



Australian Government

**Community Grants Hub**  
Improving your grant experience



## National Landcare Program

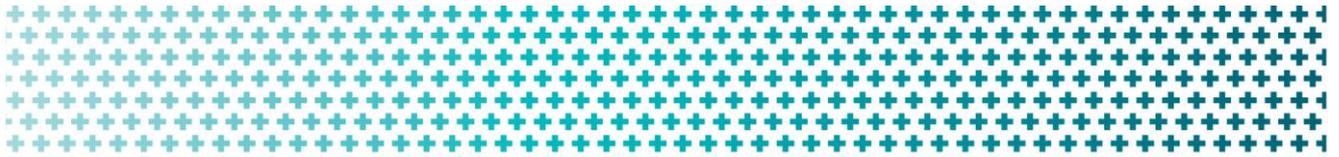
### SMART FARMS SMALL GRANTS (Round 2) - Final Report

<b>Grantee Name</b>	Sugar Research Australia Limited
<b>Activity ID</b>	4-BA9FVFC
<b>Activity Title</b>	Australian sugarcane industry soil health benchmarking in Central Queensland- Increasing profit and transforming soil health practices through cooperative industry research, extension and adoption.
<b>Date Due</b>	15/12/2021
<b>Report prepared by:</b>	Gus Manatsa, Phone: 0439 369 421 Email: GManatsa@sugarresearch.com.au

#### Declaration

<b>I declare that the agreed Activity has been undertaken and completed as detailed in the Small Farms Small Grants Round 2 Final Report. I am authorised to submit this report on behalf of my organisation:</b>	
<b>Full Name</b>	Gus Manatsa
<b>Position within Organisation</b>	Manager, Research Missions
<b>Signature</b>	
<b>Date</b>	13/12/2021

<b>Did the project finish on time?</b>	<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>
<b>If No, why not?</b>				



## Activity Deliverables (as per Grant Agreement)

### Activity 1

Measure changes in soil health under a range of farming practices: potential soil health indicators, benchmarks & measurements recommended to enable grower/ industry demonstration of performance improvement through the implementation of IFS practices (i.e., cover cropping, organic amendments, row spacing, controlled traffic, minimal till).

#### Describe what you did and what was achieved

Over two years, ten paired sites were established across the three mill areas of the Central Region to determine the soil health, root health and business impact of transitioning to an Improved Farming System (IFS). Long-term IFS sites, of at least ten years, were matched with nearby sites using conventional farming practices. Physical, chemical, and biological soil parameters were measured, along with root development testing, to determine variation between the sites within each pair and therefore the long-term impact of implementing IFS practices. This work is building the evidence required to assist the industry to determine the best set of soil health indicators for the Central region.

Combined results from the Central region indicate that microbial biomass, pH and soil compaction are positively impacted by improved farm management systems. Some measures that seemed to show very strong trends in the first year were more mixed in the second year, notably effective rooting depth. Soil texture emerged as a major influence on results, making it difficult to assess the effects of improved management practices in some cases. Root biomass averaged substantially higher in the IFS treatment, possibly reflecting a combined influence of other soil health factors. As always, context and paddock history must be considered when evaluating soil health.

This project examined a suite of chemical, physical and biological measures in conjunction with crop growth, to identify useful measures of soil health. Several measures showed a response to improved farming practices, such as pH, effective rooting depth, microbial biomass, stalk biomass and root biomass. These indicators are therefore a good starting point for investigations of soil health.

It also highlighted the challenges of measuring soil health. Farms vary so widely in environment and management practices that comparisons are difficult. The fine-grained details of management, such as irrigation timing, can have an outsized impact on results. The definition of soil health itself is variable, as it depends on the challenges and goals of the individual grower. The use of the soil health toolkit should therefore be informed by the farm at hand and the goals of the grower.

*Achieved: Provide evidence of the benefits of adopting IFS practices on soil health and subsequent advantages to business productivity, profitability and sustainability.*

*Achieved: Determine potential soil health indicators be used in soil, pest and root test interpretation: Verify the best subset of soil chemical, physical, and biological indicators to describe soil health and measure soil response to practice adoption.*

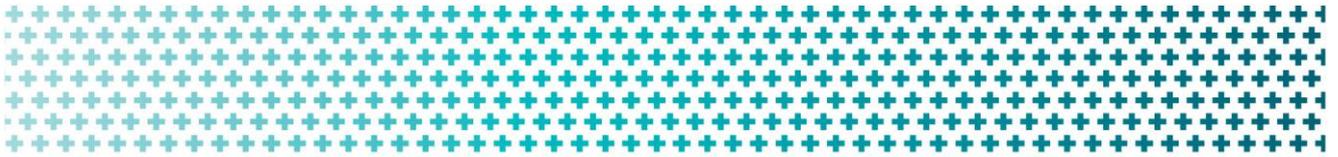
**Did this activity achieve its objectives?**

**Yes**



**No**





### Outline the highlights and achievements of this activity:

In each of the two years of the project, five paired sites in the Central Region were chosen to undertake baseline sampling to evaluate the impact different management practices had on soil health. One site in the pair was a grower who farms with an IFS and the second a grower who undertakes a CON farming system. Sites ranged in location from Proserpine in the north to Carmilla in the south of the growing region.

All *paired sites* were of the same soil type classification, and sampling locations were chosen in the same electroconductivity range based on EC maps produced by Farmacist Pty Ltd using the Geoprospector Topsoil Mapper machine.

#### Paired Sites Year One

- Pair 1- Kourmala
- Pair 2- Carmila
- Pair 3- Proserpine
- Pair 4- Eton
- Pair 5- North Eton

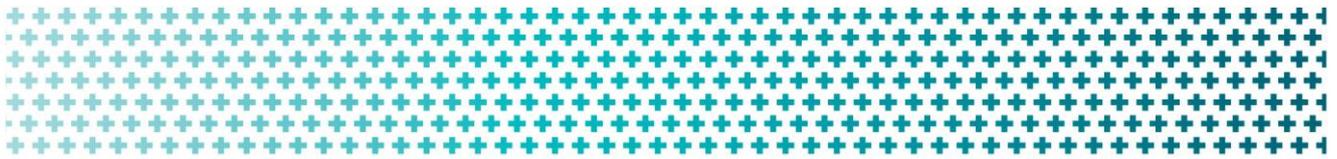
#### Paired Sites Year Two

- Pair 1- Carmila
- Pair 2- Koumala
- Pair 3- North Eton
- Pair 4- Proserpine
- Pair 5- North Eton

Appendix C provides a copy of the Central Region Paired Sites Technical Report: Year One (Farmacist Pty Ltd, August 2020) and Appendix A, a copy of the Central Region Paired Sites Technical Report: Year Two (Farmacist Pty Ltd, September 2021) providing a comprehensive overview of the methodology, results and discussion at a *paired site* and regional level. Individual grower reports have also been prepared but have not been included in this report for privacy reasons at this stage.

In summary, a series of 52 physical, chemical, and biological tests were conducted to evaluate the impact different management practices have on soil health, root health/development and sugarcane yield in the Central region. The following tests were undertaken, determined by previous paired sites campaigns of the Herbert/ Burdekin regions:

- Electromagnetic mapping the soil
- Soil bulk density
- Gravimetric soil moisture
- Water infiltration
- Soil compaction
- Soil chemical and physical properties
- Pachymetra counts
- Plant parasitic and free-living nematode counts
- Soil microbiology
- Crop biomass
- Root structure examined by WinRHIZO



## Combined findings: 2019-2020 and 2020-2021

Soil health is part of a complex farming system. It is influenced by management of the whole farming system and existing farm environment. The wide variation in many soil health measures reflects the need to account for multiple influencing factors and interacting relationships. For example, irrigation events were noted as a confounding influence on results in the first year, demonstrating the importance of management factors. In the second year, variation in soil texture made comparisons difficult, reflecting the influence of the existing environment. These factors, and the loose definition of a “healthy soil”, complicate effort to quantify soil health.

That said, there were measures that differed relatively consistently between the IFS and CON treatments (Table 1). These ‘standout’ parameters were diverse. Soil measures included chemical (pH), biological (microbial biomass), and physical (effective rooting depth) properties of the soil, reflecting the many components of soil health. Another three measures related to the crop, indicating that crop growth is responsive to soil health.

**Table 1.** Selected soil health indicators across both years of the project. Chosen indicators were “improved” on at least 7/10 IFS sites compared to their conventional counterpart.

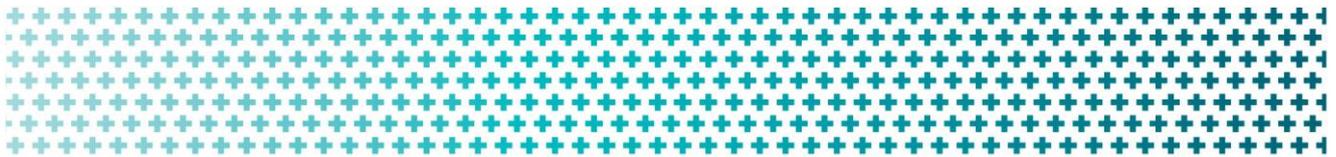
Parameter	No. IFS sites “improved”	Amount higher in IFS	Units
pH	7	0.5	pH
Microbial biomass	7	23	%
Effective rooting depth	7	7.5	%
Stalk count	9	18	%
5m stalk biomass (wet)	8	13	%
Total root biomass (wet)	7	34	%

Many growers in Mackay and Plane Creek aim to improve their soil pH. The use of artificial fertilisers tends to decrease pH over time, necessitating the application of lime. The 0.5 unit increase in soil pH seen on IFS sites is most likely a result of increased liming on IFS farms. A pH between 5.5 and 7 is optimum for sugarcane production.

Soil health factors are often interlinked. For example, increasing soil pH has been found to lift microbiological activity, demonstrating a connection between soil chemical and biological factors. In this instance microbial biomass averaged 23% higher in the IFS sites than the CON sites. Part of this difference may have been caused by the increased pH seen in the improved sites. Clearly, individual measures of soil health should be considered part of a bigger picture.

Effective rooting depth is a surprising inclusion in Table 1, as effective rooting depth averaged lower in the IFS sites in the second year. It makes the list because of clear results from the first year, in which all IFS sites had higher effective rooting depths than their conventional counterparts. Efforts to reduce compaction were a common theme among IFS sites. Practices such as matching vehicle spacings and reduced tillage are all known to limit compaction and likely contributed to the increased effective rooting depth.

The remaining three factors are related to the growth of the crop. Stalk biomass averaged 18% higher in the IFS sites, suggesting improved crop vigour. Interestingly, this increase was derived from increased stalk counts rather than stalk weight. As previously described, pH is an important influence on crop growth, and it is possible the increased pH on the IFS sites translated to increased crop biomass. Increased effective rooting depth is another possible factor. However, there are any number of possible management and environmental influences on crop biomass and they are difficult to separate.



By percentages, the standout measure from the paired site trials was root biomass. Wet root biomass averaged 34% higher in the IFS sites. This was greater than the increase in stalk biomass, suggesting that the root system of the crop was especially sensitive to improvements in soil health. The root system of the plant is known to respond to a combination of chemical, biological and physical factors. Perhaps root biomass therefore acts as an overall 'litmus' test for soil health – reflecting the suitability of the soil for crop growth. Though these results are limited in scope, they suggest root biomass could be a productive avenue for future investigations.

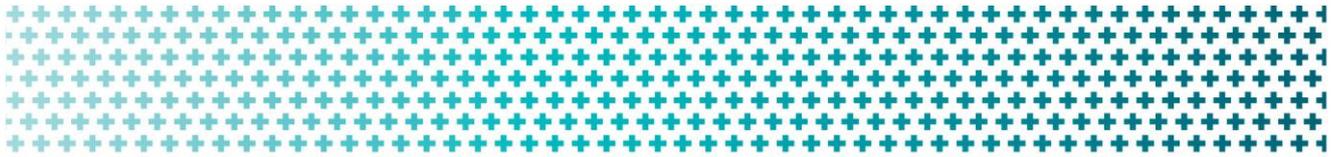
### What evidence has been provided with this report?

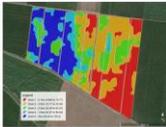
- Appendix A-Central Region Paired Sites Technical Report: Year Two (September 2021), Farmacist Pty Ltd
- Appendix B- Central Region Paired Sites Biological Report, Nicole Robinson, The University of Queensland
- Appendix C- Milestone 4 Report (Year One) (August 2020), Marguerite White, ICD Project Services (Includes Central Region Paired Sites Technical Report: Year One (August 2020)).

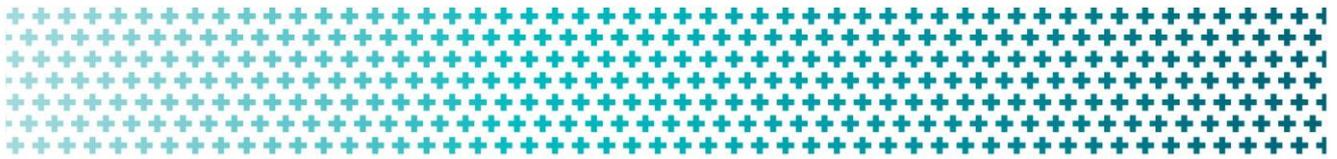
These reports contain research, extension and communications outcomes and outputs relating to this activity, also summarised in the below section.

### Impact of this activity (e.g. X number of events, Y count of publications, include feedback summary for any events)

TITLE	DETAILS
SRA Soil Health Toolbox	The project was established on Toolbox – Tile on the homepage, click through to dedicated page outlining project, site, and contact details. <a href="http://www.sugarresearch.com.au/soilhealth">www.sugarresearch.com.au/soilhealth</a> & <a href="https://sugarresearch.com.au/project-site/soil-health-project-central/">https://sugarresearch.com.au/project-site/soil-health-project-central/</a>
SRA Soil Health Program Map	Project paired sites mapped on SHP interactive map. Users can click on location and details provided about the site and research being undertaken.
Project Sheet	Two-page pdf document accessed from the SRA Soil Health Toolbox and printed for use as a hand-out at events to communicate objectives, activities & partners. <a href="#">SHP CENTRAL INFORMATION SHEET</a>
Australian CaneGrower Magazine, 21 <sup>st</sup> October 2019	Article in this major publication of the sugarcane industry. Article coordinated by SRA Communications Manager, Brad Pfeffer in consultation with the Wet Tropics and Central projects. Promotion of the financial support secured and overview of the two regional two-year projects. <a href="https://issuu.com/canegrowers0/docs/australian-canegrower-2019-10-21">https://issuu.com/canegrowers0/docs/australian-canegrower-2019-10-21</a> (Page 15)
The Billett, October 2019	Newsletter article reaching all cane growers of the Central Region. Co-authored by Phil Ross (SRA) and Marguerite White (See Milestone 4 Report for a copy)
SRA CaneConnection Magazine, Spring 2020	Article jointly prepared on the Soil Health Projects of the Central and Wet Tropics Regions, authored by Marguerite White. Promotes the activities and initial outcomes of the project with grower and service provider perspective. Publication has an extensive industry reach across Queensland and NSW. Distribution: 2,820 <a href="https://elibrary.sugarresearch.com.au/handle/11079/18123">https://elibrary.sugarresearch.com.au/handle/11079/18123</a> (Page 24)
SRA Soil Health Program Science Leadership Workshop, 4 <sup>th</sup> June 2020	Zoe Eagger of Farmacist presented an update to SRA Soil Health Program researchers, including Q&A. <a href="#">CLICK HERE FOR PRESENTATION</a>
SRA Legume Field days (3) – Koumala, Mackay & Proserpine, 14 <sup>th</sup> -15 <sup>th</sup> October 2020	The series of 3 workshops were strategically located to deliver key messages on the benefits of rotation crops as part of the farming system. In collaboration with SRA extension staff, Farmacist prepared the content and delivered these days under Covid-19 restrictions. Attendance was capped at 15 (45 total) and restricted to growers only. <a href="#">CLICK HERE FOR A COPY OF WORKSHOP PROGRAM AND OUTCOMES</a>



<p>Farmacist Newsletter (November-December 2021)</p>	<p>The Farmacist Newsletter is distributed to over 700 canegrowers of the Central, Burdekin and Wet Tropics regions. In this edition the video is promoted and a summary of the outcomes provided. Click the link: <a href="https://bit.ly/3FZQ41V">https://bit.ly/3FZQ41V</a></p>
<p>SRA eNewsletter, 26<sup>th</sup> November 2021</p>	<p>Article to extend the <b>Building industry confidence to adopt improved farming systems-understanding the soil health productivity-profitability relationship</b> video.</p> <div data-bbox="480 562 855 958" data-label="Complex-Block">  <p>equipment used in the Mackay Whitunday Cane to Creek project. <a href="#">Find out more</a> about the latest activities on this project.</p> <p><b>Mackay grower shares experience in implementing improved practices</b></p> <p>The Soil Health Project: Central has been a partnership project delivered by Farmacist over the past two years. It is supported by the Department of Agriculture, Water and the Environment through funding from Australian Government's National Landcare Program, SRA, Farmacist and local project partners.</p> <p>The project conducted a series of soil, biomass and root comparison tests between sites to determine how the practices influenced soil health at the sites.</p> <p>In this video, Mackay sugarcane grower, Sam Deguana shares his family's 22 years of experience in implementing improved farming practices and what the benefits have been in participating in the Soil Health Project-Central.</p> <p><a href="#">Watch the video here.</a></p> <p><b>Do you have a copy of the 2018 SRA Australian Sugarcane Nutrition Manual?</b></p> <p>If you do, there is another minor correction to be made on page 60 and one for page 27.</p> <p>More information is available at the links below:</p>  </div> <p>Distribution: 3,346</p>
<p>SRA eNewsletter, 26<sup>th</sup> November 2021</p>	<p>Article to extend the EC Mapping resource to canegrowers and industry service providers.</p> <div data-bbox="480 1032 855 1438" data-label="Complex-Block">  <p>Dear Marguerite</p>  <p><b>Now is the ideal time to consider apparent electrical conductivity (EC<sub>a</sub>) mapping</b></p> <p>EC<sub>a</sub> is the ability of the soil to carry an electrical current. EC<sub>a</sub> is mostly influenced by soil texture, salinity, and water content. Trends in conductivity can provide useful information about the soil and can be used to more precisely determine variable rate fertilizer and soil amelioration programs.</p> <p>An information sheet about EC<sub>a</sub> mapping has recently been developed and is available on the SRA website as part of the Soil Health Toolkit. (The information sheet was produced by the Central soil health project but the information is relevant across all regions.)</p> <p>Contact your local trusted advisor for more information or to discuss opportunities to undertake EC<sub>a</sub> mapping on your farm.</p> <p><a href="#">READ MORE</a></p> </div> <p>Distribution: 3,346</p>
<p>The Billet, December 2021</p>	<p>Newsletter article reaching all cane growers of the Central Region. Copy of the <b>Central Region Paired Sites Results</b> resource published. <a href="#">CLICK HERE FOR DECEMBER 2021 EDITION OF THE BILLET</a></p>
<p>Farmacist Central Region Annual Grower Update, April 2021</p>	<p>60 growers attended the 2021 Farmacist Grower Update where the project outcomes were presented by leader, Zoe Eager. <a href="#">CLICK HERE FOR COPY OF WORKSHOP PROGRAM AND OUTCOMES</a></p>
<p>Mackay Grower Advisor Update, June 2021</p>	<p>55 Central Advisors attended the MAPS annual grower advisor day where the project outcomes were presented by leader, Zoe Eager. <a href="#">CLICK HERE FOR COPY OF WORKSHOP PROGRAM AND OUTCOMES</a></p>



## Activity 2

Innovative soil health/ IFS extension: regional synthesis of solution-based soil health messages to improve production, profit and sustainability through development, training in and implementation of the SRA Soil Health Toolkit (SHET).

### Describe what you did and what was achieved

This project was an industry partnership of the Central cane growing region of Queensland. Collaboratively, the partners, led by Farmacist and SRA, ground-truthed potential soil health indicators and benchmarks for varying soil types and farming systems of the region. This work was needed so that growers could have increased confidence in soil, plant and root sampling data, to inform their decision making and build a greater understanding of how IFS practices deliver production, profit & sustainability outcomes, in addition to improved resilience to climatic variability and extreme weather.

The development of the Soil Health Extension Toolkit (SHET) provided a way for local service providers to build their own knowledge in possible Central region soil health indicators, whilst working alongside “champion” growers keen to trial the tests included in the SHET and use the data to help inform the soil constraints most impacting their yield potential, and importantly, where to progress their investigations through further in-depth testing.

The development, training and use of the SHET with growers (Activity 2) and preparation of resources informed by the paired sites data collected, analysed and interpreted (Activity 1) has resulted in a local grower support network that is armed with the right messages, packaged in the right way, with the right skills to take action in-field; and ensure grower engagement in these processes to increase ownership leading to the adoption of recommended “next-step” investigations or proactive management.

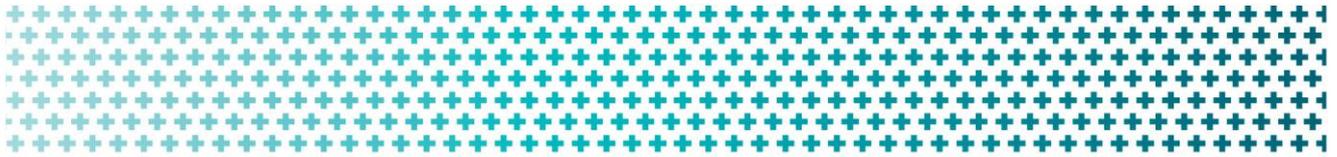
The project determined that practical use of the SHET should be focussed and referenced to a specific location. Management factors that are not always considered in discussions of soil health, such as irrigation, should be factored into the conversation and extension activities. Use of the SHET ongoing is unlikely to be “one size fits all” – different situations will necessitate different approaches. The content of the SHET, and developed supporting resources, have established a strong foundation for local service providers to deliver malleable services to meet the many needs of local growers.

*Achieved: Create a network of more knowledgeable soil health service providers, led by an engaged trusted private technical specialist (soil/nutrients/agronomy), to improve the capability to transfer knowledge, skills and solution strategies to growers.*

*Achieved: Provide training and local validation of the “Soil Health Extension Toolkit”, to be in-field with growers; identify soil, production and profit constraints caused by current practices and build capability to address impediment through IFS practice adoption (partially impacted by Covid-19 restrictions).*

<b>Did this activity achieve its objectives?</b>	<b>Yes</b> <input checked="" type="checkbox"/>	<b>No</b> <input type="checkbox"/>
--	---	---------------------------------------

**Outline the highlights and achievements of this activity:**



## Preparation of the SHET for the central region

A major deliverable for the project in year one was the collation and distribution of the SHET for partners across the region. The contents of the SHET are provided in Appendix C.

The SHET provides the tools for local advisors to collaboratively test for the following parameters infield with local growers:

- Soil bulk density
- Soil Compaction
- Soil pH and Ec
- Water Infiltration rate
- Sodium and ESP
- Soil Moisture
- Worm Counts
- Bulk Density
- Labile Carbon

The aim of the SHET was not to replace standard soil testing but to commence discussions on soil health with local growers and conduct these basic field tests to evaluate the outcome of certain management practices upon soil health (conventional versus IFS) and monitor changes over time. The project found it was a sound way to identify initial constraints to crop yield that needed further investigation with an advisor.

The project determined that the practicalities of managing the SHETs of the region over time will be more difficult than initially thought. The logistics of ensuring instruments remain calibrated and access to certain stock solutions have had to be worked through. The result has been that a “Master” SHET is located at the SRA Mackay Research Station, and a more simplified kit has been distributed to other organisations.

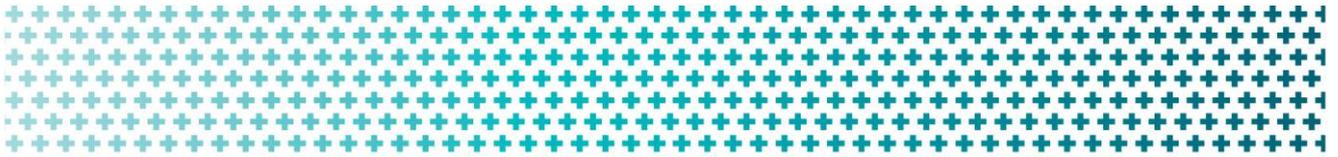
Six toolkits have been strategically hosted by the following key service providers across the Central growing region:

1. Mackay Area Productivity Services
2. Sugar Research Australia Mackay (2 available)
3. Sugar Services Proserpine
4. Farmacist Pty Ltd
5. Plane Creek Productivity Services Limited

The assistance and advice of the Herbert/Burdekin Soil Health Project (SRA Project #2017/005) was integral to the successful delivery of this outcome in the Central region.



**Figure 1** Top left: Stickers developed for all contents of the SHET. Bottom left: Zoe Egger, Farmacist, delivers a SHET to SSP in June 2020 Right: The SHET is delivered to MAPS and SRA in July 2020.



## Training in use and Management of the SHET

A SHET Training Workshop was conducted on the 10th of March at the Te Kowai (Mackay) Research Station and again in March 2021 as part of the paired sites sampling activity (Activity 1). Training was jointly coordinated by Farmacist and SRA Adoption. Three team members of the Herbert/Burdekin Soil Health Project (2017/005) travelled to the region to deliver the training- Dr. Monia Anzooan (Ayr), Robert Verrall and Linda DiMaggio (Ingham). Table 2 provides the spread of Central partner employees who have been trained. The program of training delivered is provided in Appendix C.

**Table 2** SHET Training Attendees

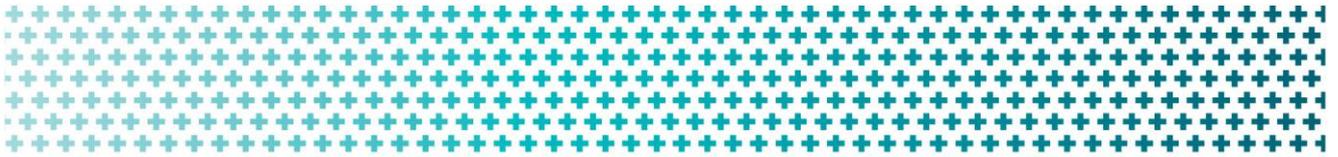
ORGANISATION	NUMBER OF ADVISORS
SRA	5
Sugar Services Proserpine	3
Mackay Area Productivity Services	4
Plane Creek Productivity Services	4
Farmacist	6
QDAF	2
<b>TOTAL ADVISORS TRAINED</b>	<b>24</b>



**Figure 2** SHET training for Central region service providers, March 10th 2020.

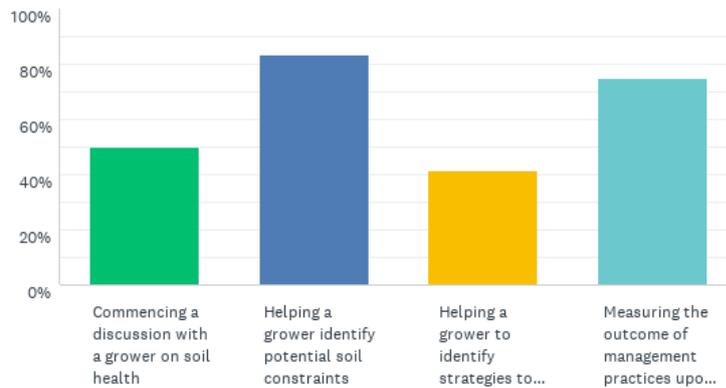
An evaluation of the training was undertaken:

- 3.6/5 average rating was scored for *the training was worth attending*
- 3.8/5 average rating was scored for increasing my understanding of the purpose of the SHET and different options for using it in-field along-side growers
- 3.8/5 average rating was scored for increasing my skills to conduct in-field measurements of physical, chemical, and biological (labile carbon and worm counts) soil health indicators



- 3.8/5 average rating was scored for the training has given me greater confidence to use the SHET in-field with a grower and provide feedback during the Central region’s trial and validation.
- Figure 3 provides insight into where the value of the SHET was considered beneficial by the attendees of the training. The highest values were in identifying soil constraints (83%) and measuring the outcome of management practices on soil health (75%)

The scenarios in which I think I will find the SHET most useful in my job are (multiple answers can be selected):



**Figure 3** Snapshot of how Central region advisors believe the SHET will benefit their work in soil health with sugarcane growers of the Central region.

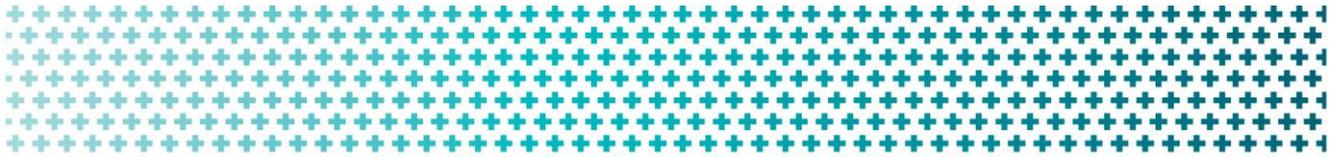
## SHET trial and validation

The SHET was trialled and validated across four sugarcane regions- Wet Tropics, Herbert, Burdekin, and Central regions.

In order to facilitate quality outcomes of this process, the Herbert/ Burdekin Soil Health Project (SRA Project #2017/005) led the development of the SHET Operating Guidelines, with the Central and Wet Tropics projects providing essential roles in review and feedback of this document. A copy of the manual can be accessed [HERE](#) .

Furthermore, as part of this process, the trained service providers across all four regions are now managing the data they generate in the field with growers by inputting the data into the standardised Toolkit Recording Database. In three regions this database is shared by all partners. In the Central region, each of SRA/ Farmacist, SSP, MAPS and PCPSL have access to individual databases for privacy reasons. The database also includes field sheets so that data can be noted in the field for entry into the database upon return to the organisational office.

A Microsoft Teams group was established for each accessible database including: SHET users of the partner organisations, Dr Danielle Skocaj (CI Herbert/Burdekin region) and Marguerite White (WT & Central SHP Coordinator). Within each group the database, operating procedures and other shared documents were provided. A



copy of the SHET Trial Recording Database and Field Sheets can be accessed [HERE](#). A motherhood SHET Workshop Presentation for training service providers can be accessed [HERE](#).

The nine months scheduled for use of the SHET, to trial and generate physical, chemical and physical soil indicator data was acutely affected by Covid-19 restrictions, limiting access to direct trial with growers in the field. The resource was to be extensively tested in field to be evaluated for appropriateness as the key sugarcane soil health indicator data collector, along with data generated from paired sites and demonstration sites across the four regions. The SHET was determined to assist in development of certain regional parameters for the “stand-out” indicators of the Central Region at the paired sites (Appendix A).

In the Central region, Farmacist oversaw trial of the SHET and management of the data generated. Quality checks, regional/ industry analysis and interpretation were a cooperative effort across all regions, led by Dr Danielle Skocaj.

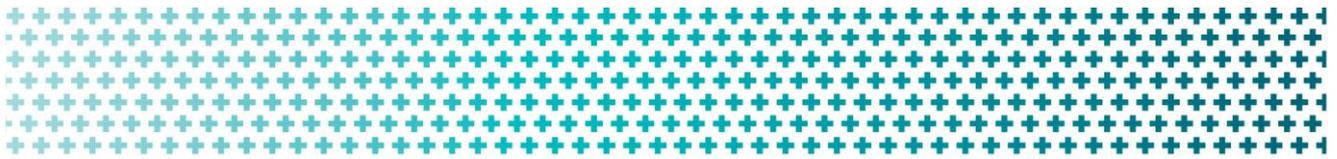
### What evidence has been provided with this report?

- Appendix A-Central Region Paired Sites Technical Report: Year Two (September 2021), Farmacist Pty Ltd
- Appendix B- Central Region Paired Sites Biological Report, Nicole Robinson, The University of Queensland
- Appendix C- Milestone 4 Report (Year One) (August 2020), Marguerite White, ICD Project Services (Includes Central Region Paired Sites Technical Report: Year One (August 2020)).

These reports contain research, extension and communications outcomes and outputs relating to this activity, also summarised in the below section. Links to associated developed resources of the SHET are provided in the section above.

### Impact of this activity (e.g. X number of events, Y count of publications, include feedback summary for any events)

TITLE	DETAILS
MAPS Newsletter, March 2020	Update on the project and SHET training in local industry newsletter (See Appendix C Report for a copy)
YouTube Video: “Update on SRA’s Soil Health Extension Toolkit	Filmed in partnership by the Herbert/Burdekin and Central Soil Health Projects. Filmed and produced by Marguerite White. Hosted on the SRA Soil Health Toolbox to promote the development and purpose of the SHET. 353 Views. <a href="https://youtu.be/9PoWcF0if40">https://youtu.be/9PoWcF0if40</a>
SRA eNewsletter, 15 <sup>th</sup> May 2020	Article jointly authored by soil health project leaders to release SHET video and promote the purpose of the SHET. Distribution: 3,346 (See Milestone 4 Report for a copy)
SRA CaneConnection Magazine, Winter 2020	Article jointly authored by soil health project leaders to provide a detailed overview of the SHET in context with aligned soil health benchmark and indicator investigations across the four regions. The publication has an extensive industry reach across Queensland and NSW. Distribution: 2,820 <a href="https://sugarresearch.com.au/sugar_files//2020/05/caneconnection-winter-2020-f_web.pdf">https://sugarresearch.com.au/sugar_files//2020/05/caneconnection-winter-2020-f_web.pdf</a> (page 24)
SRA eNewsletter, 17 <sup>th</sup> July 2020	Article of the project to promote the release of the SHET in the Central Region to encourage growers to contact the project to have the SHET used infield by their local advisors. The article also provided an overview of the paired sites and cumulative aims to determine soil health indicators and benchmarks for the region. Distribution: 3,346 (See Appendix C Report for a copy)



### Activity 3

Governance, engagement & communications: technical guidelines & farmer case studies linking soil health & productivity to IFS practices and resources published on SRA Soil Health Toolbox website, further communicated via partner industry networks.

#### Describe what you did and what was achieved

- The Soil Health Project-Central was overseen by both a project steering group and technical advisory panel, both of which facilitated a strong collaborative effort towards oversight of the project and assured engagement with all key stakeholders of the region who are involved in grower soils, agronomy and nutrient extension.
- The Soil Health Project- Central project delivered progress and outcomes on Activity 1 & 2 through the key avenues of grower extension conducted in the Central region. These were partnership workshops with SRA in the Proserpine, Mackay and Koumala districts, MAPS Annual Grower Advisor Workshops and Farmacist Annual Grower Update Meetings.
- A series of soil health resources were developed and have been published on the SRA Soil Health Toolbox. These include videos, case studies and fact sheets. These resources are being extended through local service providers and SRA and Farmacist communication avenues.

*Achieved: Advance grower engagement in soil health research trials, leading to improved adoption uptake, by providing seasonally relevant action learning opportunities.*

*Achieved: Provide a conduit for cross-organisational coordination of soil health-related action learning activities, unified approach to soil health language & terminology to reduce confusion & develop region applicable technical resources, underpinned by rigorous science, to be hosted by SRA's Soil Health Toolbox website.*

**Did this activity achieve its objectives?**

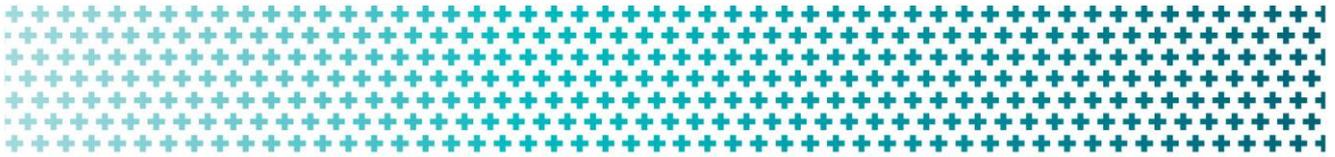
**Yes**



**No**



**Outline the highlights and achievements of this activity:**



## Project Steering Group

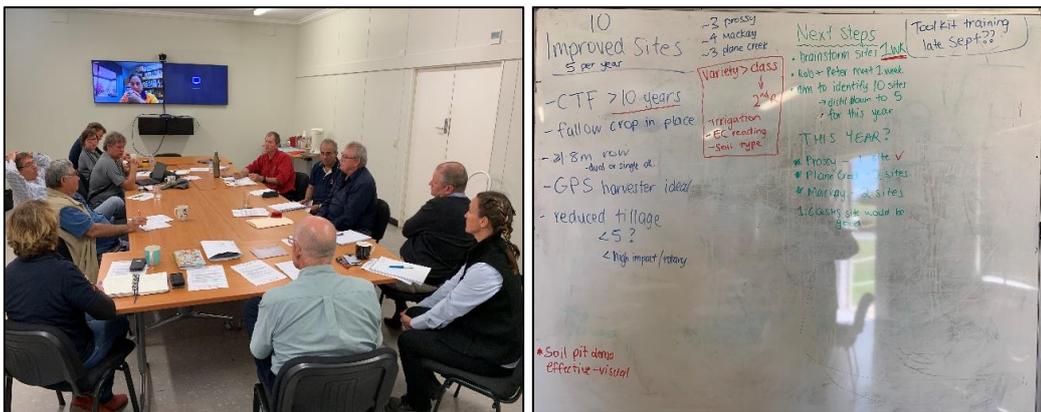
Farmacist sought consultation on the project via the members of the steering group. The inaugural meeting was held on August 6<sup>th</sup>, 2019, to oversee the commitments across the three investment channels into this integrated soil health project for Central sugarcane farmers, these being the National Landcare Program (Commonwealth), SRA and QDAF, and the substantial in-kind support from SRA and partner organisations. Membership included representatives from:

- SRA Adoption team- 2 representatives
- SRA Research- 1 representative
- QDAF
- Sugarcane Services Proserpine Ltd (SSP)
- Mackay Areas Productivity Services Ltd (MAPS)
- Plane Creek Productivity Services Ltd (PCPSL)
- Central Queensland Soil Health Systems (CQSHS)
- Farmacist Pty Ltd- 2 representatives

There was also representation from Wilmar Sugar at the first meeting.

There was ongoing input into the project by members of the reference group, importantly in the selection of the year one and year two paired sites, assistance in sampling of the paired sites and training/trialling and managing data of the SHET.

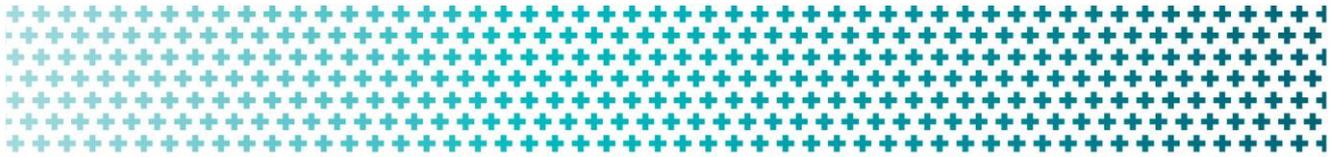
The members of the reference group were sought for input, feedback, and advice via an email group. A further meeting was held on August 27<sup>th</sup>, 2020 to review the year one data and activities, and plan for year two. In early 2022, with no Covid-19 restrictions, the steering group plans to hold a series of workshops to deliver the outcomes of the project (soil health indicators and SHET) to each of the 3 districts.



**Figure 4** The Soil Health Project- Central Steering Group collaborate to develop the project workplan and identify year one paired sites, communication, and extension activities on August 6<sup>th</sup>, 2019.

## Technical advisory group

On matters of a technical nature, Farmacist has both formally and informally sought input, feedback and advice from the project's research organisation partners, The University of Queensland (UQ) on biological sampling analysis and interpretation, and The University of Southern Queensland (USQ) on chemical data findings. On the 6<sup>th</sup> of April 2020, a joint data analysis review meeting was conducted with representatives including:



- UQ – Dr Nicole Robinson
- USQ- Prof. Bernard Schroeder
- SRA Research- Dr Danielle Skocaj (2017/005 Herbert/ Burdekin Soil Health Project)
- HCPSL (Herbert Soil Health Officer)- Richard Hobbs
- BPS (Burdekin Soil Health Officer)- Terry Granshaw
- T.R.A.P Services (2019/904 Wet Tropics Soil Health Project)
- Farmacist- Zoe Egger & Che Trendell

Initially this was scheduled as a Townsville based face to face meeting, however, due to Covid-19 restrictions, the meeting was moved to a Zoom Platform over three hours. The aim was to review the cumulative and trend data resulting from biological, physical, and chemical soil across the paired sites, and where necessary, refer to raw datasets. As an outcome of this meeting, changes were made to the presentation of the data for some indicators, however, largely there was agreed findings on chemical, biological and physical key messages for the region.

The support of UQ, USQ and SRA's Dr Danielle Skocaj for ongoing advice was an invaluable contribution throughout 2021 when opportunity to travel or meet were limited. These partnerships ensured quality interpretation of the data and commencement of determinations of the potential soil health indicators of the Central region.

### Preparation and extension of resources

There was a strong partnership formed between Farmacist (including ICD Project Services), SRA Communications (Sam Ryalls/ Allyson Starky) and the Herbert/ Burdekin Soil Health Project (SRA Project #2017/005) chief investigator, Dr Danielle Skocaj, to prepare, review and design the resource outputs of the project. The benefit to the industry has been new partnerships and connectivity leading to improved synthesis and reduced duplication of effort resulting in resonating messages and additional innovative resources for SRA's Soil Health Toolbox website. Importantly, the intention is to continue to extend these resources over coming years to not only the Central region, but more broadly to cane growers and advisors, where applicable, of NSW and Queensland.

### What evidence has been provided with this report?

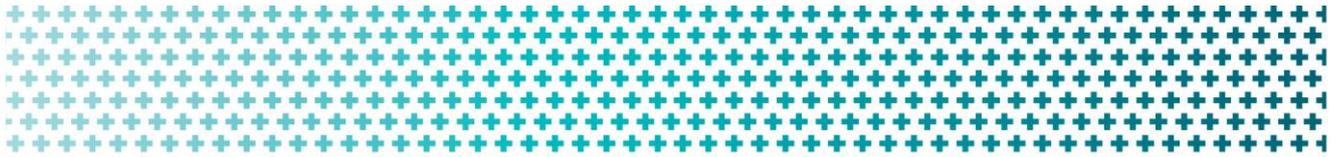
*(e.g. photographs, communication materials, website links, reports, Media attention/coverage)*

- Appendix A-Central Region Paired Sites Technical Report: Year Two (September 2021), Farmacist Pty Ltd
- Appendix B- Central Region Paired Sites Biological Report, Nicole Robinson, The University of Queensland
- Appendix C- Milestone 4 Report (Year One) (August 2020), Marguerite White, ICD Project Services (Includes Central Region Paired Sites Technical Report: Year One (August 2020)).

These reports contain research, extension and communications outcomes and outputs relating to this activity, also summarised in the below section.

### Impact of this activity *(e.g. X number of events, Y count of publications, include feedback summary for any events)*

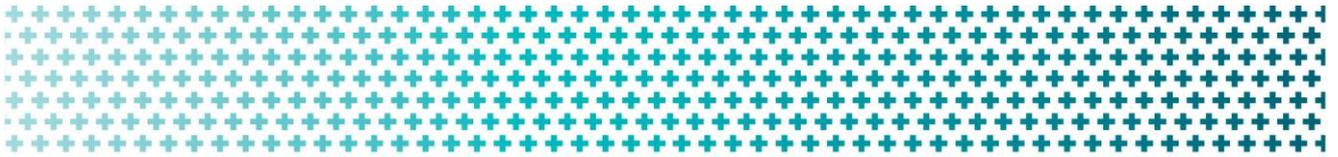
TITLE	DETAILS
The economic and environmental impacts of	This case study is part of a series that evaluates the economic and environmental impacts of practice changes adopted by sugarcane growers aimed at improving soil health on their



managing soil health, Case study 3: Ray Abela (Central Queensland), 16 <sup>th</sup> September 2021	farms. This particular case study was a collaboration between the Queensland Department of Agriculture and Fisheries and the Soil Health Project-Central. Click on the link: <a href="https://bit.ly/31DVPUg">https://bit.ly/31DVPUg</a>
Soil Health Project Central Resource (November 2021)	Accessed from the SRA Soil Health Toolbox- printable for use as a hand-out at events & in electronic form via industry eNewsletters/ Magazines. <b>Measuring Soil Health:</b> <a href="https://sugarresearch.com.au/sugar_files/2021/12/20211109_Measuring-Soil-Health_F.pdf">https://sugarresearch.com.au/sugar_files/2021/12/20211109_Measuring-Soil-Health_F.pdf</a>
Soil Health Project Central Resource (November 2021)	Accessed from the SRA Soil Health Toolbox- printable for use as a hand-out at events & in electronic form via industry eNewsletters/ Magazines. <b>EC Mapping:</b> <a href="https://sugarresearch.com.au/sugar_files/2021/11/211122_EC-Mapping_F.pdf">https://sugarresearch.com.au/sugar_files/2021/11/211122_EC-Mapping_F.pdf</a>
Soil Health Project Central Resource (November 2021)	Accessed from the SRA Soil Health Toolbox- printable for use as a hand-out at events & in electronic form via industry eNewsletters/ Magazines. <b>Electromagnetic Mapping:</b> <a href="https://sugarresearch.com.au/sugar_files/2021/12/211104_Electromagnetic-Mapping_F.pdf">https://sugarresearch.com.au/sugar_files/2021/12/211104_Electromagnetic-Mapping_F.pdf</a>
Soil Health Project Central Resource (November 2021)	Accessed from the SRA Soil Health Toolbox- printable for use as a hand-out at events & in electronic form via industry eNewsletters/ Magazines. <b>Benefits of a Central region Soy-bean fallow crop:</b> <a href="https://sugarresearch.com.au/sugar_files/2021/12/211109_Benefits-of-a-Central-region-soybean-fallow-crop_F.pdf">https://sugarresearch.com.au/sugar_files/2021/12/211109_Benefits-of-a-Central-region-soybean-fallow-crop_F.pdf</a>
Soil Health Project Central Resource (November 2021)	Accessed from the SRA Soil Health Toolbox- printable for use as a hand-out at events & in electronic form via industry eNewsletters/ Magazines. <b>Central Region Paired Sites Results:</b> <a href="https://sugarresearch.com.au/sugar_files/2021/12/211108_Central-Region-Paired-Sites-Results_F.pdf">https://sugarresearch.com.au/sugar_files/2021/12/211108_Central-Region-Paired-Sites-Results_F.pdf</a>
Soil Health Project Central Resource (November 2021)	Accessed from the SRA Soil Health Toolbox- printable for use as a hand-out at events & in electronic form via industry eNewsletters/ Magazines. <b>Importance of Soil Microbe Community Composition:</b> <a href="https://sugarresearch.com.au/sugar_files/2021/12/211108_Importance-of-soil-microbe-community-composition_F.pdf">https://sugarresearch.com.au/sugar_files/2021/12/211108_Importance-of-soil-microbe-community-composition_F.pdf</a>
Soil Health Project Central Resource (October 2021)	In this video, Mackay sugarcane grower, Sam Deguara shares his family's 22 years of experience in implementing improved farming practices and what the benefits have been in participating in the Soil Health Project- Central project. The video is published on the Farmacist YouTube Channel but has been linked to the SRA Soil Health Toolbox: <b>Building industry confidence to adopt improved farming systems- understanding the soil health productivity-profitability relationship:</b>  <a href="https://youtu.be/m5ymlM8ehuk">https://youtu.be/m5ymlM8ehuk</a>

## PROJECT FINANCES

<b>Did Project expenditure meet the expectations of the agreed Project Budget?</b>	<b>Yes</b> <input checked="" type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<b>If No, please provide details of why, below.</b>		



**Co-contribution:**

**Please comment on the amount of in-kind / cash co-contributions you received and whether this was in line with the amount in the original project budget.**

There were some variations in the in-kind contributions provided over the lifespan of the project. Due to changes in the structure of SRA extension services mid-way through the project, there was more limited support from SRA to support extension and local communications in year two. However, this was far outweighed by the additional in-kind support provided by Farmacist in the sampling and analysis services, especially in root sampling. An additional 20-days (2-days per pair) was provided in-kind.

The number of SHET one-on-one farm visits (trial of the SHET) was impacted by Covid-19 restrictions. The estimated in-kind support from SRA, PSS, MAPS and PCPS was 80-days total on this activity but only 40-days was achieved. However, PPS, MAPS and PCPS all contributed further hours under Activity 1 & 3, bringing the total in-line with estimated in-kind.

It must be noted that 50% less NLP grant funding was received than originally requested, therefore both in-kind and other contributing grant funds (QDAF & SRA) substantially outweighed the NLP contribution.

**A financial report must also be submitted on completion of the project as per item E.4 of your grant agreement.**

**GRANT OUTCOMES**

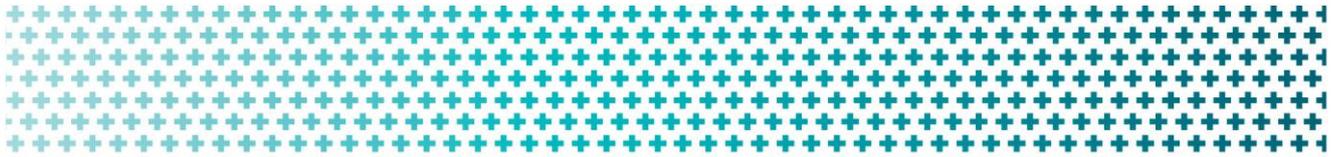
**Describe how your project supported the adoption of best practices that improve the management and quality of our natural resources and increase on-farm productivity through one or both of the following outcomes:**

**Outcome 1: Doing and fostering sustainable natural resource management best practice**

Central region sugarcane organisations cooperatively establish 10 “IFS/ standard practice Paired Sites” and conducted grower action learning opportunities in relation to the activities conducted and data resulting from these activities. Sites were tested for 52 soil physical, biological, chemical and crop root health parameters, plus production measurement, to undertake comparison analysis between (1) standard practice field V (2) IFS practice managed field of 10+ years within the same soil type.

Results informed regional potential soil health indicator determination, technical resources & extension tools. An extension model to engage growers in applied research, through development, training and use of the SHET delivered resonating knowledge, understanding and capability including resources that are specific to the soils, climate and farming systems of the Central region.

**Outcome 2: Capacity building for sustainable natural resource management**



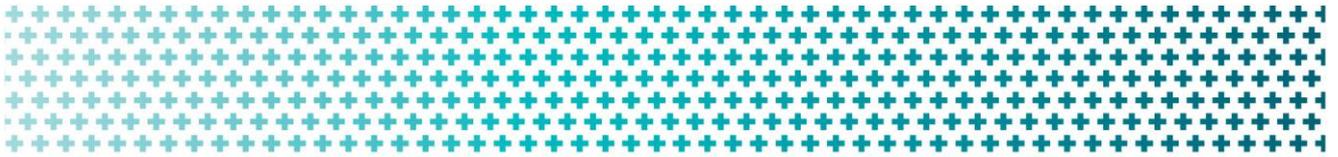
The project worked with trusted research and extension providers of the region. In Central, growers seek support from a variety of agencies, most often relative to enterprise size. It was therefore important that breadth of influential organisations, their trusted personnel and established relationships with growers and contractors were called upon to determine regional soil/ crop constraints & improve knowledge on soil health/ IFS practices via direct and in-direct engagement activities.

The project directly addressed impediments to soil health best practice adoption. The right messages (simplified, profit-focused), packaged in the right way (relevance, peer championing (Paired sites hosts)), were delivered by the right personnel (private and industry trusted advisors) with the right enabling support (SHET/ feasible solutions/ case studies). This was supported by the aligned Paired Sites activities (Activity 1) which provided the evidence sought by growers on the relationship between using certain soil health indicators to measure improved performance and production/ profit benefits- growers require broader incentive other than simply “soil health”.

The benefit to the industry has been increased understanding of farming practices on soil health, crop development/health and productivity constraints, and is leading towards creating opportunities to participate in market programs requiring performance parameters and measurement.

Adoption of practices highlighted through the project includes greater understanding of the benefits of optimal fertiliser rates (placement & source to match crop demand); trash retention is used to reduce soil erosion; improved soil structure (reducing compaction), labour and input costs from controlled traffic farming & reduced tillage; and well-managed legume fallows used to break pest and disease cycles while reducing fertiliser inputs. Greater understanding of the benefits of soil ameliorants (including organic matter) to address constraints (pH, poor regional Organic Carbon levels of 1.1%) has been demonstrated to improve soil biology and physical structure to promote more exploratory rooting systems resulting in improved yield (increased ratoons) and greater resilience in extreme climatic conditions.

<b>Project Measures</b>	<b>The measure of what was achieved (e.g. Number of hectares, Number of landholders, Number of individuals, Number of groups)</b>
<b>The estimated number of farmers/fishers adopting sustainable land management practices</b>	120
<b>The estimated number of farmers/fishers improving their skills and knowledge</b>	300
<b>The estimated number of hectares over which new practices have been adopted (if applicable)</b>	It will be ongoing as a result of the project
<b>The number of individuals engaged by the project</b>	3,200
<b>The number of groups engaged by the project</b>	12 (directly)
<b><i>Any additional outcomes – please add as appropriate</i></b>	



### Project learnings and lessons

Describe any learnings and lessons gained from the project including any comments that could lead to improved processes for future funding rounds? (200 words)

The scope of the Soil Health Project-Central was revised (to deliver fewer outcomes/outputs) after the initial application was made, due to the NLP Grant being reduced by 50%. In hindsight, the impact of reduced funds was far greater than initially determined, therefore, the project was over-scoped from commencement. Delivering upon both research and grower engagement activities was incredibly time-consuming for the project managers (Farmacist Pty Ltd) and there was difficulty in coordinating all activities in a timely manner once the support of SRA extension personnel was reduced in year 2.

The estimated time for sampling of the *Paired Sites* was based upon information supplied by SRA's Herbert/Burdekin Soil Health Project (SRA Project #2017/005). Again, these figures were deemed to be under-scoped (especially root sampling/ cleaning) and therefore the project manager (Farmacist Pty Ltd) provided in-kind support to a much higher level than initially scoped.

The project was an excellent example of regional support for a collaborative project on soil health. Project development and initialisation were strong, however, as with these types of projects reliant on the goodwill of each organisation, core business priorities and external factors (i.e.; response to global pandemic) influenced in-depth and ongoing input into project direction and support to implement activities. This resulted in the Project managers (Farmacist, including ICD Project Services), having to take on more work than budgeted. Future projects need to ensure there is a greater commitment by all partners to deliver upon the in-kind contributions they committed.

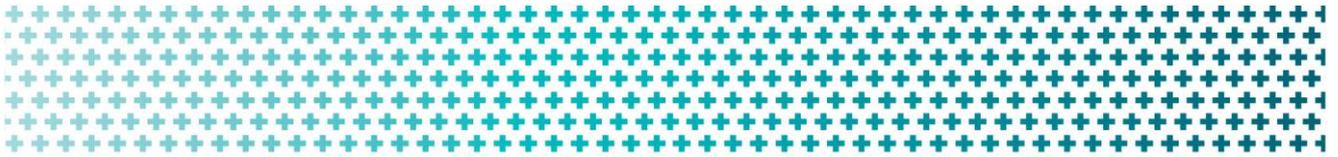
Including the same core SRA, USQ and UQ advisors across the different soil health projects of the Central, Burdekin, Herbert and Wet Tropics worked extremely well. It provided consistency across in-field protocols, testing and interpretation as well as reduced duplication of effort.

Each of the SHETS (6) now located throughout the district are worth \$4,000. There is an ongoing role for SRA in ensuring the equipment is maintained, calibrated and used into the future. This will require a dedicated SRA extension specialist.

**Your project was an important part of the Smart Farms Small Grants program. We would appreciate you telling the story of the project which may be shared with the wider community. Please use the Project Summary Template **as attached** to complete this.**

If available, please include any photographs that show what you have achieved along with the signed photo consent form **attached**.

Summary is attached.



### ADDITIONAL INFORMATION

**Is there any other information you think we may be interested in regarding this project?**

Unfortunately, 2020 and 2021 were very difficult years in which to be conducting a project that was partially based upon working closely with growers one-on-one. Whilst the project was able to adjust, direct engagement with growers was reduced for large periods of time.

Please return this form to [DAWE.Manage@communitygrants.gov.au](mailto:DAWE.Manage@communitygrants.gov.au)

FOR OFFICIAL USE ONLY - APPROVAL	
<b>Date received:</b>	
<b>An assessment prepared by:</b>	
<b>Signature:</b>	
<b>Date:</b>	Click or tap to enter a date.