Sugar Research Australia®

SRA IMPACT PATHWAY REPORT
June 2019

Executive Summary

- This Impact Pathway Report provides a comprehensive report on the impact and outputs being delivered under SRA's Strategic Plan 2017/18 – 2021/22 and 2018/19 Annual Operational Plan. For the first time, the Report covers SRA's contestable and core research, development and adoption (RD&A) project portfolio, as well as support functions. Previous Impact Pathway Reports covered only the contestable investment projects.

- Recently commissioned independent evaluations on a selection of completed SRA research investments show an aggregated average return on investment of **2.33 to 1**.

- Key outputs successfully delivered across SRA's core and contestable project portfolio in the reporting period of 1 October 2018 to 31 May 2019 include:

Key Focus Areas (KFAs)	Key Outputs
KFA1: Optimally-adapted varieties, plant breeding and release	12 new varieties released.
KFA2: Soil health, nutrient management and environmental sustainability	Commercially available in-field soil health test kit.
KFA3: Pest, disease and weed management	Molecular pathogen diagnostic service (assays) for soil borne pathogens.
KFA4: Farming systems and harvesting	Yield forecasts derived from analysis of satellite imagery delivered to mills.
KFA5: Milling efficiency and technology	Coatings identified for resistance to erosion and corrosion in boiler tubes.
KFA6: Product diversification and value addition	Technologies for the use of sugarcane products as animal feed ingredients.
KFA7: Knowledge and technology transfer and adoption	Extension resources to communicate water quality monitoring results and practice change to improve nitrogen and pesticide use.
KFA8: Collaboration and capability development	Capability appointments at Queensland University of Technology (QUT) in the milling sector.
KFA9: Organisational effectiveness	SmartCane Best Management Practice accreditation for SRA's Tully research station.

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

1. IMPACT EVALUATION

Independent economists conducted five ex-post cost-benefit analyses of completed SRA research investments. The projects were all completed with final reports in the year ended June 2018. The aggregated return on total investment for the five projects is 2.33 to 1.

The evaluation results have been provided to the Council of Rural RDCs (CRRDC) for cross-RDC evaluation summarisation.

A further six projects are currently being evaluated and will be reported in the next Impact Report and the 2018/19 Performance Report.

Return on investment summary

Project	PVB[1] ($m)	PVC[2] ($m)	NPV[3] ($m)	BCR[4]	Impact
2014/015 – Measuring the profitability and environmental implications when growers transition to best management practice (BMP)	2.15	0.42	1.73	**5.14**	Increased successful adoption of BMP leading to higher grower profitability and lowered environmental off-farm impacts.
2014/045 – Boosting nitrogen use efficiency in sugarcane through temporal and spatial management options	7.46	3.09	4.36	**2.41**	Increased profitability of the sugarcane industry through more efficient nutrient management practices and avoiding harsher regulation, with an ongoing licence to operate, some savings in nitrogen fertiliser and an increase in sugarcane yield.
2014/055 – Developing an alternative herbicide management strategy in the Wet Tropics	4.10	1.56	2.55	**2.64**	Increased yields of sugarcane due to reduced competition from grass weeds at reduced cost, or at least no additional cost, to growers.
2014/069 – Field assessment and further development of high-sucrose sugarcane	0.70	1.85	-1.15	**0.38**	Small to moderate gains in Commercial Cane Sugar (CCS) however this is likely over long time periods and with significant investment cost in deregulation of transformed varieties, resulting in low BCR.
2015/046 – Securing Australia from Papua New Guinea (PNG) biosecurity threats	3.16	0.64	2.52	**4.95**	Avoided future yield losses in Australian sugarcane if, and when, incursions from PNG occur via faster diagnostic testing and improved varietal resistance knowledge.
Aggregate (investment in all projects)				**2.33**	

[1] Present Value Benefits.
[2] Present Value Costs.
[3] Net Present Value.
[4] Benefit Cost Ratio.

Project 2014/015 – Measuring the Profitability and Environmental Implications when Growers Transition to BMP

BCR 5.14:1

Key objective of project: to improve the then current existing knowledge about outcomes for farm profitability and the environment from adopting SmartCane BMP modules/practices.

Contribution to SRA's Strategic Plan Outcomes:

- Addressed KFA 7 outcomes, as well as some or all of KFAs 2, 3 and 4 outcomes.

Key impacts delivered:

Economic

- Contribution to an increased level of profitability by sugarcane growers in the Wet Tropics.
- Potential future contribution to BMP adoption and increased profitability in other sugarcane growing regions of Australia, if the methods underlying the project are applied elsewhere.

Annualised weighted average equivalent benefit from BMP adoption	$81 per ha
Probability of outcome achieved (adoption level)	90%
Probability of impact achieved given successful outcome	75%

Environmental

- Reduced impact of sugarcane farming on the environment in the Wet Tropics.
- Potential reduction of impact on the environment elsewhere in the Australian sugarcane industry.

Social

- Contribution to improved sugarcane economic analysis capacity, as well as broader policy implications across government (both state and federal) regarding how scientific, productivity, and environmental pursuits can be accommodated and communicated via grower case studies.
- Increased sugarcane industry profitability resulting in positive income spillovers to sugarcane communities.

Project 2014/045 – Boosting nitrogen use efficiency in sugarcane through temporal and spatial management options

BCR 2.41:1

Key objective of project: to increase nitrogen-use efficiency and effectiveness by matching nitrogen supply and nitrogen demand of the sugarcane crop through temporal and spatial adjustments to nitrogen inputs.

Contribution to SRA's Strategic Plan Outcomes:

- Largely addressed KFAs 2 and 4 outcomes, and to some extent KFA 7 outcomes.

Key impacts delivered:

Economic

- Contribution to increased sugarcane yields from increased nitrogen fertiliser use by some growers.
- Contribution to reduced costs of nitrogen fertiliser without yield loss by some growers.

Nitrogen savings with improvement to SIX EASY STEPS® guide	5.0 kg per ha
Cost saving per hectare	$6.15
Additional management costs involved in application of new nitrogen strategies (excluding additional nitrogen)	20% of benefits after nitrogen costs
Additional sugarcane yield produced	5%
Probability of outcome achieved	50%
Probability of impact given successful outcome	75%

Environmental

- Reduced losses of nitrogen to the environment including to the Great Barrier Reef.

Social

- Increased future productivity and profitability of the sugarcane industry resulting in positive income spillovers to sugarcane regional communities.
- Increased research capacity and scientific knowledge, including an increase in a more balanced approach to pursuing goals of profitability and sustainability resulting in a reduction in the probability of the sugarcane industry losing a part of its social licence to operate.

Project 2014/055 – Developing an alternative herbicide management strategy in the Wet Tropics

BCR 2.64:1

Key objective of project: to Identify alternatives to PSII herbicides for the Wet Tropics and identify a methodology and service provider for routine screening of new cane varieties for herbicide susceptibility.

Contribution to SRA's Strategic Plan Outcomes:

- Addressed principally KFA 3 outcomes and to some extent KFA 4 outcomes.

Key impacts delivered:

Economic

- Increased yields of sugarcane due to improved control of grass and other weeds through alternative management strategies including alternative herbicide use and strategies pertaining to chemical and sugarcane varietal selection and usage.
- Potential for reduced costs of weed control.
- More selective and effective use of herbicides to avoid phytotoxic issues with some varietal/herbicide interactions.
- Potential to use similar strategies in other sugarcane growing regions.

Cost reduction	10% per ha
Probability of outcome achieved (adoption level)	75%
Probability of impact achieved given successful outcome	75%

Environmental

- Contribution to a reduction in pesticide pollutant loads under the Reef Plan program.

Social

- Improved scientific knowledge regarding phytotoxic interactions between chemicals and sugarcane varieties.
- Increased productivity and profitability of the sugarcane industry resulting in positive income spillovers to sugarcane communities.

Project 2014/069 – Field assessment and further development of high-sucrose sugarcane

BCR 0.38:1

Key objective of project: to further investigate the potential for targeted gene manipulation for increasing sucrose levels of sugarcane, specifically whether the higher sucrose production observed in transgenic material in the glasshouse will remain stable in the field, and whether the high-sucrose trait can be created in elite cultivars.

Contribution to SRA's Strategic Plan Outcomes:

- Addressed KFAs 1 and 8 outcomes.

Key impacts delivered:

Economic

- Potential contribution to higher sucrose levels in sugarcane varieties through use of the transformation technology in currently commercial varieties without sugarcane yield or disease resistance reductions.
- Potential contribution to higher sucrose levels in new varieties produced by conventional breeding programs.
- However, significant additional costs of deregulation (estimated at $16m) to capture the potential economic impacts would be experienced.

Average increase in CCS for each new variety bred	15%
Probability of intermediate outcome (approval of gene regulator)	75%
Probability of positive ratooning and stability outcome	75%
Probability of impact given successful deregulation and positive ratooning and stability	75%

Environmental

- Nil.

Social

- Improved sugarcane research capacity and scientific knowledge in transformation that may be valuable in modifying other characteristics of the sugarcane genome.
- Potentially increased future productivity of the sugarcane industry resulting in positive income spillovers to sugarcane communities.

Project 2015/046 – Securing Australia from Papua New Guinea (PNG) biosecurity threats

BCR 4.95:1

Key objective of project: to further investigate variants of the Ramu stunt and Downy mildew pathogens present in PNG, other relevant scientific information and develop more accurate diagnostic assays and resistance screening tests to improve preparedness if such threats entered and became established in Australia.

Contribution to SRA's Strategic Plan Outcomes:

- Primarily addressed KFA 3 outcomes but also had implications for KFAs 1 and 8 outcomes.

Key impacts delivered:

Economic

- Avoided future yield losses in Australian sugarcane through improved geographic information on potential sources of PNG pests and disease risk and increased Australian industry awareness and vigilance regarding the pest and disease threats.
- Avoided future yield losses in Australian sugarcane, if and when, incursions occur via faster response to management of incursions through improved testing and information regarding varietal resistance, e.g. growers affected by an incursion and other growers surrounding the infected area can mitigate risk by planting varieties with known higher resistance.
- Potential reduction in impacts of control measures should an incursion occur, e.g. unnecessarily destroying areas of susceptible surrounding crop to prevent further spread.
- Reduction in the likelihood of an incursion in Australia occurring through improved control in Australian quarantine.

Without eradication, maximum proportion of potential affected area incurring losses without the project	
Ramu stunt	40%
Downy mildew	20%
Borers	40%
Without eradication, maximum proportion of potential affected area incurring losses with project:	
Ramu stunt	30%
Downy mildew	15%
Borers	30%
With eradication, maximum proportion of potential affected area incurring losses without the project	
Ramu stunt	10%
Downy mildew	5%
Borers	10%
With eradication, maximum proportion of potential affected area incurring losses with project:	
Ramu stunt	7.5%
Downy mildew	3.75%
Borers	7.5%

Environmental

- Reduced reliance on pesticides that may have adverse effects on other species and the Australian environment.

Social

- Increased scientific capacity, goodwill and skills formed through partnerships in PNG.
- Reduced future productivity losses to the Australian sugarcane industry resulting in avoided loss of income spillovers to regional sugarcane communities.

2. OUTPUT TRACKING 1 OCTOBER 2018 – 31 May 2019

As part of SRA's Monitoring and Evaluation Framework, SRA's RD&A investment outputs are tracked and reported on a bi-annual basis.

The following output categories have been set to appropriately capture the diversity and breadth of RD&A outputs across SRA's portfolio:

Output Category	Definition	Examples
1. Product	A tangible/visible item that is created as a result of R&D and adoption efforts.	A new variety, a new piece of machinery, a new sensor, a growers' handbook or manual etc.
2. Scientific Knowledge	New or updated research knowledge, information or experimental findings that typically underpin future research.	New chromosome selection knowledge, stool architecture variability information, improved understanding of signals for floral induction etc.
3. Soft Technology	New or validated methodology or processes that can be utilised by industry or in further research.	A new or updated framework, design, model, portal, interface, set of recommendations etc.
4. Tool/Enabler	Material, activity or other that indirectly supports/promotes outcomes or further R&D and adoption efforts.	Development of a database, a literature review, an economic analysis etc.
5. Communicator/ Capacity Builder	Engagement activity or information that promotes communication, adoption and/or industry capacity building.	A training course developed and delivered, a project's 'set' of adoption/communication strategy activities, PhD or internship completed etc.

Outputs delivery status summary:

Status		Outputs
RED	Not delivered / serious delays / major issues	6 (3%)
AMBER	Not delivered / in progress / a risk but not an issue yet	77 (36%)
GREEN	Delivered / on track / no issues	128 (61%)

Details on the status of outputs under each KFA are provided below.

KFA1: Optimally-adapted varieties, plant breeding and release

	Output	Project	Delivery comments	Adoption/Next Steps
PRODUCTS				
●	New varieties suited to a two-year cropping system in NSW identified among introgression clones.	2013022	Clone KQB07-34350 selected for release as a two-year variety for NSW growers.	This project continues for another year, during which more evaluation will be done.
●	Reliable markers for high value traits.	2018005	It is still early days for this project, but it is on track to produce significant outputs for the SRA breeding program.	Ongoing.
●	12 new varieties released.	PLANBKN PLANCEN PLANHBT PLANNSW PLANNTH PLANSTH	Released WSRA17 and SRA23 in Burdekin; SRA21 and SRA22 in Central; SRA24 in Herbert; SRA11$^{\phi}$ and WSRA18 in NSW; SRA25, SRA26 and SRA27 in Northern; and SRA11$^{\phi}$, SRA19 and SRA20 in Southern.	Promotion of new varieties and recommendations at grower meetings and field days.
●	Tissue culture plantlets.	PLANVPD	A record of 102505 tissue culture plantlets were ordered for Spring 2019, up 7% on Spring 2018 orders.	Ongoing, with orders captured via QCANESelect™ tissue culture ordering system.
SCIENTIFIC KNOWLEDGE				
●	Single nucleotide polymorphism (SNP) markers linked to agronomic traits.	2013030	Data included in Sugarcane Hub and in Final Report.	Already used to develop high throughput markers.
●	List of genes that are linked to traits of agronomic importance.		Data included in Sugarcane Hub and in Final Report.	Potential source of new markers.
●	Baseline description of sugarcane root systems.	2015002	Baseline description of healthy sugarcane root systems completed and used to demonstrate presence of genetic variation for root traits amongst varieties.	Outputs have been rolled into two new projects: 2018002 and 2018003.
●	Knowledge of effects of environmental constraints on root systems.		Defined the effect of stress on root systems.	
●	Morphological traits linked to ratooning performance.	2015004	Completed, results showed no consistent change in stool architecture over a 50-year timeline of released varieties and other insights.	The findings from this project are being utilised in the new project 2018004.
●	Sugarcane transcriptome, Metabolome and Proteome knowledge.	2015016	Substantial valuable "omics" data has been produced, which will be a valuable resource for future research.	Knowledge useful for future research.
●	Methodologies for identifying SNP markers.	2015025	Methodologies developed in this project will be utilised in future projects.	The methods developed in this project will be useful for future marker development.

	Output	Project	Delivery comments	Adoption/Next Steps
	Increased knowledge of the sugarcane genes that are differentially regulated during Pachymetra root rot, smut and nematode infection.	2015025	The lists of genes identified in this project will be a useful resource for improving our understanding of the infection process for these organisms.	Future R&D investment will be required in order to take advantage of the gene expression data produced in this project.
	Optimisation of flow sorting to isolate single chromosomes from sugarcane introgression clones.	2015026	Protocols for tissue preparation and flow sorting have been optimised using sett roots of sugarcane.	The methods developed in this project are being utilised in new project 2018006.
	Sequencing information from the isolated *Erianthus* chromosome conferring Pachymetra resistance.		Sequencing information from an isolated *Erianthus* chromosome, revealing 8 putative resistance genes.	The sequence information obtained for this chromosome has already provided a useful marker. This marker is now available for use in the SRA introgression program.
	Quantitative information on nitrogen use efficiency related traits.	2016044	This project is on track to deliver useful outputs, but these will not be delivered until the final report is submitted in the next financial year.	N/A
	Tools and selection methodology to aid identification of nitrogen-efficient or nitrogen-responsive sugarcane.			
	Knowledge of correlations between fibre quality and economics of factory operations.	2017001	Completed, with knowledge that there are correlations between fibre content, short fibre content and factory operations.	SRA exploring further fibre quality measurement research.
	Establish a reference population for genomic evaluations of sufficient scale to enable accurate genomic evaluations.	2017002	The project is ahead of schedule with respect to establishing a reference population, having already developed one of the world's largest populations for genomic selection in sugarcane. 4038 clones having been genotyped and phenotyped, providing a valuable resource for genomic selection in the SRA breeding program.	This reference population will be utilised for genomic selection during the remaining years of this project.
	Assessment of stool architecture changes in modern varieties and linkage between morphological and biochemical markers.	2018004	This project is on track to deliver useful outputs, but these will not be delivered until later in the project.	Ongoing.
	Transgenic plants produced with CRISPR sequences and molecular analysis completed.	INNOVA1	Over 50 plants using the GUS constructs have been produced, and twenty using the PDS gene construct.	Analysis is ongoing.
	Field and glasshouse trials completed for Pachymetra root rot management strategies and varietal	PLANPAC	Field trials in the Central, Herbert and Southern regions harvested. The results from field experiments support the current guidelines used to provide growers with	Trial results were reported in an ASSCT publication. Publication of genetic variation research is pending, due to the terms

	Output	Project	Delivery comments	Adoption/Next Steps
	resistance in commercial fields.		recommendations regarding cultivar selection for planting. No evidence was found to support that planting the same intermediate cultivar over multiple crop cycles could lead to increased Pachymetra virulence.	of an MTA with CSIRO. SRA staff have met with CSIRO to discuss collaboration on both publications. Expected submission by end 2019.
🟠	Comparison between marker-trait associations for SNP markers in Indian sugarcane breeding programs for cane yield and sugar content with those already identified in Australia.	2016803	Project funding delayed on Indian side by 12 months. Phenotyping of Indian germplasm complete, genotyping in progress.	Compare marker effects between SBI and SRA when Indian genotypes are available. Make recommendations for germplasm exchange.
SOFT TECHNOLOGY				
🟢	High throughput Kompetitive allele specific PCR (KASP) markers linked to important traits, ready for deployment in SRA breeding program.	2013030	A set of high-throughput KASP markers based on SNPs linked to CCS are now available for use in the Australian sugarcane breeding program.	Available for use in SRA breeding program.
🟠	New methodology for testing stool architecture trait variation.	2015004	Methodology for testing stool architecture traits developed and correlations between particular traits and productivity can be used to screen varieties in selection trials. An indirect method requires further R&D.	
🟢	A disease specific SNP chip.	2015025	A set of 122 robust high-throughput KASP markers based on SNP's linked to resistance to smut, Pachymetra root rot and root knot nematodes.	These markers are currently available for use in the SRA sugarcane breeding program.
🟢	Generation of marker(s) for the *Erianthus* chromosome conferring Pachymetra resistance.	2015026	Development of a high-throughput KASP marker for the *Erianthus* chromosome conferring Pachymetra root rot resistance.	The sequence information obtained for this chromosome has already provided a useful marker. This marker is now available for use in the SRA introgression program.
🟠	Methodology and associated documentation of high-throughput phenotyping in the selection program.	2016028	The overall outputs from this project will not be delivered until next financial year, but the project is on target to deliver these outputs.	Methodology to be utilised in breeding program.
🟠	Ratooning index for varieties.	2016032	Some initial analyses completed.	N/A
🔴	Predictive model for variety composition.		Not commenced.	N/A
🟢	New progeny bred from genetically diverse Indonesian-*Erianthus* and Chinese-derived hybrids for new sources of Pachymetra resistance.	2016039	Two populations have been generated in this project, and in these populations 83% and 57% of the progeny were resistant to Pachymetra.	All true hybrids from these populations have been passed on to the SRA Introgression program and will be evaluated as

	Output	Project	Delivery comments	Adoption/Next Steps
				potential parents in the breeding program.
	Markers for selection.	2016803	Markers identified for red rot resistance, TCH, CCS and water use traits in Australian germplasm and reported to SRA Breeding Team.	Convert red rot markers to breeding tools. Publish results. Combine TCH and CCS data with other projects.
	Compendium of sugarcane traits and their associated genes.	2018001	A project variation has been accepted for this project which will enable it to deliver better outputs than intended. However, these outputs will not be delivered until next financial year.	The web-based compendium, in the form of a Knetminer database, will be available in late 2019.
	Methods to assess root growth in soils of various bulk densities in pots and in the field.	2018002	A new improved strategy for root core sampling in the field has been validated in a trial at Gatton, and methods for testing responses to soil compaction have been established that are effective even with small pots in the glasshouse.	Further optimisation of the field sampling procedure (using an algorithm developed at Iowa State University) is underway, and both field and glasshouse methodologies will be used to assess varietal differences to soil compaction.
	Methods for isolation of specific Saccharum chromosomes.	2018006	Despite great efforts, the FISHIS method has proved to be unsuccessful in sugarcane. However, alternative methods based on flow cytometry (developed in project 2015026) will still allow the project objectives and outputs to be achieved.	Ongoing.
	Markers to regions of the genome that are inherited from S. spontaneum.		Research ongoing; but on-track to deliver useful outputs for the SRA introgression program in the next two years.	
	Analysis and presentation of disease resistance ratings.	ANADATA	Revised analysis method has been developed to account for annual variation in absolute infection levels. Presentation of ratings now also includes a confidence interval.	Extend the confidence intervals to include all other diseases for 2020 Regional Variety Committee meetings.
	Two CRISPR constructs specific to two different target sites on the GUS gene have been constructed.	INNOVA1	Both constructs have been used for bombarding the callus.	Completed.
	Embryogenic callus successfully produced, still expressing GUS gene.		Callus has been used for two bombardment experiments, and cells were still expressing GUS gene activity.	Completed.
	Remotely Piloted Aircraft (RPA)-based hyperspectral screening system, protocols and procedures for assessing sugarcane canopy reflectance.	INNOVA4	Protocols and optimised parameters for hyperspectral imagery collection were developed. Methods for image processing and spectral data analysis were developed.	There is an opportunity to explore how to make use of this technology to answer physiological questions in sugarcane.

	Output	Project	Delivery comments	Adoption/Next Steps
🟠	Models that predict yield, sugar accumulation and physiological attributes from sugarcane canopy reflectance.	INNOVA4	Nitrogen treatment and genotypes were discriminated with high accuracy. Good prediction accuracy was observed for yield. Moderate prediction accuracy was observed for physiological attributes. However, prediction of sugar accumulation was poor.	Proof of concept was successfully achieved however significant technical challenges were identified and resolution of these issues will be required to justify additional research in this direction.
🟠	First fast-track trial established using tissue-cultured material.	PLANCEN	SuperCross Q208$^{\phi}$ x Q209$^{\phi}$ trial has been established in polytunnel. Has not been planted to field yet because of slow/uneven growth and wet weather conditions.	The trial will be planted to the field before the end of June 2019.
🟢	Progeny Assessment Trials (PATs) and propagations.	PLANBKN PLANCEN PLANHBT PLANNSW PLANNTH PLANSTH	Routine breeding operations were successfully completed with clones evaluated for productivity, quality and disease resistance and selected for propagation.	In 2019, selections will be made from the PAT to plant into a FASTCAT – a new way to test more clones, speed up the time to release and improve the rate of genetic gain.
🟢	Clonal Assessment Trials (CATs) harvested and clones selected and propagated.			Clones to be tested and propagated for FATs.
🟢	Final Assessment Trials (FATs) established.		Routine breeding operations were successfully completed with clones evaluated for productivity, quality and disease resistance and performance data presented to Regional Variety Committees for decisions on progression towards commercialisation and for release.	Ongoing planting, harvesting and selections and clones for repeat/acceleration.
🟢	Seed produced from parents chosen on their merit.	PLANCRO	1,035 bags of seed were produced from 769 parental combinations in 2018 photoperiod crossing and 579 crosses were made in 2019 field crossing. A number of changes to the crossing program have been made to increase the rate of genetic gain. The first phase of parent consolidation was completed to significantly reduce the number of parents used in field crossing. The plant breeders now nominate specific cross combinations for photoperiod crossing, and over 50% of these commissioned crosses were achieved in 2018/19. These changes aim to reduce the number of cross combinations to allow production of larger quantities of seed from the highest value crosses. There are currently 18,810 crosses comprising 38,230 bags of seed in storage.	Ongoing.

	Output	Project	Delivery comments	Adoption/Next Steps
	Seed distributed for regional germination.	PLANCRO	Regional distribution comprised 329 crosses to Bundaberg, 268 crosses to Mackay, 435 crosses to Brandon, and 65 introgression crosses to Ingham.	Ongoing.
	In-house variety ID testing service to all SRA stations, productivity boards and commercial tissue culture laboratories for clone identification and quality assurance.	PLANDNA	2276 samples were processed for molecular identification. Over 95% of samples were correct, however important identity errors were found in plant breeding, tissue culture and commercial propagation.	Ongoing.
	Sample collection and genotyping using selected markers for smut resistance.		High quality genotypic data of 380 CAT-T clones and 171 progenies of the biparental population with 10 smut related SNP markers were obtained. Woodford smut trial SMW18-6 completed.	Complete.
	Validation of the association between SNP and smut resistance.		5 SNPs showed significant association with smut resistance. These markers identified all susceptible clones in the Northern program but were not effective for the Southern program.	Association mapping will be conducted on a regional basis to determine if different markers may be effective across the breeding programs.
	Regional tissue sampling protocols and workflows for routine marker assisted selection (MAS) of seedlings.		9 populations targeted to the Northern, Herbert and Burdekin breeding programs have been selected for MAS. Tissue sampling of all 3,200 seedlings has been completed.	Samples will be genotyped with the 5 SNP markers and the information used to select seedlings before field planting the 2019 PAT trials.
	Recommendations made to the Herbert Regional Variety Committees on top performing introgression clones.	PLANGEN	5 introgression clones were included in the 2018 Herbert regional variety trials however the trial failed due to poor germination.	The trial will be replanted in 2019.
	Introgression PATs (iPATs) and propagation.		Over 8,000 seedlings were planted at SRA Ingham and Wilmar Macknade stations to form the first iPAT.	SRA plant breeders inspected the trial and selected 300 clones for propagation and further evaluation. Selected clones will be planted in 2019 iCAT.
	Introgression CATs (iCATs) harvested and clones selected and propagated.		2018 iCAT was established with 400 clones. 320 clones were propagated for the 2019 iCAT.	Commercial harvest in 2019, with the first ratoon crop to be weighed in 2020.
	Introgression FATs (iFATs) established.		50 clones were propagated for the first iFAT.	A strategy to increase selection pressure on ratoon crop performance has been implemented with the plant crop phase of field trials harvested under commercial conditions and productivity

	Output	Project	Delivery comments	Adoption/Next Steps
				measurements taken in subsequent ratoon crops. The germplasm in the introgression pipeline was consolidated from a range of previous pre-breeding research projects. New primary crosses with S. officinarum and S. spontaneum will be made from 2020.
	Hydroponic seedling system.	PLANSTH	2018 seedlings planted to field. New trial planted in growhouse in 2019.	Sampling and selection of 2018 trial. Plant 2019 seedlings to the field.
TOOLS/ENABLERS				
	Big Data Roadmap.	ANADATA	Roadmap developed and Board paper prepared.	Board consideration of Roadmap.
	Yellow Canopy Syndrome (YCS) test kit developed.	2015016	A YCS test kit (based on a rapid starch assay on leaf midribs) has been developed and released to key personnel for in-field validation.	The test is currently being validated in all regions with promising results and will be made available to productivity services organisations once validated.
	Genetic map for Q208xQ209 cross to deliver molecular markers linked to commercially-relevant traits.	2018005	Progeny from this cross have been planted in the field and will be genotyped in the coming months. It is still early days for this project, but it is on track to produce significant outputs for the SRA breeding program.	Ongoing.
	Assessment of new SNP marker technology, genotyping by sequencing (GBS).		It is still early days for this project, but it is on track to produce significant outputs for the SRA breeding program.	
	Spectracane Support.	PLANSPE	Preventative maintenance schedule completed at all sites and all system functioning correctly. Migrated all sites away from MATLAB based calibrations to standard ISIS format with remote support and weekly monitoring established for all sites. A detailed report on SpectraCane performance and process improvements was provided to the plant breeding teams at the Annual Selection meeting.	System manual and remote support guidelines to be completed and peer reviewed. The Ingham station NIR system has been implemented in manual mode and automation is scheduled for completion in September 2019.
COMMUNICATORS/CAPACITY BUILDERS				
	Mill Area Statistics and Varietal Composition reports.	ANADATA	Milling reports developed and distributed.	Enhance the reports for the 2019 season.
	Statistical support and data analysis.		Analysis of 89 FATs, 10 CATs, 75 PATs on CCS, fibre and tonnes of sugarcane per hectare (TCH), 3 agronomy trials on biomass and phytotoxicity ratings, and more	Continue to work with researchers to enable them to undertake most appropriate statistical analyses.

	Output	Project	Delivery comments	Adoption/Next Steps
			than 204 pathology trials. Analysis was also completed for one FAT for genome-wide association studies (GWAS) and 24 trials (includes 2 Indian trials) for genomic selection on CCS, TCH, red rot and canopy temperature.	
	Training modules for statistical analyses.		Introductory course for design and analysis of data using R developed.	Course to be rolled out to SRA researchers.
	Productivity drivers identified for selected mill areas.	2016032	Analyses completed and communicated for Tully and Burdekin.	Targeted extension strategies being developed with cane productivity services.
	Tool to extract and summarise productivity data and automate productivity reports.		Software company engaged to develop tool for Tully district.	Extend tool to other mill areas.

KFA2: Soil health, nutrient management and environmental sustainability

	Output	Project	Delivery Comments	Adoption/Next Steps
PRODUCTS				
	Updated SIX EASY STEPS® course material and updated web-based NutriCalc tool.	2017004	Project field trials established, and links established with other relevant research, for collection and collation of data, review mechanism established through SIX EASY STEPS® Advisory Committee (SESAC).	On-track delivery of project outputs. Project Reference group and SESAC established. Links with SIX EASY STEPS® Tool Box project.
	Commercially available in-field soil health test kit.	2017005	Operating manual for the soil health extension toolkit to ensure correct operation of items contained within the toolkit is currently being finalised.	The manual and hands on training will be provided to the soil health officers and other HCPSL and BPS staff for additional infield testing.
	Regionally-specific extension materials for evaluation/ interpretation of soil health.		A new online resource for sugarcane soil health was released by SRA on the 11 March 2019.	The Sugarcane Soil Health Toolbox is located on the SRA website and provides a wealth of information to help growers build their knowledge on soil health and adopt improved farming practices.
SCIENTIFIC KNOWLEDGE				
	Capacity to manage root-associated fungal communities and predict disease suppressive status of sugarcane cropping soils.	2013101	Reported average production losses to sugarcane root diseases in Australia are 10-15% and are therefore estimated to cost the Australian sugar industry approximately $80-100 million p.a. This research has enhanced ecological understanding of plant-microbe interactions in sugarcane cropping soils and the potential to	The project found fungi in cropping systems contain plant beneficial and sugarcane plant pathogenic species. These fungi remain largely unidentified and further research is required to isolate and identify the plant pathogenic species

	Output	Project	Delivery Comments	Adoption/Next Steps
			improve root disease prediction and management. Project outputs have been communicated through industry workshop and Cane Connections article.	and monitor their dynamics in response to cropping sequences.
	Improved understanding of nitrogen use efficiency when yield is constrained by sodicity, poor drainage or harvesting late in the season.	2015065	Results from early crops suggest there is potential to reduce nitrogen rates on poorly drained soils, sodic soils and crops harvested/ratooned late in the season.	Trials extended for two more years to deliver more robust datasets to inform SIX EASY STEPS® toolbox.
	Nutrient capture from runoff or irrigation water.	2015907	Rainfall simulation trials have established proof of concept of the use of inhibitors and sorbents to manage overland flow of nitrogen forms derived from fertilisers. Field trial sites have been negotiated and selected for Burdekin and Herbert. Large scale soil sampling has been conducted at one of the two sites, and the sampled soil is providing the basis for laboratory and growth accelerator confirmatory investigations of the proposed formulations.	On-going. Opportunities for commercialisation of novel products may be negotiated at the conclusion of the project.
	Improved knowledge and understanding of native soil nitrogen supply and nitrogen dynamics in sugarcane including two-year cane.		At field trials sites of two-year cane crops the use of drone imaging is useful for assessing nitrogen-status of the crop. Monitoring of urea from different PCU products into soil was similar over the first month, then noticeably slowed for product formulated for 270 release profile. Data from deep soil cores and mineralisation studies shows that soils in northern NSW with high carbon content can contribute agronomically significant quantities of nitrogen to the crop.	Outputs delivered through contributions to SIX EASY STEPS® Tool Box.
	New understanding on enhanced efficiency fertiliser management practices on productivity in different sugarcane farming regions.		Field trail data from 6 sites across industry show that different nitrogen fertiliser formulations and blends can improve synchrony of nitrogen supply with crop demand and mitigate nitrogen loss pathways.	
	Trials conducted to assess enhanced efficiency fertiliser.	2016807	55 enhanced efficiency fertiliser trials were harvested during the 2018 crush. Trials were located from Mulgrave to Bundaberg.	Trials ongoing.
	Fig Tree and McDonald Creek sub-catchment water quality samples for 2018/19 collected and analysed.	2017801	Sub-catchment monitoring is ongoing. Results have been shared with growers throughout ambient conditions and wet season. Three demonstrations harvested in 2018	Continue sub-catchment monitoring through Cane to Creek 2.0 (2018803) project. Monitoring will be expanded to Mossman,

	Output	Project	Delivery Comments	Adoption/Next Steps
			and results reported back to grower group.	Johnstone, Murray, Herbert and Haughton catchments.
	Myrtle Creek sub-catchment run-off water quality samples for 2018/19 collected and analysed.	2017810	Results of first season of run-off water quality monitoring of four sites supports recommendations to time nutrient and pesticide applications at least 20 days before rainfall run-off and incorporate pesticides and nutrients with irrigation. Due to a delayed wet season, pesticides and nutrients were generally applied well before the first runoff events, potentially reducing the likelihood of losses. Results also indicated potential to improve application techniques for imidacloprid.	Continued run-off water quality monitoring and reporting. Investigation into application techniques for imidacloprid warranted.
	Four monitoring and demonstration sites established for 2019/20 wet season.			
	Refinement and calibration of the root DNA health assay for improved assessment of root system health.	2018003	A calibration equation for the root DNA diagnostic assay developed that adds functional information by allowing prediction of the mass of fine (absorptive) roots.	Good engagement with industry to showcase the diagnostic.
	Dataset on soil greenhouse gas (GHG) emissions, denitrification and nitrogen use efficiency from sugarcane.	2018007	Fertiliser field trials initiated and collaborations established for industry-wide data set on soil GHG emissions and nitrogen use efficiency in sugarcane.	Data gathering and simulations will proceed over the next two years.
	Preliminary assessment of the impact of additional organic inputs, mixed species fallow cropping and intercropping on soil condition.	2018008	Mixed cover crops in NSW and Mackay were assessed. There was no difference between mixed species cover crops and a soya bean fallow biomass. Two intercropping trials established at NSW and Mackay. Soil core have been collected for assessment of nutrient content, carbon and soilborne pests and pathogens.	On-track. Tully trial site will be established in October 2019 – delayed due to the unfavourable seasonal conditions.
SOFT TECHNOLOGY				
	Revised nitrogen guidelines for crops constrained by sodicity, poor drainage or harvesting late in the season.	2015065	With preliminary data from only two early crops (plant cane, first ratoon) it is not appropriate to suggest potential nitrogen changes. Trials have been extended for two years to collect more rigorous datasets.	Trials extended for two more years to deliver more robust datasets to inform SIX EASY STEPS® toolbox.
	Best legume residue management practice recommendations.	2015074	Recommendations are being fed into development of guidelines and draft decision tree for SIX EASY STEPS® toolbox.	Development of SIX EASY STEPS® toolbox in project 2018003.
	Improved understanding of nitrogen mineralisation of legume residues.		Comprehensive understanding achieved and research findings and data sets to be fed into development of SIX EASY STEPS® toolbox.	

	Output	Project	Delivery Comments	Adoption/Next Steps
🟢	Crop responsiveness model to determine optimal nitrogen rates.	2015075	Model (prototype-Optim-N tool) developed that integrates yield potential and weighted climate forecasting to determine optimal nitrogen rates for 75% of soil performance groups in the Tully region.	Input from professional software developers required to take the protype tool to commercial level of robustness and usability. Validation trials required to confirm soundness and robustness of tool outputs.
🟠	Optim-N a prototype App to estimate crop nitrogen requirement for the coming season.		A prototype delivery tool called Optim-N App developed that provides nutrient management recommendation for the Wet Tropics.	The App outputs needs to be trialled with advisors and validated for a range of scenarios to ensure robustness of the recommendations.
🟠	Revised nutrient management guidelines.	2017004	Project field trials established, and links established with other relevant research, for collection and collation of data, review mechanism established through SIX EASY STEPS® Advisory Committee (SESAC).	On-track delivery of project outputs. Project Reference group and SESAC established. Links with SIX EASY STEPS® Tool Box project.
🟠	Revised SIX EASY STEPS® nitrogen guidelines for seasonal climatic conditions, crop management factors.	2017009	Field trials established to determine appropriate nitrogen fertiliser rates for late ratoon crops and crops in drier climatic zones.	On-track.
🟢	New knowledge of Herbert climate zones and influence on nitrogen requirements in major soil types.		The five sub-climate zones delineated in the Herbert region reflect local industry knowledge, are closely aligned with established productivity zones and soil groups and will improve simulations of optimum nitrogen application rates.	Simulations of field trial data will continue to validate model predictions for nitrogen requirements.
🟢	Draft decision support logic for the Herbert catchment for controlled release fertilisers.	2017015	Phase I of this research has been successfully completed to test and correct the decision support logic for the use of enhanced efficiency fertilisers.	Phase II of the project needs to be initiated to capture and test outputs from all enhanced efficiency fertiliser research trials and deliver a single industry wide tool. Further work is needed to evaluate early season rainfall indicators and their forecasting to better predict the outcomes for late ratoon crops and the effects of timing of nitrogen supply on CCS.
🟢	New knowledge and technologies to forecast extreme climate weather events.	2017901	Predictability of seasonal heat extremes due to variations of the wintertime stratospheric polar vortex and its representation in the ACCESS-S model has been completed.	A web interface has been developed by the Bureau of Meteorology to view forecasts, updated daily. A large number of experimental forecast

	Output	Project	Delivery Comments	Adoption/Next Steps
				products have been developed. Specific products are available for heat extremes, as well as additional general products for temperature and rainfall.
🟠	Field sampling design for estimating root system health.	2018003	DNA assay has been applied to intensive sampling of a field site in the Herbert. Test results show that a meaningful map of sugarcane roots can be generated that correlate with soil properties and terrain.	Good engagement with industry to showcase the diagnostic.
🟠	Nitrous oxide emission reduction methodologies in sugarcane.	2018007	Outputs from the field trials and simulations will inform the development of the methodologies in year 3 of the project.	On-track.
🟠	New farming practices recommendations to improve soil condition and sugarcane productivity.	2018008	On-track to be delivered.	Ongoing.
🟠	Web-based decision support tools to refine nutrient management to enable full adoption of SIX EASY STEPS® guidelines.	2018013	Tool box content has been developed for high performing sites, sodic soils, legume fallows late harvests, last ratoon in the crop cycle and mill by-products. Format on the SRA website has been developed but access is restricted at this stage.	Project on-track. Industry consultation and feedback is in train.
TOOLS/ENABLERS				
🟠	Proof of concept App for informed nitrogen management.	2017004	On-track with collation of data and submissions available for discussion, and initial planning of the intended smartphone SIX EASY STEPS® App.	On-track delivery of project outputs. Project Reference group and SESAC established. Links with SIX EASY STEPS® Tool Box project.
COMMUNICATORS/CAPACITY BUILDERS				
🟢	Communication of Crop responsiveness model.	2015075	Industry workshops, meetings and industry magazine has communicated project outputs with limited trialling of the model with Grower reference group. SIX EASY STEPS® team consulted on the development.	Communications and extension plan developed to trial tool with nutrient management advisors.
🟢	Communication and marketing plan to increase knowledge and confidence in SIX EASY STEPS® methodology	2016804	Delivered in March 2019 in extensive consultation with Department of Environment and Science	Implementation of plan and monitoring of progress.
🟠	Soil health officers' capacity building.	2017005	Detailed activity reports from soil health officers in the Herbert and Burdekin are available and demonstrate support and encouragement for practice change. This is influencing	The Sugarcane Soil Health Toolbox is located on the SRA website and provides a wealth of information to help growers build their knowledge on soil health

	Output	Project	Delivery Comments	Adoption/Next Steps
			implementation of fallow cropping and controlled traffic. Agricultural economist worked with the soil health officers and project team to develop Precision Business Management publications for the Burdekin and Herbert regions to highlight some of the key learnings from the long-term paired sites.	and adopt improved farming practices.
	Understanding of user needs and develop pathways to extend new industry relevant tools to mitigate the impact of extreme climate and weather events.	2017901	Sugar industry reference group has been established to provide feedback to researchers on weather/climate events and thresholds that impact strategic and tactical on-farm/milling decision making.	Reference group surveyed on the format and usability of tool and formats that are being developed by the Bureau of Meteorology; first 'products' tested for multi-week temperature outlook.
	Communication materials to assist adoption of root system diagnostics.	2018003	Communication and extension plan developed with project 2017005.	Good engagement with industry to showcase the diagnostic.
	Grower demonstration field sites and extension activities.	2018008	Materials developed for Soil Health Program and hosted at Soil Health ToolBox website with locators' map and project description and contacts.	Trial sites form part of growers' demonstration sites and extension program in the regions.

KFA3: Pest, disease and weed management

	Output	Project	Delivery Comments	Adoption/Next Steps
PRODUCTS				
	Grub damage risk mapping system to industry.	2015038	Final report has been delivered. Conclusion from ground-truthing and industry consultation was that system was too unreliable (especially false positives) and too expensive to be adopted.	Overlay with soil maps and other data layers could improve reliability – a proposed gap for 2020/21.
	Prototype Spot Spray sensor system.	2015055/ 2015815	Final report delivered. Product licenced to a commercial partner. Green-from-brown detection good but green-from-green (i.e. in-row) inconsistent depending on crop and weed (guinea grass) height.	Revisit when commercial product (cameras, software, sprayers) available from commercial partner.
	Efficacy data for alternatives to imidacloprid for canegrub control.	2016003	An insecticide has been identified with efficacy comparable to imidacloprid but more data may be needed.	Present data to APVMA to evaluate adequacy for registration. Clarify intentions of relevant chemical companies. Establish more efficacy trials if required.

	Output	Project	Delivery Comments	Adoption/Next Steps
	Molecular pathogen diagnostic service (assays) for soil borne pathogens.	2016047	DNA assays were developed for major root pathogens / parasites in the Australian sugarcane industry. A framework for commercial delivery of the test in the industry was implemented and training of productivity services commenced.	Assays are being trialled at SRA soil health sites in projects 2017005 and 2018008. Research continues in project 2018009 to develop further molecular biological assays for industry.
SCIENTIFIC KNOWLEDGE				
	Improved commercial assay for Ratoon Stunting Disease (RSD).	BIOBRSD	The project has comprehensively studied the LSB qPCR method and provided a scientific foundation to support its adoption. Factors that have been studied include varietal impact on RSD detection, the impact on timing and the optimal methods for sample detection and processing.	Final project report due 30 June 2019 with conclusions on the recommended RSD assay to be delivered to industry for adoption in 2020.
	Identify causal agent of YCS.	2014049	The discovery that foliar application of insecticide can prevent or alleviate symptoms of YCS has given one of the strongest leads so far to the cause of YCS. Intensive insect study underway evaluating insect fauna in relation to timing of YCS onset and insecticide treatment.	Ongoing field trials.
	Identification of bio-markers and related soil health conditions for YCS diagnosis and management.	2014082	Project was not successful in determining the cause of YCS or assisting with YCS management.	N/A
	Moth borer phylogenetic tree.	2016041	Phylogenetic trees have been developed which highlight the genetic diversity and relationships of major moth borers.	Exotic moth borer R&D continued in project 2017902.
	Identify causal agent of YCS.	2016064	Project has focussed on phytoplasmas as causal agent but results inconsistent.	Provide results to Scientific Reference Panel at review meeting in August 2019.
	Evaluation of imidacloprid run-off as affected by formulation and application method.	2017008	Measured levels of imidacloprid in run-off lower than in some other studies. Differences between formulations apparent.	Continue trials.
	Established larval feeding behaviour of Soldier fly.	2017808	Using transcriptome analysis UQ have established that Soldier fly larvae produce venom proteins when they feed on sugarcane roots. This work has been recently published in Insect Science.	Development of a model system for laboratory/ glasshouse studies.
	Knowledge of efficacy of three soil applied systemic insecticides for moth borers.	2018010	Good results with one insecticide against top shoot borer (Scirpophaga) in PNG; results against Sesamia and Chilo less promising.	Continue trial evaluation and establish new trials in 2019.

	Output	Project	Delivery Comments	Adoption/Next Steps
SOFT TECHNOLOGY				
🟢	Methodology for testing RSD in cane juice.	INNOVA3	Testing of cane juice for RSD using both LAMP methodology and NIR showed promise with both methods able to detect RSD at low concentrations.	This work has now become the subject of an SRA Transformational research project proposal.
🟠	Management options for YCS.	2014049	Spray application of bifenthrin has alleviated YCS symptoms; currently an unregistered use pattern and more work needed on rates and timing.	Ongoing field trials.
🟢	Canegrub risk maps – Mulgrave and Herbert.	2015038	Maps delivered only to Mackay due to budget and industry support. Mackay Area Productivity Services (MAPS) concluded risk map didn't reflect their field observations or historic canegrub incidence.	No further work proposed.
🟠	Management solutions for Soldier fly.	2015804	3 variety trials continue to be monitored in the Bundaberg area for varietal preference/ tolerance to soldier fly. Unfortunately, no strong preferences have been observed. A chemical trial was established in Central region in plant cane with promising results observed. This is to be followed up in the 2019/20 season. Trials have commenced in the Central region observing the impact of aerial application to control adults and the subsequent impact of their control on population establishment.	Research trials ongoing.
🟠	Updated borer Incursion Management Plans.	2016041	Revision of borer incursion management plans first requires completion of taxonomic and molecular studies to resolve some research questions. A further twelve months of activity required.	Research continues in Rural R&D for Profit project 2017902 addressing in part recommendations of this project.
🟢	Reliable moth borer diagnostic protocol.		Two molecular approaches; DNA barcoding and genome skimmings used together are useful for species delineation and identification of adults and larvae. They provide rapid diagnosis and a clear path to refining and extending borer diagnostics in the future.	
🔴	Identify treatments (antimicrobials, hot water) that may suppress YCS.	2016064	Research has yet to identify appropriate treatments.	Provide results to Scientific Reference Panel at review meeting in August 2019.
🟠	Adjuvants or formulations identified that reduce	2017008	One herbicide, Grounded, reduced herbicide runoff but only on bare	Conduct further trials.

	Output	Project	Delivery Comments	Adoption/Next Steps
	herbicide run-off while maintaining efficacy.		soil. Mud/ash applied before herbicides increased run-off.	
●	Efficacy of a sorbent bed for end-of-row capture of chemicals evaluated at small scale.		Bed (in small box) was effective at removing PS II herbicides at experimental scale.	Publish results. Suggest not a priority for SRA investment – practicality doubtful at field scale.
●	Updated molecular and morphological diagnostics for exotic moth borer threats.	2017809	Clearer data set developed to support the identification of larvae from endemic and exotic moth borer species.	Written report including completed DNA and next generation sequencing, revised SRA moth borer dossiers and species distribution maps.
●	Sugarcane specific tool box of advanced molecular diagnostic tools for existing and unknown pathogens and exotic pests.	2017902	On-track, development of a range of new diagnostic technologies for sugarcane diseases underway for use in domestic quarantine. When used correctly bar-coding can be used to identify exotic moth borers.	Industry demonstration of new LAMP method for future in-field detection of sugarcane mosaic virus to researchers, productivity staff at workshop and shed meetings.
●	Commercial DNA-based assay service.	2018009	First high throughput processing of soil samples and quantification for three organisms in soil health / breeding trails was completed. Some difficulty with the Pachymetra test was experienced with Mackay samples and is being further investigated.	Ongoing.
TOOLS/ENABLERS				
●	RSD screening.	BIORSDL	RSD lab tested 30361 samples and detected a total of 336 positive samples. All samples were tested using both the ELISA method and qPCR method with the qPCR method detecting more than double the number of positive samples than the less sensitive ELISA method. As a result, the testing methodology has been changed to the qPCR method for the 2019 season.	Ongoing testing.
●	Resistance ratings for clones and varieties provided to breeding program and industry.	BIODTLY BIODWFD	A Total of 1369 clones have been screened for Pachymetra resistance over the last year. 90 clones have been screened for Orange rust and Yellow Spot resistance.	Ongoing screening.

	Output	Project	Delivery Comments	Adoption/Next Steps
	Field inspection of the clones from the Central region was completed, and random sampling done for all clones sent from the Central region to Tully.	BIOPTLY	178 samples were analysed and no Fiji disease virus, mosaic or SCYLV was found. Minor diseases and leaf diseases were noted in the field but were not a barrier to sending the cane. A paper has been prepared and accepted by the Journal Crop Protection outlining a probability-based case for the declaration of area freedom of Fiji disease in Central region. The paper concludes based on over 30000 field inspections that there is an extremely low probability that Fiji disease remains in the Central region.	We are nearing the declaration of area freedom of Fiji leaf gall for the Central region, which will mean that movement from the Central region to northern areas will be permissible without quarantine.
	Soil assays for Pachymetra root rot and nematodes.	BIOSPLY	Soil pathology lab tested 710 soil samples for Pachymetra and 250 for nematodes in the last year giving growers the necessary information to make informed decisions about crop management.	Ongoing screening.
	Overseas varieties received and planted in post-entry quarantine facility.	BIOQUAR	24 foreign varieties were received and planted in 2018/2019. Disease testing has been completed for 10 of these and no exotic pathogens have been found. Intercepted 8 plants with Sugarcane Yellow Leaf Virus (SCYLV) in the 2017/2018 intake.	Ongoing screening and release of varieties from post-entry quarantine and tissue culture distributed to all regions.
	Rapid resistance screening procedure developed and optimised for chlorotic streak disease.	2017010	Several procedures evaluated to determine optimal doses for screening.	Suitable procedure selected and trialled on advanced clones.
	Diagnostic test of chlorotic streak in plants and water.		Diagnostic test developed.	Evaluate test on field-collected samples from productivity services.
	Enhanced capability within SRA to respond to moth borer incursion.	2018010	Project staff have gained experience with exotic borers in PNG and Indonesia.	N/A
COMMUNICATORS/CAPACITY BUILDERS				
	Disease training workshop held at Woodford.	BIOPWFD	At total of 53 extension and productivity services staff attended.	Ongoing technical advice to extension staff and researchers as requested.

KFA4: Farming systems and harvesting

	Output	Project	Delivery Comments	Adoption/Next Steps
PRODUCTS				
🔴	Novel endophyte-sugarcane variety.	2015051	Beyond the scope of this project to complete this deliverable.	Further investigation into the development of novel, or artificial, associations is required if industry is to realise the potential benefits of these endophyte associations.
🟢	Delivery of the real-time harvest decision-making tool (SCHLOT Live) to industry.	2016951	Project complete, final report due. SCHLOT Live hardware/software tested under commercial conditions and contractors enthusiastic – reportedly changed operator behaviour.	Develop a commercialisation agreement; in progress with assistance from Dallas Gibb and Michael Shannon. Aim to deliver up to 16 units to Australian contractors during 2019 season.
🟠	Improved harvester front end design and operation to minimise stool damage.	2016952	Harvesters modified with matched forward speed and basecutter rotational speed have better cane feeding but effect on ratooning and yield inconsistent. Damage knockdown rollers shown to be critical.	Harvest trials to be conducted again in 2019. Include adjustable knockdown roller position as a trial treatment.
🔴	Improved basecutter designs based on dynamic modelling.		Due to delay in modelling component, this is not going to be completed before project end in 2020.	N/A
🟢	Ready-reckoner calculators.	2018011	Some calculators developed and demonstrated at workshops.	Activities with innovation hubs will continue under a new project with a Rural R&D for Profit project 'Smarter Irrigation for Profit Phase 2' led by Cotton Research Development Corporation (CRDC).
SCIENTIFIC KNOWLEDGE				
🟠	Quantification of the effect of chopper box design and setup on performance and sucrose loss.	2014048	Tests late in the 2018 season were inconclusive due to poor quality cane supply; will be repeated at start of 2019 season.	This and related project 2016955 have already resulted in extensive harvester modifications using after-market (EHS) chopper drums.
🟢	Assessment of changes to sugarcane productivity and profitability on marginal soils with the application of organic ameliorants at depth.	2015007	Measurable changes in some soil attributes have been observed in response to the application of ameliorants, such as increased soil carbon. In ratoon crops the application of mill-mud/ash plus	Outputs will contribute to Soil Health Program Resource Hub information for growers and advisors.

	Output	Project	Delivery Comments	Adoption/Next Steps
	Determination as to whether crop response to applied nitrogen is limited on sodic soils due to lower yield potential.		trash at depth showed significantly higher cane yield than the control at one site. Similarly, the developing second ratoon crop at the Mackay site showed higher biomass for those treatments with organic amendments at six months.	Outputs will contribute to tool on sodic soils in SIX EASY STEPS® ToolBox, which will provide growers and advisors guidelines for full implementation of SIX EASY STEPS® and how/when it is appropriate to make adjustments to refine nutrient management.
	Dynamic model of interaction of harvester front end and cane stalks.	2016952	A basic model developed but needs refinement. Project leader at QUT is resigning in July 2019. This part of the project is behind schedule.	Complete project and write up modelling.
	Economic evaluation of alternative harvesting and cane cleaning practices.	2016953	Use of a mobile cane cleaning plant in combination with low loss harvesting on the Tableland did not provide improved economic returns.	N/A
SOFT TECHNOLOGY				
	Ongoing testing of an intermediate size non-pneumatic cane cleaner prototype.	2014035	Final report will be delivered by 30 June 2019 concluding performance of the intermediate-sized unit was satisfactory with throughput up to 20 t/h.	Commercial development would require dynamic modelling of the cleaning process and further testing at larger scale. Given industry's negative response to work undertaken with a pneumatic cane cleaning plant by DAF (Project 2016/953) there should be no further investment unless there is strong industry push.
	Proof-of-concept of benefits of endophyte (microbe) inclusion in sugarcane.	2015051	A protocol for screening beneficial endophytes against important pathogens and nemotodes was developed and tested for several microbes.	Further investigation into the development of novel, or artificial, associations is required if industry is to realise the potential benefits of these endophyte associations.
	Ongoing investigation of the effect of grain legume crops on productivity and soil biology of subsequent sugarcane crop.	2017012	Rotations with legumes reduced numbers of lesion nematodes compared with continuous cane, but effects on other nematodes depended on legume type and nematode species. Trend to reduced soil bulk density and higher productivity with organic matter applied sub-surface.	Continue trials. Showcase trials at annual SRA/ Queensland Department of Agriculture and Fisheries/ Grains Research Development Corporation (GRDC) bus tours.
	Ongoing trialling of Digital Soil Mapping (DSM) methods to inform precision application of nutrients for	2017014	Chemistry and physical testing of soil properties from the samples collected and data analyses show that DSM delineation of	Outputs to be developed and delivered through SIX EASY STEPS® Tool Box. Training and mentoring

	Output	Project	Delivery Comments	Adoption/Next Steps
	improved soil, productivity and profitability outcomes.		management zones for the topsoil is more precise than zones based on a traditional soil texture map.	being provided to Productivity Services Groups.
TOOLS/ENABLERS				
●	Yield forecasts provided to mills.	2016062	Yield forecasts derived from analysis of satellite imagery were delivered to mills for the 2019 harvest season.	Potential commercial providers engaged to supply forecasts after project completion.
●	Crop vigour/yield maps available to growers.		Scripting developed to allow automatic extraction of field/block imagery. But note, Wilmar notified project in 2019 that they will no longer supply block boundaries (GIS layer) and no longer require yield forecasts.	Potential commercial providers engaged to supply field/block level maps after project completion.
COMMUNICATORS/CAPACITY BUILDERS				
●	Demonstration of the productivity and economic benefits of harvest best practice (HBP).	2016955	Project is complete. 43 replicated trials and workshops in 2017 and 52 in 2018. HBP on average reduced cane loss and increased harvest yield and grower return, but increased contractor costs. Adoption of HBP increased among engaged harvesting groups.	Further demonstrations/ workshops will be conducted by the Adoption team in 2019. A decision-support tool will be developed using results from 2018-20 and elsewhere to allow growers/ contractors to negotiate suitable payment for HBP.
●	7 Irrigation hubs and training programs.	2018011	Hubs and have been established and work plans developed.	Activities with innovation hubs will continue under a new project with a Rural R&D for Profit project 'Smarter Irrigation for Profit Phase 2' led by CRDC.

KFA5: Milling efficiency and technology

	Output	Project	Delivery Comments	Adoption/Next Steps
PRODUCTS				
●	Coatings identified for resistance to erosion and corrosion in boiler tubes.	2016020	Selected coatings identified from laboratory experiments.	Chosen coatings to be installed in sugar factories and evaluated.
●	Performance of coatings evaluated in sugar factories.		Tubes coated and either installed or installation in progress.	
●	Evaluation of Ultrasonic Time Of Flight (TOF) sensors for use in Australian Sugar Mill Evaporators.	2017003	After efforts to improve calibration performance, the Pro-M-Tec TOF Ultrasonic instrument was shown to reliably measure Brix in evaporators.	Results were presented to the Industry at the 2019 ASSCT conference.
SCIENTIFIC KNOWLEDGE				
●	Knowledge of crystallisation equipment and practices for modifying pan boiling techniques to improve sugar quality.	2015013	Seasonal conditions during 2018 harvest resulted in low O-acetyl-galactoglucomannan (GGM) levels in the crop. Planned work will be	Contract variation in place to enable work to continue in 2019 season.

	Output	Project	Delivery Comments	Adoption/Next Steps
			undertaken in 2019 if conditions are suitable.	
	Recommendations for rotor hammer configurations to allow more power absorption in existing shredders.	2015018	Completed. Results indicate no advantage in adopting a shredder hammer configuration with more hammers per row than the standard configuration.	There has been extensive dissemination of project findings to representatives of all the Australian milling organisations through the SRA-funded annual Regional Seminar Series.
	Knowledge of the effect of using vapour at different calandria pressures.	2018012	Data collection at five factories undertaken in 2018.	Ongoing.
	Knowledge of the suitablity of the Neltec Colour Q.	2018201	Final report delivered.	Results presented at ASSCT conference and QUT Research Seminars presented in 2019.
	Improved understanding of the causes of high colour sugar.	2018203	Extraneous matter (EM) in the cane supply appears to be a major factor contributing to the highly coloured raw and affined sugars at times through the season and signals the need to encourage reduction in EM from the growing and harvesting sector.	Follow on research will be needed to better quantify the effects of EM on colour in sugar and the boiling practices which increase the partitioning of colour within the crystal.
SOFT TECHNOLOGY				
	Real time scheduling system (RTSS) for cane rail transport that will produce on-demand schedules throughout the day.	2014037	Project has now finished. Progress has been made towards delivering the output, but considerable work is still required.	This project could potentially be completed by postgraduate students over the next few years.
	Strategies for removal of volatile and acidic components from evaporator vapour.	2017007	Sampling and analysis conducted at sugar factories in 2018. PhD student enrolled.	N/A
	Operational procedures or designs to retard formation of acids or reduce impact.		Sampling and analysis conducted at sugar factories in 2018.	
	Specification of overall recommendations to upgrade the pan stage.	2018012	Data collection and modelling commenced.	Ongoing.
	Recommendations on the preferred method of installation and use of Neltec Colour Q.	2018201	Final report delivered.	Results presented at ASSCT conference and QUT Research Seminars presented in 2019.
	Strategies to increase the pH level of condensates to reduce the level of corrosion in evaporator sets and reduce sugar degradation.	2018202	The low-level addition of caustic soda to juice mitigates the effect of low pH condensates and should decrease the propensity for corrosion in the condensate circuits.	There are moves to install new evaporators and any research into sucrose losses for these evaporators and analyses of the degradation products would be welcome.
	Modifications to management of activated sludge plants that improve	2018204	This project has demonstrated the usefulness of commercially available water treatment chemicals for improving	Outcome will be reported in Milling Matters.

	Output	Project	Delivery Comments	Adoption/Next Steps
	the quality of wastewater from sugar mills.		wastewater quality and has identified potential design improvements for activated sludge treatment plants.	
🟢	Setup and rollout of Mosaic support software for laboratory NIR analysis of multiple mill products.	NIRDMER	The Mosaic system has been implemented delivering improvements in remote site access and data management.	Remote support of laboratory NIR installations.
TOOLS/ENABLERS				
🟠	Trialling of an online near infared (NIR) spectroscopic analysis system to quantify availability of key nutrients in mill by-products.	2016019	NIR models developed now include the reference data for samples, and Griffith University and the SRA team continue to build on these to develop more robust NIR models for all four instruments. Once the performance between the ReSpect FT-NIR and the MicroNIR can be compared, online trials can be initiated. A primary location for installation of the ReSpect FT-NIR could not yet be identified, due to the instrument having less than satisfactory performance, despite preliminary NIR models on samples providing promise. The new MicroNIR instrument has already been successfully integrated with the NCS software and is fully capable of online scanning.	In a bid to ensure this project is able to deliver, the project team have increased their workload and have included three additional NIR instruments for scanning and model development.
🟢	Lab-scale apparatus and procedure for simulating boiling conditions in sugar factory evaporators.	2017007	Customised laboratory boiling test apparatus designed and constructed to allow simulation of a wide range of evaporator juice boiling conditions.	N/A
🟠	Computational Fluid Dynamics (CFD) models of circulation in common designs of batch pans when supplied with vapour at different supply pressures.	2018012	Modelling commenced.	Ongoing.
🟢	Cost-benefit analysis of use of the Neltec Colour Q.	2018201	Final report delivered. Payback period of 3 years for a typical factory for installation of a single Control Unit for the control of the C sugar purity in four fugals, assuming the improved control results in a reduction in final molasses purity of 0.5 unit.	Results presented at ASSCT conference and QUT Research Seminars presented in 2019.
🟢	Process spectra, associate laboratory data and update NIR calibrations for mill sites.	NIRDMER	All calibrations were updated and a reduction in the number of latent variables in the models has significantly improved predictive performance.	Remote support of laboratory NIR installations.
🟢	New and emerging NIR technology for Sugar industry use evaluated.		A trial of MicroNIR was successfully conducted at Tully Sugar Ltd to monitor bagasse moisture at number 5 mill.	Research updates were presented at the regional milling seminars held at Broadwater, Bundaberg,

	Output	Project	Delivery Comments	Adoption/Next Steps
				Mackay, Townsville and Gordonvale.
	NIR systems that meet agreed analytical performance criteria (precision and accuracy) such that outputs can be used with confidence for factory process control and/or cane payment.	PLANCAS	All systems operated within the performance criteria for factory process control and cane payment. All remote service requests were responded to within one hour of logging. Mulgrave mill and Millaquin transitioned from DL5000 to Diode array NIR systems. New support contracts for laboratory DA1650 NIR instruments were executed with Wilmar Victoria and Invicta mills, Bundaberg Sugar Millaquin mill/refinery, and an additional instrument at QSL.	Ongoing support for Cane NIR Systems (CAS), Bagasse NIR Systems (BAS), Sugar NIR Systems (SAS) and Laboratory NIR solutions to contracted clients.
COMMUNICATORS/CAPACITY BUILDERS				
	Assist ASMC technical committee to progress NIR certification for use in trade with National Measurement Institute (NMI).	NIRDMER	Support was provided for a technical tour by NMI of current sugar mill NIR applications.	Ongoing.

KFA6: Product diversification and value addition

	Output	Project	Delivery Comments	Adoption/Next Steps
PRODUCTS				
	New feed, chemical and fuel product diversification opportunities for sugar, cotton, forest and wood products and pork industries.	2015902	Developed technologies for the use of sugarcane products as animal feed ingredients. Upcycling sugarcane bagasse and trash into animal feed ingredients would allow relatively low value crop by-products to contribute significantly to the income of Australia's sugarcane farms. Project developed new bagasse and trash pre-treatment processes that changed their structure and chemistry to improve their nutritional value and transform them into quality feed ingredients for animals such as cattle, pigs, and chickens. The project has developed several new processes and technologies that, if implemented, will deliver new revenue streams for producers and processors within the agricultural sector. Products targeted in this project also include fuels and chemicals and they can both reduce farm costs and provide new	Funded during Round 4 of Rural R&D for Profit programme, Phase 2 of the Biorefineries for Profit project, a short-term (12 month) program, will increase the technology-readiness level of three technologies developed in Phase 1. Phase 2 will include delivery of pilot-scale manufacturing of novel feed ingredients and probiotics from sugarcane crop residues and by-products.

	Output	Project	Delivery Comments	Adoption/Next Steps
			revenue opportunities in the sugar sector.	
COMMUNICATORS/CAPACITY BUILDERS				
●	Report highlighting Industry priorities for value add and diversification opportunities in the sugar industry.	2018014	There are significant resources available to the sugar industry, not all of which are used for value add and diversification activities. The top two topics identified by the review were a market watch and a complementary technology watch. This reflects the industry view that there are no shortage of opportunities and the industry will invest when they think they can make a profit. The knowledge held by SRA on the topics of value add and diversification are valuable, but likely with relation to specific opportunities rather than industry wide opportunities.	Market watch and Technology watch flagged in the portfolio gap analysis as an action item for SRA.

KFA7: Knowledge and technology transfer and adoption

	Output	Project	Delivery Comments	Adoption/Next Steps
SCIENTIFIC KNOWLEDGE				
●	Evaluation of existing irrigation scheduling tools.	2015082/ 2015903	Project evaluated irrigation scheduling in the Australian industry and provided industry recommendations.	Further irrigation research continued in Smarter Irrigation 2 Rural R&D for Profit and project 2018011.
SOFT TECHNOLOGY				
●	Boiler simulator training package.	2016001	A boiler simulator training package ready for industry use has been developed for boiler operators, trainee boiler operators, shift supervisors and instrumentation staff.	A small follow-up project is required that would involve incorporating the simulator back end and solvers into the distributed control system (DCS) at a particular factory. If this could be done successfully and the steps required to achieve this reported to the rest of the industry, it is likely there will be more widespread adoption of the boiler simulator.
●	Generic interface for the boiler simulator.		The boiler simulator has been demonstrated to industry at a workshop in May 2019. There will be some fine tuning to accommodate site specific and interaction with existing factory control systems (if requested by the sites), the simulator will be ready for use by factories for operator training. The simulator front end uses the SysCAD plant simulation software and a licence fee to the software supplier will apply to use the simulator.	

	Output	Project	Delivery Comments	Adoption/Next Steps
COMMUNICATORS/CAPACITY BUILDERS				
🟠	Ongoing testing and implementation of an extension approach to enhance the adoption of improved pesticide and herbicide practices in the Tully, South Johnston.	2016002	Key messages for herbicide use (less on = less off, timing matters) and imidacloprid use (identify problem and risk, treat when needed only, apply according to label) promoted through on-ground demonstrations, rainfall simulations and workshops.	Work to be continued further south in new government-funded project Cane to Creek 2.0.
🟠	Investigation of energy innovation options for the Australian sugar industry through market analysis and industry workshopping.	2017011	Three case studies completed and two more commenced. “Funding opportunities for energy innovation in Australian sugarcane” published.	Continue case studies and communication activities.
🟢	Grower workshops, paddock demonstrations and extension resources to communicate results, including Cane to Creek video and Cane to Creek articles published in CaneConnection and CANEGROWERS magazines.	2017801	Four "SIX EASY STEPS®: Putting theory into practice" workshops were run with a total of 30 attendees. These workshops were assisted by WTSIP extension staff with the aim to increase the adoption of nutrient management plans. 11 attendees requested plan updates after these workshops, whilst a further 11 attendees requested to be involved in the nutrient management planning process to develop their first plans. These plans were developed by WTSIP staff as a follow-up to these workshops. All paddock demonstrations have been implemented for 2018 and are due to be harvested in the 2019 season.	Harvest demonstration sites in 2019 season and continue some sites in Cane to Creek 2.0. Continue training through Cane to Creek 2.0.
🟢	Extension resources to communicate run-off water quality monitoring results.	2017810	Established grower groups, on-farm demonstration of practices, shed meetings, SRA e-newsletters, CaneConnection, Proserpine Canegrowers e-newsletters and Facebook posts to communicate water quality monitoring results and practice change to improve nitrogen and pesticide use and end-of-paddock water quality monitoring.	Continued grower engagement and communication, including promotion through Whitsunday Times.
🟠	Formation of Cane to Creek 2.0 Technical Advisory Committee and Regional Steering Committees and engagement of growers and external service providers.	2018803	Formation of committees commenced. Process commenced for engagement of external service providers through service agreements. Process commenced for grower engagement and staff engagement.	Roll out Cane to Creek 2.0 in the Mossman, Russell/Mulgrave, Johnstone, Murray, Herbert and Haughton catchments of the Great Barrier Reef.

	Output	Project	Delivery Comments	Adoption/Next Steps
	Graduate Trainee appointed (based in Bundaberg) – funded under National Farmer Federation's Pilot Agricultural Extension Work Placement Program.	2018804	Induction commenced and delivery of a structured work and training program underway.	Mentors to be appointed to provide trainee with on-ground experience in key extension techniques.

KFA8: Collaboration and capability development

	Output	Project	Delivery Comments	Adoption/Next Steps
COMMUNICATORS/CAPACITY BUILDERS				
	Capability development through postgraduate scholarships.	Various	Students have contributed significantly to research projects for the sugar industry, both through their studies and allied research.	Ongoing scholarship program.
	Learning management system (LMS) with modules covering different stages of mill operations.	2017013	Modules completed for low grade fugals and cooling crystallisation.	Development of further modules to complete the LMS will require additional support after this project concludes in December 2019.
	Capability appointments at QUT in the milling sector.	2018015	Program commenced with the employment of three new research staff in the first year across different disciplines (mechanical engineering, chemical engineering and chemistry). It will be followed by one new researcher each subsequent year, to cater for the inevitable turnover of younger staff (if turnover is low, the frequency of subsequent appointments may be reduced).	In their second and third years, the new staff member will be increasingly charged to research or consulting activities as appropriate. As a result, funding from the capability program will reduce to 50% in the second year and reduce further to 25% in the third year. By the end of the third year, the new staff member is expected to be fully funded from regular RD&E and consulting activities.

KFA9: Organisational effectiveness

	Output	Project	Delivery Comments	Adoption/Next Steps
SOFT TECHNOLOGY				
	New *SPID*NET.	ITSPIDN	System should be finished and operable in Q4 2019.	Implementation strategy to be delivered across plant breeding, pathology and farming system groups as soon the system is operable.

	Output	Project	Delivery Comments	Adoption/Next Steps
TOOLS/ENABLERS				
	SmartCane Best Management Practice Accreditation.	FARMTLY	SRA's Tully research farm was BMP accredited in January 2019, only Bundaberg remains to be accredited.	As Bundaberg is a new farm, SRA had to wait for a period to attain reasonable farm records before applying for accreditation. All preparatory work has been completed and SRA is now awaiting advice from CANEGROWERS as to when the BMP auditor will visit the site.
	Implementation of New Accounting Standards.	FINANCE	Completed formal initial assessment impact of the New Accounting Standards AASB9, AASB15, AASB16 and AASB1058. Initial assessment focusses on recognition (how sale and lease/rental transactions will be recorded differently).	Based on impact assessment, plan for: - New processes - resourcing of additional work that the new standards require.
	Single Touch Payroll.	FINANCE	Completed transition to Single Touch Payroll for all SRA staff. Meaning that staff and ex-staff have access to pay advice and payment summary information, directly from MyGov.	Continue to monitor.
	New purchasing system.	FINANCE	Implemented SAP Concur efficient purchasing system. This innovative solution is more-efficient, user-friendly and good for the environment (eliminates paper). Also has the benefit of simplifying and de-risking potential upgrade of the Finance system (which is where the purchase process was previously processed). As at May 2019, staff training is 75% complete.	June implementation to be followed by period of enhanced support – and active monitoring.
	Sustainable financial position.	FINANCE	A series of Board papers presented to ARC25, ARC26, BM37, BM38 and BM39. Purpose is to help keep sustainable financial position front-of-mind and identify possible levers for Directors and the Executive Team.	Implementation of strategies to achieve and maintain financial sustainability.
	Integrated planning, budgeting and forecasting tool.	FINANCE	Implementation of new tool reduces inherent risk by continued use of inadequate and unsupported Microsoft product for planning, budgeting and forecasting.	Per *Sustainable Financial Position* above, this implementation is essential to effective resource and financial planning.

	Output	Project	Delivery Comments	Adoption/Next Steps
			Implementation activity paused in 2nd half of 2018/19, awaiting further progress in relation to SPIDNet.	This implementation needs to occur in the 1st half of 2019/20.
	Compliance framework.	BOARDER	Updated Compliance Framework to align with SRA's risk register. Established Compliance Committee and completed Compliance Committee training on 10 June 2019.	Ongoing monitoring of compliance and risk management.
COMMUNICATORS/CAPACITY BUILDERS				
	SRA's research, activities and performance Outcomes and Impacts communicated to investors through a suite of communication products, reports and online media and social platforms.	COMMMGR	SRA continues to deliver a broad range of communication products that support and enhance research and adoption activities to SRA investors.	Ongoing improvement and innovation, as measured by SRA Grower Survey, direct feedback, and consultation.
	Campaign for new membership based on Levy Payer Register.	COMMMGR	The campaign will be developed and rolled out as information is collected through the Levy Payer Register.	A campaign plan will be developed during the third quarter of 2019.
	2017/18 Performance Report.	CORPREP	Performance Report published on SRA's website in October 2018 and widely promoted to industry and government investors and other Research and Development Corporations (RDCs) and Industry Owned Companies (IOCs).	Performance monitoring and data collection in preparation for 2018/19 Performance Report.
	2018/19-2021/22 Organisational Plan.	CORPREP	Organisational Plan approved by Board at BM39.	Implementation and monitoring of Organisational Plan deliverables by Executive Team.
	Levy Payer Register.	CORPREP	Notice published on Department of Agriculture's website on Friday 31 May 2019 advising a Sugarcane Levy Payer Register has been established for use by SRA only. The Register will provide SRA with access to levy payer contact details for communication purposes.	Levy payer details will be submitted by mills over the course of the 2019 season, with the full complement of SRA levy payer details being available at close of season.
	SRA investor engagement.	CORPREP	Monthly meetings with Queensland Department of Agriculture and Fisheries and DAWR. Quarterly meetings with industry representative bodies. Email consultation on matters of interest to investors.	Ongoing consultation and engagement.

	Output	Project	Delivery Comments	Adoption/Next Steps
	Review of investment Framework and process.	FUNDERU	Review completed by Colere Group and report 'Developing an Improved Investment Framework and Process' provided to Board at BM41.	Board to consider Report recommendations.
	HR Strategy.	HUMANRE	Development of HR Strategy delayed.	Strategy to be developed upon commencement of new Leader HR in July 2019.
	Culture and Values Assessment Survey.	HUMANRE	Bi-annual survey delayed.	Survey content and timing to be determined upon commencement of new Leader HR in July 2019.
	WHS Management System Audit.	HSAFETY	Compliance rate to AS4801 of SRA's Indooroopilly Head Office's Safety Management System has increased from 52% in 2016 to 94% in 2019.	Work towards achieving Safety II culture and compliance to the new ISO45001 standard. This will require updating some procedures and increasing the focus on proactive actions and prevention of incidents.
	Safety II Culture Workshops.	HSAFETY	2-day workshops rolled-out across SRA stations to introduce Safety II culture.	Ongoing staff communication and engagement activities.
	IT Strategy.	ITSERVS	Draft IT Strategy prepared in 2018.	Finalisation delayed until new *SPID*Net project completed.
	Review of fixed assets and cost options.	ASSTMGT	Review of SRA sites and fixed assets to be conducted during 2019/20.	Assessment of options and recommendations for SRA sites to be developed after the review.