded throughout its rationale, objectives, key strategies, and key performance indicators (KPIs). It will be evaluated annually by measuring key performance indicators to:

- Demonstrate the effectiveness of research investment in alignment with our strategy that benefits the sugar industry, providing tangible evidence of the impacts delivered to industry and government investors.
- Enhance understanding of the factors contributing to success, informed by lessons learned and to develop business cases for future research.
- Assess and demonstrate progress to inform investment planning and refine the R&D Plan.

The key performance indicators (KPIs) of the R&D Plan are categorised into three broad areas: measuring research outputs; adoption on farms and in mills; and cumulative impacts to the Australian sugarcane industry.

Evidence will be collected, collated, and analysed at each level using a variety of sources such as project reports, BCA's grower and miller surveys, and other data to baseline and evaluate performance to support continuous learning and adjustment in building a high performing research portfolio.

Where baseline data is lacking for a KPI, the data to establish a baseline will be collected and or collated as quickly as practical. Within the KPI framework targets have been set where a baseline exists or can be easily established. Otherwise, targets have not been included and will be added as baseline data is collected/available. Progress towards achieving the KPIs will be reported on as part of the annual evaluation process and communicated to industry and government stakeholders at the annual R&D forum.

Continuously assessing SRA's performance and impact facilitates ongoing evaluation of the benefits and value derived from R&D investments for growers, millers, and regional communities. This process supports continuous learning and adjustment. Evaluation ensures accountability, guides decision-making, and effectively demonstrates the value and impact of R&D investment.

Figure 3 Key Performance Indicator Framework

Outputs

Tangible results, tools and technologies as a result of investment in high quality, value for money R&D e.g. new varieties, best practices, training and tools.

Adoption

The adoption of practices, tools and knowledge on farms and in mills.

Impact

The impact of R&D driving technical change and improved profitability, productivity and sustainability (environmental and social impacts) for the industry and regional communities.

Sustaining a balanced portfolio

INCOME AND EXPENDITURE FORECAST

SRA's income streams consist of a levy from sugarcane produced and processed within Australia paid by growers and millers. This levy is matched by a contribution from the Commonwealth Government in accordance with the Statutory Funding Contract 2021-2031 between SRA and the Commonwealth, acting through the Department of Agriculture, Fisheries and Forestry. SRA also receives funding from co-investment partners including, but not limited to, the Queensland Department of Agriculture and Fisheries, the Queensland Department of Environment and Science, and the Great Barrier Reef Foundation. Over the life of this Plan, SRA expects to sustain the level of investment required to deliver research outcomes effectively and efficiently to a high standard. SRA expects to invest an additional $3 million annually in new R&D aligned with the programs and principles of this R&D Plan to deliver on its purpose. SRA will actively monitor and manage budget across the life of the Plan, reporting any variance between forecast and actual income and expenditure in SRA's Annual Operating Plan and Annual Report.

PORTFOLIO BALANCE

The program and principles of this R&D Plan guide a balanced approach to research investments to achieve the overall objectives of the Plan and deliver value to millers, growers, and the broader community. The programs provide a framework for investment that considers the estimated value that could be delivered to growers, millers, and the Australian community more broadly and the principles aim to guide SRA decision-making to build and maintain a balanced portfolio. SRA's Statutory Funding Agreement with the Commonwealth requires a focus on the delivery of benefit to Australian canegrowers and millers and the broader community. In balancing the needs of all stakeholders, SRA's investment portfolio aims for a mix of investments that:

- Align to industry priorities.
- Addresses government national science and rural R&D priorities.
- Delivers on the objectives of the R&D Plan.
- Assess and mitigate technical, adoption and commercial risks.
- Deliver equitable impact across time, geography, and crop.
- Align to our agreed investment strategy.

R&D Plan 2024-34

Key Performance Indicators

	VARIETIES	AGRONOMY & FARMING SYSTEMS	CROP PROTECTION	MILLING & PROCESSING	ADOPTION
OUR R&D INVESTMENT OUTPUTS	Achieve 2% long term genetic gain per annum.	New agronomic technologies, knowledge and guidelines developed per annum.	New knowledge/tactics across six priority insects, weed and/or pathogen targets by 2034.	New capability and technologies for mills and processors per annum.	Engage with 75% of levy payers per annum by 2034.
ADOPTION ON FARMS AND IN MILLS	2% per annum increase in production of new varieties as a proportion of the crop.	Increased number of growers adopting improved agronomic technologies and practices per annum. Build awareness of sugar sustainability stories.	Increased number of growers prepared for biosecurity threats per annum. Increased number of growers adopting improved sustainable technologies and practices to manage pathogens, weeds, and insects per annum. % increase in weighted average of disease resistance of commercial crop (including 7% improvement in pachymetra and 5% improvement in smut) by 2034.	Increased number of mills adopting technologies developed by SRA's research per annum. Increased number of mills trialing and adopting innovations and technologies to diversify income by 2034.	>50% of growers and millers adopting technologies, knowledge and practices and practices from SRA's research by 2034.
IMPACTS TO CANE FARMERS, SUGAR MILLERS AND REGIONAL COMMUNITIES	5% yield improvement from adoption of SRA varieties by 2034.	10% improvement in crop yield or production efficiency gains from adoption of improved agronomic technologies and practices by 2034. 10% improvement in nutrient use efficiency by 2034. Reduce greenhouse gas emissions by 2034.	10% improvement in avoided losses due to pathogens, weeds and insects by 2034.	25% improvement in milling and processing productivity by 2034.	25% improvement in grower productivity by 2034.

OVERALL

SRA research investments exceed the return-on-investment benchmark set for Rural Research and Development Corporation (RDCs) of 5.6 to 1.
SRA aims to achieve and demonstrate continuous improvement in governance and administration efficiency.
Improved return on investment by 2034.
Satisfaction by growers and millers with R&D levy investment.

Glossary

ABARES (Australian Bureau of Agricultural and Resource Economics and Sciences): The science and economics research division of the Australian Government Department of Agriculture, Fisheries and Forestry.

AI (Artificial Intelligence): A branch of computer science concerned with creating intelligent machines that can learn and solve problems. Artificial intelligence could be used in the sugarcane industry for tasks like analysing data from sensors and aerial imagery to detect weeds, pests and diseases and streamlining sugar processing operations in mills.

AOP (Annual Operating Plan): A plan that details SRA's research portfolio and forecast expenditure each year.

ASMC (Australian Sugar Milling Council): Advocates on behalf of member Australian sugar mills on a range of policy, regulatory and legislative topics to add value and deliver benefits for the sugar value chain.

BCA (Benefit cost analysis): A benefit-cost analysis weighs the expected benefits of a project against its expected costs to determine the return on investment.

CCS (Commercial Cane Sugar): A pre-assessment of the IPS sugar that can be recovered from a specific quantity of sugarcane based on its analysed properties and assuming a standard set of conditions.

ESG (Environmental, Social, and Governance): A framework for measuring a company's sustainability practices.

FAT (Final Assessment Trial): The final stage of testing new sugarcane varieties before commercial release.

Genetic gain: Genetic gain is the improvement of a sugarcane variety's economic value, as measured by relative economic genetic value (rEGV) compared to standard varieties (e.g. Q208).

IPM (Integrated Pest Management): A holistic approach for controlling pests that combines various methods (e.g. cultural, physical, genetic, biological, chemical and regulatory) to minimise economic and environmental impact.

IPS (International Polarisation Scale): International Pol Scale-Raw Sugar Equivalent (IPS) normalises actual sugar production to a standard sugar pol of 98.95°Z to compensate for differences in sugar purity made and operating conditions, and multiples this by 1.037 in alignment with the International Pol Premium Scale of the Sugar Association of London prior to March 2016.

IWM (Integrated Weed Management): A holistic approach for controlling weeds that combines various methods (e.g. cultural, physical, genetic, biological, chemical and regulatory) to minimise economic and environmental impact.

KPI (Key Performance Indicator): A measurable value used to track progress toward a specific goal.

Milling: Can refer to two things (a) In a sugar factory, milling refers to cane being processed through a milling train to extract juice, one of numerous critical factory operations and, (b) in a broader sense, milling refers to the entire process of producing sugar from cane.

Moonshot: A high-risk, high-reward project that pushes boundaries to achieve a breakthrough solution for a major challenge facing the industry. It could involve disruptive technologies or entirely new approaches with the potential to transform the future of the industry.

NUE (Nutrient Use Efficiency): Amount of nutrient applied (kg) per tonne of cane produced.

Pol (Polarisation): is a direct measurement of the percentage of sucrose present in a sugar sample, measured by its optical rotation.

Productivity: A measure of how efficiently farms and/or mills convert inputs into outputs i.e. the ratio between what's produced (e.g. cane, sugar) and what's used to create it (e.g. land, labour, machinery).

Profitability: A measure of profit generated by farms and/or mills, calculated as the difference between revenue (e.g. influenced by yield and price) and expenses (e.g. influenced by production and operating costs).

PSI (Pol Sugar Index): A measure of sugar recovery performance at the mill; defined as the ratio of tonnes IPS sugar produced, to incoming tonnes CCS in cane supply.

R&D (Research and Development): Activities undertaken to develop new knowledge and technologies.

rEGV (relative economic genetic value): A selection index used by plant breeders to measure the relative economic returns for the whole industry through the improvement of varieties.

RSD (Ratoon Stunting Disease): A disease that affects sugarcane growth and yield.

SRA (Sugar Research Australia): A research organisation focused on supporting the Australian sugarcane industry to be competitive, productive and sustainable.

Sustainability: Is a three-pronged approach that promotes social, economic and environmental benefits. It also means being accountable to stakeholders for the industry's actions and impacts.

SPIDNet (Sugarcane Plant Improvement Database (SPID)Net): A database established to capture harvest, mill and productivity data for SRA to use in its breeding program and research.

Yield: Is amount of sugarcane (measured in tonnes) or sugar (measured in CCS) produced per hectare of land. Factors that can influence yield include weather, agronomic practices, and sugarcane variety.

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