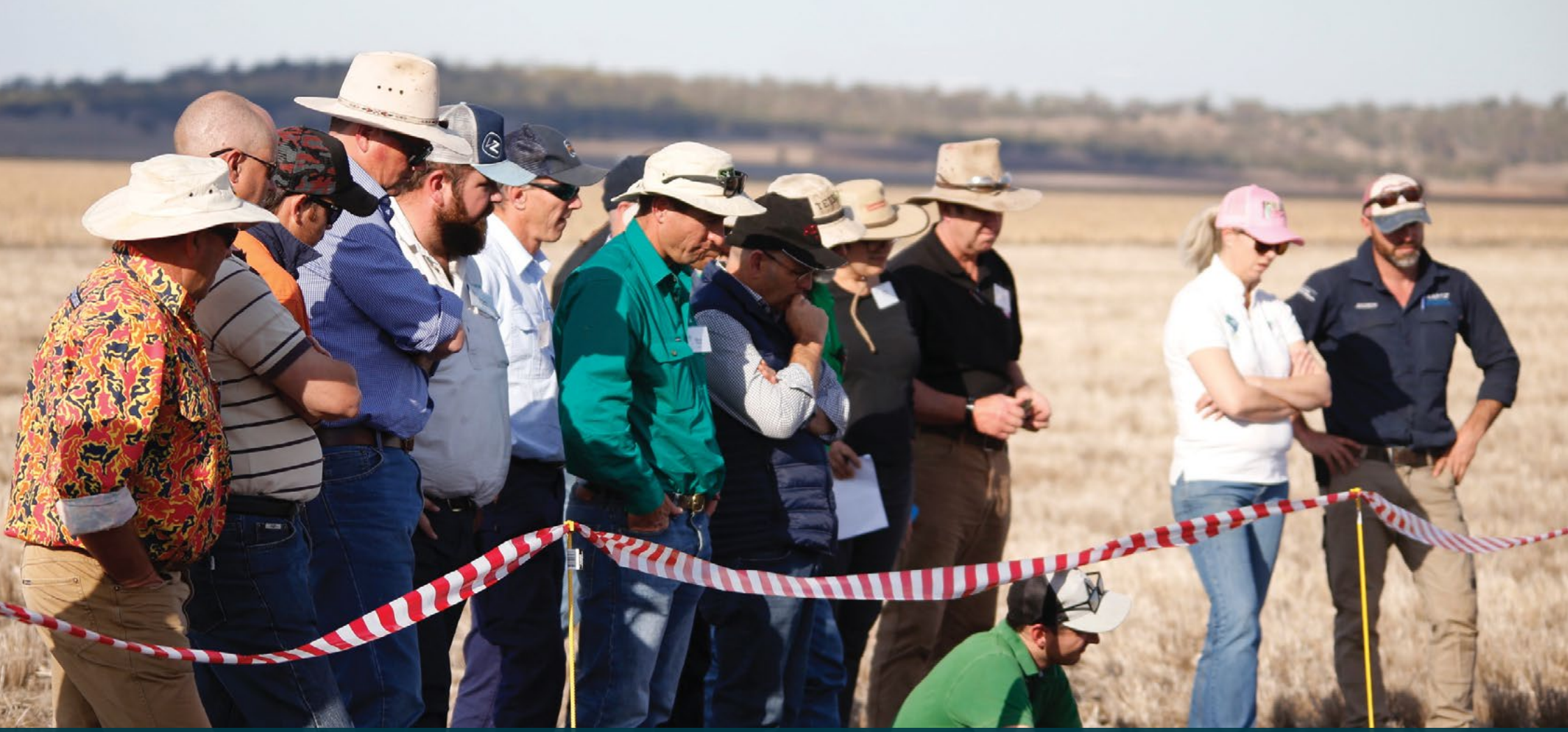


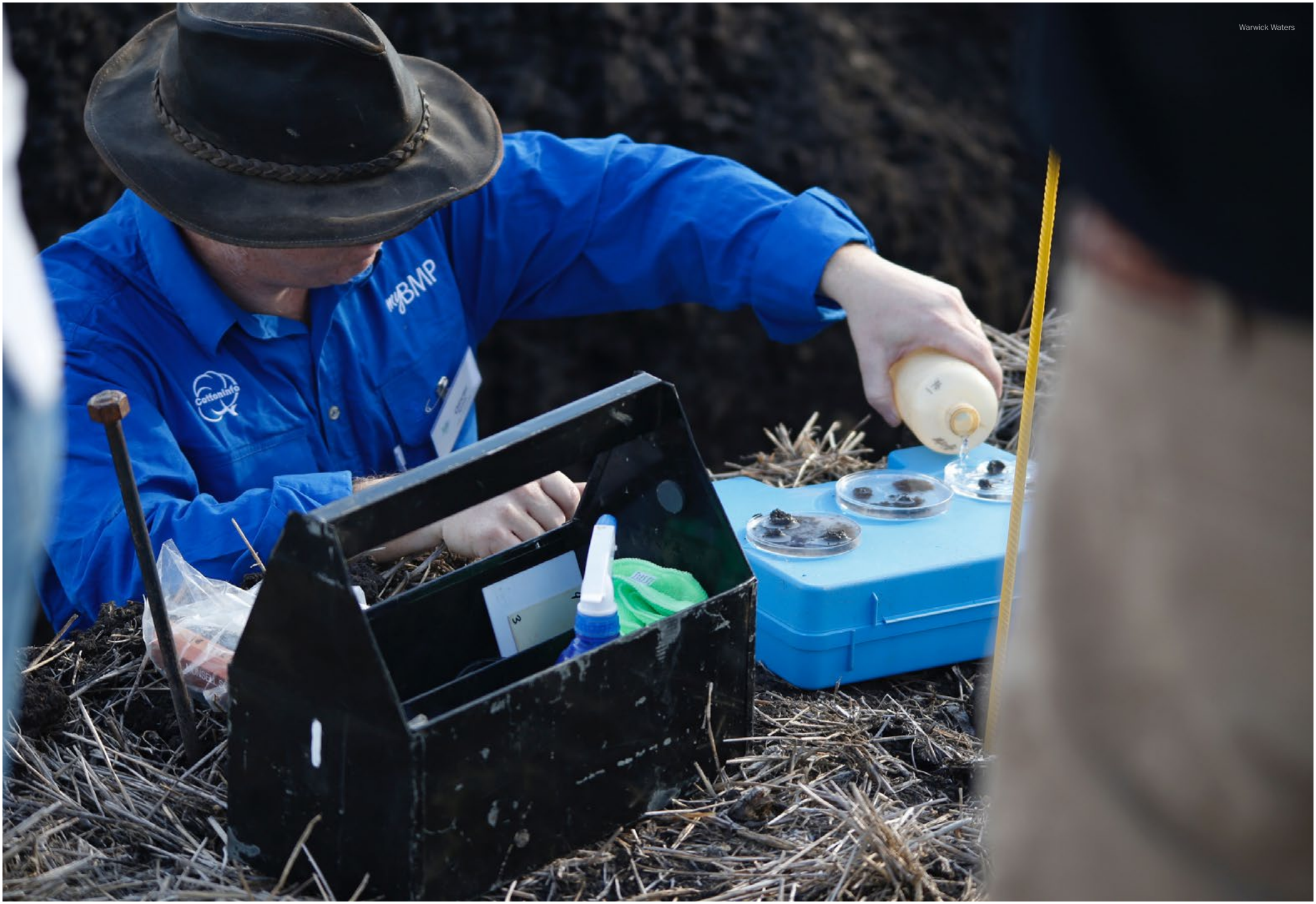
CottonInfo

Annual Operational Plan

2021-2022

CottonInfo is a joint initiative of CRDC, CSD, COTTON AUSTRALIA

Best Practice



Warwick Waters

1. Introduction

CottonInfo is the Australian cotton industry's extension program: designed to deliver research and development (R&D) outcomes to cotton growers and consultants and increase the adoption of best practice. CottonInfo is an unincorporated joint venture between three cotton industry organisations: Cotton Seed Distributors (CSD), the Cotton Research and Development Corporation (CRDC) and Cotton Australia (CA). In 2021, the Joint Venture partners renewed the contract for another five years, ensuring the partnership until 2025.

CottonInfo connects growers and consultants with the latest R&D outcomes to help achieve best practice. The team comprises Regional Extension Officers (REOs), Technical Leads and *my*BMP experts, who work across a broad portfolio, covering biosecurity, climate, crop nutrition, disease management, energy use efficiency, fibre quality, integrated pest management, natural resource management, pesticide application efficiency, soil health, stewardship, water management and weed control.

The development of the AOP has three key drivers:

DELIVERING
on the goals and targets of the CottonInfo Strategic Plan 2018-23.

PROGRESSING
any outstanding actions, and considering any opportunities or issues arising from the 2020-21 AOP.

ASSESSING
new CRDC-supported research projects for their suitability to engage with growers and consultants, and integrating these into the AOP.

2. Alignment with the Strategic Plan

The CottonInfo 2018-23 Strategic Plan contains three strategic goals with supporting key focus areas:

STRATEGIC GOAL ONE: SUCCESSFUL ADAPTATION AND ADOPTION OF RESEARCH AND DEVELOPMENT.

a. R&D outcomes adopted to increase productivity and profitability.
b. New technologies and management practices adapted and integrated into best practice in *my*BMP.
c. Sustainable cotton farms with a social licence.
d. Collaboration within cotton and across sectors to share knowledge and deliver extension efficiently.

This strategic goal recognises that the outcomes of research are only effective when they result in informed decision-making and practice change in the farming system. The role of extension is to increase the rate of practice change, the reach to more growers and the effectiveness of the change implemented.

STRATEGIC GOAL TWO: ENABLE SUCCESSFUL COTTON INDUSTRY EXPANSION.

a. A whole of business and systems approach.
b. Support the information needs of new growers and new regions.

This strategic goal recognises that cotton is grown as a component of a farming system, with crop rotations and adjacent land use affecting productivity. Aspects of soil health, compaction and pest management are influenced by the wider production system. New cotton growers need to successfully fit cotton production into their farming system as well as grow a profitable cotton crop. CottonInfo will support new growers by connecting them with industry communication channels and existing resources. Peer-to-peer learning will be offered through activities that allow growers and consultants to share their experience. While the number of new growers in established cotton growing regions has been limited due to the reduced area of cotton grown, Northern Australia has continued to progress towards the establishment of a northern cotton industry.

STRATEGIC GOAL THREE: PREPARED TO RESPOND TO BIOSECURITY THREATS AND ASSIST IN THE EVENT OF NATURAL DISASTERS.

a. Capacity to support the industry in the event of a biosecurity incursion.

OUR ENABLING STRATEGIES: AN EFFECTIVE EXTENSION TEAM, AND A TRUSTED INFORMATION SOURCE.

a. *my*BMP supports and resources industry best practice.
b. Works collaboratively with other industry service providers.
c. Supports innovation and adoption of new technology.
d. Utilises innovative communication practices and responsive two-way communication.
e. Is organisationally effective and efficient.

This strategic goal recognises that the cotton industry needs to continuously plan and prepare for unforeseen crises such as biosecurity incursions. The CottonInfo team provide a foundational asset to industry responsiveness through their established communication systems, both regional and expertise networks, and an understanding of farming systems. This year CottonInfo will continue to build the team's capacity to respond, develop networks with other biosecurity stakeholders and emphasise the importance of biosecurity plans through *my*BMP.

3. The Plan

3.1 Priorities for the 2021-22 Season

With a likely return to average planting areas, large projects in their final year and multiple cross-industry opportunities, 2021-22 will be a busy season for extension in the cotton industry. While the team will deliver across all technical areas of the CottonInfo program, there will be five areas of particular focus for this season. With good rainfall in most cotton growing regions, the 2021-22 season is looking promising for an average- to above-average planted area. Initiatives for the 2021-22 season include:

- An updated version of the CottonInfo Researchers Tours, with the focus on systems issues and the interaction of technical areas. The concept is building on successful workshops at the end of the 2021 season that explored the interaction between nutrition, integrated pest management (IPM) and defoliation. Other interactions that could be explored include nutrition, disease, soil health and water use efficiency (WUE).
- Continuation of the regional retention trials to support early season pest management decision making. In conjunction with the CRDC Retention project (Grundy, DAF Queensland), we are aiming to provide growers with the confidence to implement IPM early in the season. Mealy bug and silverleaf whitefly (SLW) are continued threats from poor IPM. The retention trials complement the extension of the updated SLW decision tool and the SLW app.
- The major cross-sectoral projects, Smarter Irrigation for Profit (SIP2) and More Profit from Nitrogen, are both in their final years. We will be working closely with SIP2 to coordinate extension activities, with planning underway to support the cross-industry Southern Irrigated Crops conference and bus tours of design and automation application in the St George area.
- Supporting digital agriculture opportunities with a focus on connectivity, assessing new technology and digital skills training. These are areas where all three joint venture partners have objectives that can be supported.
- At a cross-industry level, the 2021-22 season will see significant activity with the implementation of the National Drought Fund (NDF) Drought Hubs. CottonInfo will work with the relevant hubs to support extension of tools and information to help growers plan for and better manage drought. It is also likely that there will be cross-industry action on developing climate change adaptation and mitigation through Agricultural Innovation Australia that will have an extension focus.
- In collaboration with CA Regional Managers, CottonInfo Biosecurity workshops will be rolled out across the industry to enable participants to develop a Farm Biosecurity Plan for their farm business and also complete the *my*BMP biosecurity module.

3.2 Stakeholder Engagement

At a regional level, ongoing coordination between the regional representatives of the partner organisations remains essential. This will continue to be achieved through regular interaction between the CottonInfo REOs, the Cotton Australia Regional Managers (RMs) and the CSD Extension and Development team (E&D team). Each organisation should have an understanding of the workplan priorities of the other, as well as identified areas where they can work collaboratively to effectively deliver outcomes. In practice, this will comprise of a twice-yearly regional meeting between REOs, RMs, CSD E&D Agronomist, regional Crop Consultant Australia (CCA) representatives and the local Cotton Grower Association (CGA) chair to share workplans and identify opportunities to coordinate.

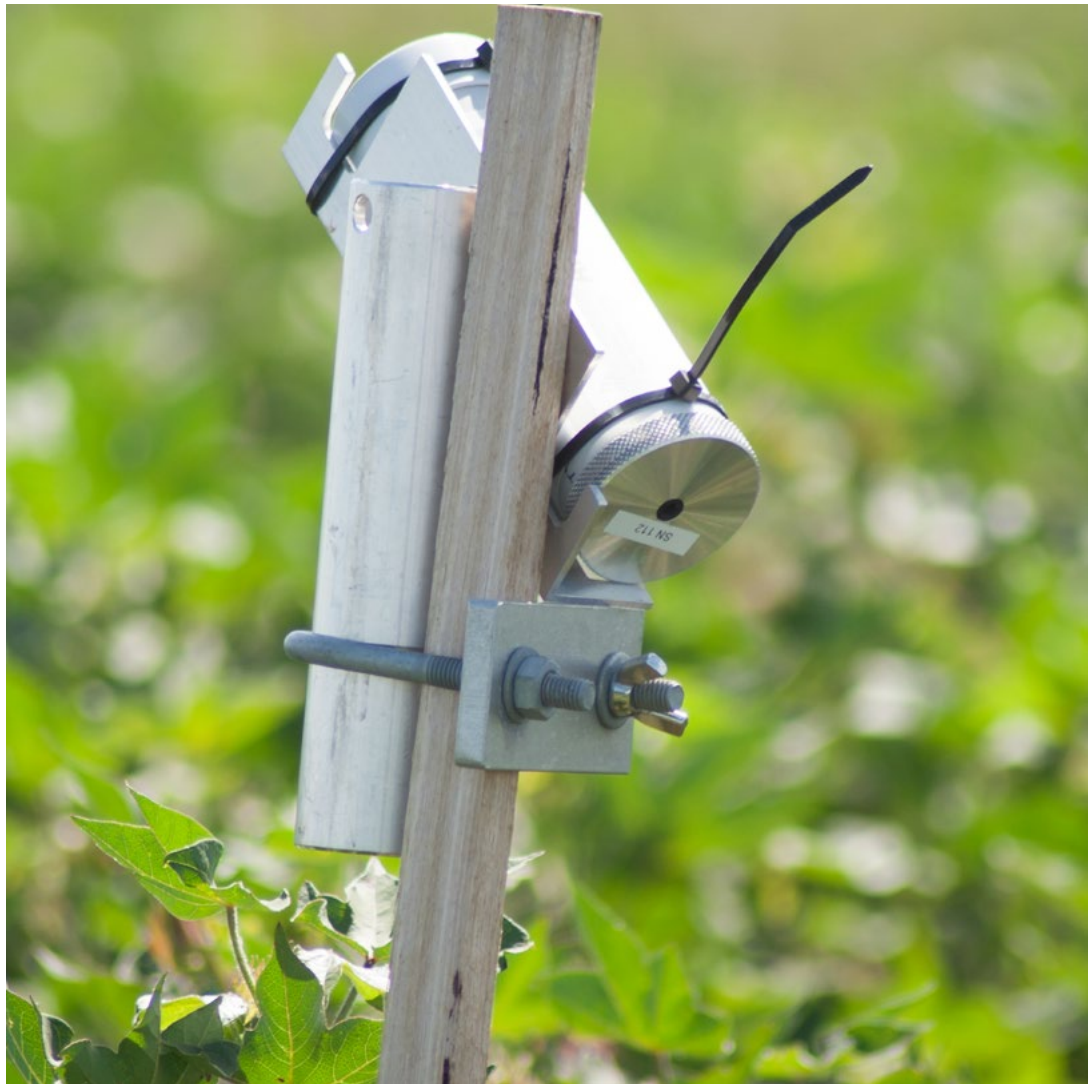
CottonInfo Technical Leads will engage with researchers in their technical area and be the point of contact between relevant research organisations and the CottonInfo team. In conjunction with CRDC R&D Managers, research forums will be supported with the aim of bringing together researchers, industry stakeholders and representative growers and consultants to receive updates of current research and discuss research and extension gaps to prioritise for the future.

3.3 Communications

Led by the CottonInfo Communications Lead, the 2018-23 Communications Strategy is designed to support the CottonInfo Strategic Plan, the AOP, and the CottonInfo team. The primary objectives of the CottonInfo Communications Strategy are to communicate R&D outcomes and extension information to growers and consultants and encourage adoption, utilising innovative communication practices and responsive, two-way communication; and to communicate CottonInfo's role as a trusted information source to growers and consultants.

Importantly, communications is a whole of team effort - Technical Leads have a key role in working with researchers to package findings into resources and *my*BMP, while the REOs provide direction for regional specific information needs and communicate directly with local growers.

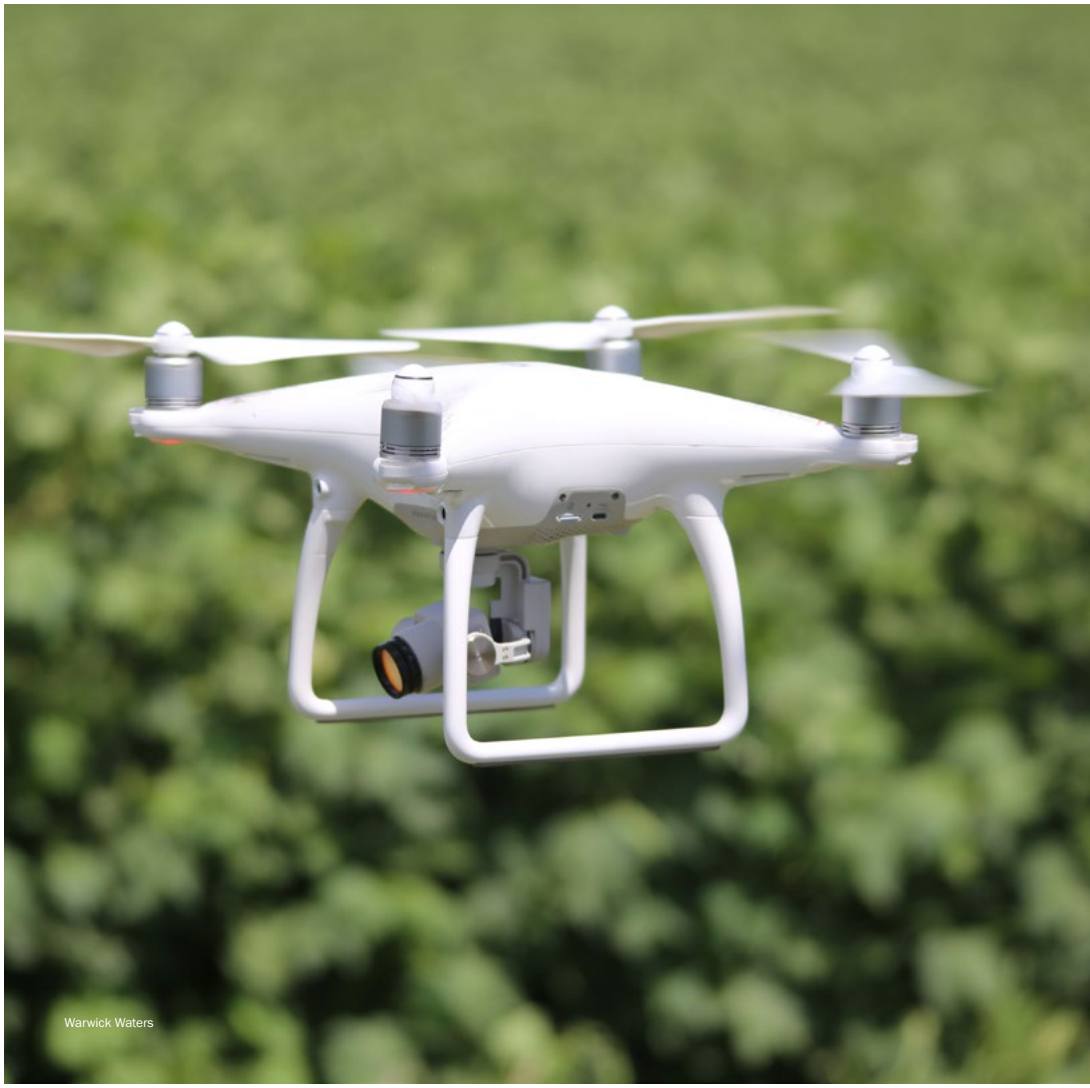
COMMUNICATIONS IS A WHOLE OF TEAM EFFORT



3.4 Building upon the 2020-21 AOP

Activities in the 2021-22 AOP that build on the 2019-20 activities include:

- **WUE benchmarking project,** with new approaches to collect data that provide growers with options of level of detail to be implemented.
- **Consolidation of the Cotton Catchup meetings,** with the inclusion of more intentional processes to capture research and extension needs through the season.
- **A second year of soil testing** to support the pre season nitrogen loss indicator concept (Jon Baird, NSW DPI).
- **Continued publication of an industry-wide crop check** to monitor crop development, pests, disease and weeds.
- **Herbicide resistance demonstration sites expanded** to promote alternative control tactics.


Warwick Waters

3.5 Integration of H.A.R.D. Research Projects

Each year, new CRDC R&D projects are assessed for their suitability to engage with growers and consultants. CottonInfo uses a four point H.A.R.D. assessment of projects to see if they require **help** from the team, should be part of an **awareness** campaign for end users, are a **resource** providing expertise or key knowledge, or if there is a specific regional **demonstration** associated with the project. These projects meet the Strategic Plan target of 30 H.A.R.D. projects integrated into the AOP.

3.5.1 Goal 1: Successful adaptation and adoption of research and development

Resource Use Efficiency

D: RRD4P More Profit from Nitrogen (Schwenke, Baird, Antille)
R: UNE1403 Professor of soil biology (Knox)
H: DAN1503 Resilient farming systems in irrigated vertisols (Nachimuthu)
D: RRDP1602 Smarter Irrigation for Profit Phase 2 (Jamali)
A: CSP1904 Improving nitrogen use efficiency (McDonald)
A: USQ1903 Managing soil constraints (Bennett)
R: 1902FRP006 Benchmarking WUE (Perovic, Crawley)
D: Plant based sensing for irrigation (Jamali)
R: Real time automation for irrigation (Foley)
A: Building profitable farm systems through increasing soil carbon (DCRA)

Increased Reliability of Cotton Production

R: CSP1401 Enhancing integrated pest management (IPM) in cotton systems (Heimoana)
R: DAN1703 Innovative solutions for disease (Le)
A: Defoliating cotton in a difficult environment (ICAN)
R: DAN1903 Cotton disease technical lead in the south (Shakeshaft)
R: DAQ1902 IPM for high yielding cotton (Grundy)
H: UWS1901 Biological based products for production (Singh)
A: RRDP2007 Evaporation mitigation solutions (Qiao)
A: RRDP2004 Gwydir Valley digital technologies for irrigation (Gall)
A: NEC1901 Sensors for IPM (McCarthy)
R: DAN1901 Integrated weed management (Koetz)
R: DAN2004 Improved management of weeds in cotton and grains farming systems. DPI and DAF Queensland (Charles)
A: 1920FRP010 Disease suppressive soils (Smith)
H: Improved systems for limited water cotton production (Welsh)
A: Climate proofing cotton through improved WUE (WSU)
A: Environmental co-benefits of irrigation water (GU)
A: Greenhouse gas baseline and mitigation for cotton (CSIRO)
H: Dryland and limited water systems research (NSW DPI)
A: Agripest challenge (CSIRO)
H: Novel options for IPM (CCA)


Renee Anderson

3.5.2 Goal 2: Successful Cotton Businesses and Expansion

A: CSP903 Science leadership for Northern Australia – supporting the development of cotton in the farming system in Northern Australia. (This project has postdoc built into it and will facilitate linkages between the CRC for Northern Australia) (Yeates)
A: MRES1701 Development of a spray drift hazard prediction system (Tepper)
H: CRDC1944 Supporting the sustainability strategy (Cosgrove)
A: Best practice to manage future workforce skills (CQU)
H: Building digital capacity in the cotton industry (TBA)

3.5.3 Goal 3: Prepared to respond to unplanned threats

H: RRDP1724 Cotton industry disease survey (Smith)
H: Review of the biosecurity plan for cotton (PHA)

3.6 Summary matrix of key activities

In some cases, technical areas will contribute to outcomes and targets across different strategic goals. AOP targets are colour coded to identify alignment with Strategic Plan goals:

IMPROVING RATE AND REACH OF ADOPTION AND ADAPTATION OF RESEARCH AND DEVELOPMENT
ENABLING SUCCESSFUL COTTON BUSINESSES AND INDUSTRY EXPANSION
PREPARED TO RESPOND TO UNPLANNED THREATS

For each technical area, a Technical Lead and partner REO will be responsible for developing a more detailed activity plan and oversee the delivery of priority activities. REOs will also develop individual action plans that include their contribution to the AOP and regionally-specific activities.

TECHNICAL AREAS	STRATEGIC PLAN TARGETS	AOP TARGETS	RESEARCH ALIGNMENT AND COLLABORATION	PRIORITY ACTIVITIES
Irrigation/Water Use Efficiency (WUE)	Improved yield 11.6 bales/ha. Improved input efficiency 1.3 bales/ML GPWUI. Increasing reliability of production 3.9M bales/year. 5 new products supported through testing and validation. Improve environmental footprint 325 kg CO^2e per bale.	30% of farms using resources for training of irrigation staff at the start of the season. 300 farms increased awareness of research findings of SIP2.	Benchmarking WUE (Perovic, NSW DPI). Smarter Irrigation for Profit Phase 2 (Rural R&D for Profit program) (Foley, USQ, Hornbuckle, Deakin and Jamali, CSIRO).	At least 10 irrigators in each region to participate in 2021-22 irrigation trends and drivers project. Bus tour of St George irrigation design development with 80 participants attending. Focus on bankless labour and efficiency improvements. Resources provided to farm managers to run irrigation application efficiency training head-ditch talks. Collaborate and support Smarter Irrigation for Profit phase 2 extension activities. Support Southern Irrigated Cropping conference.

Soil health	Involvement in 3 cross-industry projects. Improved yield 11.6 bales/ha. Two farming systems incorporated field days per year per region.	150 growers and consultants participate in systems research tour.	Support from Oliver Knox, UNE. Resilient farming systems (Nachimuthu, NSW DPI).	Each region has a cotton systems field day that incorporates the interactions of at least three technical areas. Target 30 growers and consultants per region. Support local trials where possible cover cropping, compaction, soil additives and ameliorants.
Disease	Improved yield 11.6 bales/ha. 3.9M bales 5 year average production.	Early and late season disease surveys completed and results extended regionally to all growers. FUSCOM seminar delivered to 30 participants. Southern Valley crop protection trials with a minimum of one trial in each area. Verticillium management trials, looking at soil inoculum levels (pre and post crop) on two farms.	Industry Disease Surveys, (DAF Queensland, NSW DPI). Innovative solutions to fungal diseases (Petty NSW DPI). Southern valley crop protection. CSD, DAF Queensland, Lower Namoi Cotton Growers Association.	Participate in the early and late season disease surveys, raising awareness of regional outcomes. Organise w to provide a platform for sharing current research and identifying priorities for disease research and extension. Several disease and insect trials on relevant issues to southern growers and area relevant research figures published to industry. Continue the verticillium rotation and management trials at CSD and in partnership with the Lower Namoi CGA and DAF Queensland in the Macintyre.
IPM/AWM	Improved yield 11.6bales/ha. 3.9M bales 5 year average production.	Minimum of three Cotton Catch-up meetings in each valley targeting 20 growers and consultants per meeting. Insect resistance monitoring projects supported.	IPM for high yielding cotton. Improved SLW management (Hopkinson, DAF Queensland). Enhancing IPM (Grundy, Sequeria DAF Queensland). Managing mealy bug.	Team to create a scope for the meetings that has information on how to run the meetings, feedback protocols, resourcing guidelines, tips and techniques to facilitate the meetings. Early season cotton catch-up farm walks in all regions to focus on implications of last season retention trials. Crop checks published fortnightly during the season in all regions and distributed to consultants and researchers. Continuing on farm trials demonstrating recovery potential from early retention loss in six regions. All REOs to monitor SLW parasitism every two weeks from Jan to March.

Weeds		Establish three experimental sites with a combination of best practice weed management strategies based on HRMS and modelling. Increase % growers using three or more weed control tactics from 30% to 40%.	Supporting extension of weeds tactics. Staying ahead of weed evolution. Weed control thresholds. Regional approach to weed management, focus on sowthistle and annual ryegrass.	Regional surveys of the top five resistance weeds in 50 fields to keep awareness of changes in resistance. Three on farm herbicide options demonstrations with a field day and additional farm walk at each during the season targeting 75 participants.
Nutrition	Improved yield 11.6bales/ha. Improve input efficiencies 11.5kg lint/kgN. Improve environmental footprint 325 kg CO^2e per bale.	Targeting the equivalent of 180kg CO^2e reduction from nitrogen fertiliser, equating to a 30kg N/ha reduction of fertiliser applied.	More profit from Nitrogen. Improving NUE of cotton crops (Baird, NSW DPI). Long-term P decline project (Nachimuthu, NSW DPI).	Continued development of a nitrogen loss warning system utilising the existing CSD weather network. End of season messaging in all regions to highlight the cost of excessive nitrogen, including defoliation and fibre quality impacts. Promote nutrient budgeting, targeting increased reliance on mineralised N (given longer fallows) and shifting to a greater proportion on in-crop N application to avoid pre-season losses.
NRM	Increased capacity to manage natural capital. 6.6% native veg managed for conservation.	Increase 200 growers' and consultants' awareness of BMP guidelines for conserving biodiversity on cotton farms.	New and improved technologies for managing biodiversity on cotton farms. Managing natural landscapes on Australian cotton farms to improve natural capital and increase the provision of ecosystem services. Managing riparian corridors on cotton farms for multiple benefits.	Six long term biodiversity monitoring sites continued. Sites will be used as case studies for biodiversity communication. One native plant identification and propagation workshop and three native fauna identification, management and monitoring field days targeting 100 participants.

*my*BMP	100% modules updated with CRDC research. 50% growers completed level 1.	100 new grower registrations (industry wide). Increase accredited farms from 280 to 380.	CottonInfo team in collaboration with Cotton Australia Regional Managers.	Encourage *my*BMP participation through all extension activities and CottonInfo website registrations. All modules reviewed in the 12 months to prioritise updates with Technical Leads. Continue to develop international recognition of the *my*BMP brand and sustainability. *my*BMP biosecurity webinar aimed at building the capacity of REOs and CA Regional Managers to enable them to work with growers on managing biosecurity risks.
Industry expansion	Economic partial analysis of energy, nutrition, irrigation and pest management completed. 90% of new growers actively supported in their first season.	90% of new growers supported.	Supporting cotton in Northern Australia.	Supporting new growers with resources, farm walks and peer-to-peer learning. Review of *my*BMP for northern Australia. Continue disease trial work to inform management in southern valleys. Coordinate activities with CSD E&D and Bayer Territory Business Managers RBMS.
Stewardship		85% growers and consultants use the IRMS when making spray decisions. All regions contribute to insect resistance monitoring. Stewardship of Bt technology is of high importance to 90% growers.	Insecticide resistance Technical Lead. Heli monitoring project. Insect resistance monitoring (SLW, Mirids Mites Aphids Thrips) (Bird, NSW DPI, Hopkinson, DAF Queensland). Improved management of SLW (Sequeria, DAF Queensland).	Promotion of stewardship in Bt and insecticides. REOs continued involvement in insect resistance monitoring programs. Communication of resistance issues as required.
Biosecurity	Participate in two industry training exercises. 30% farms with a documented biosecurity plan.	30% of growers having a current written biosecurity plan.	*my*BMP Biosecurity Module, Cotton Australia RMs.	Continue cross sectoral Plant Biosecurity Research Initiative to pilot a community of practice for biosecurity and extension with 40 participants. Biosecurity/*my*BMP Biosecurity Module workshops to develop farm biosecurity plans for 50 growers.

Fibre Quality		Quantify the impact of limited irrigation on fibre quality, results communicated to 80% growers. Assess the impact of nitrogen fertiliser rates on fibre quality and lint turn out.	CRDC project 'Managing cotton quality to maintain our premium status' and follow-up project.	Reporting on comparison of spindle vs stripper harvesting on semi irrigated cotton. Contributing key messages on N impact on fibre quality from analysis of CSIRO N trials. Establish the impact of harvesting and ginning on seed damage and the creation of SCF levels.
Spray drift		Spray drift awareness support for the Spray Drift Working Group. All CSD agencies distributing information associated with the workshop.	Understanding motivational factors of spray application. Inversion towers.	Work with spray drift working group. Distribution through CSD reseller network. Support the successful BRII projects to develop innovative options for eliminating spray drift. Support SOS (Stop Off-Target Spraying) Group activities.
Energy and Business	Improve environmental footprint 325 kg CO^2e per bale. Economic partial analysis of energy, nutrition, irrigation and pest management completed.	To lower energy costs in the cotton system and simultaneously lower emissions per bale to 360 kg CO^2e. One partial budget to support extension delivery.	Understanding environmental impacts with changing demand for cotton. Climate and energy for cotton farm businesses.	Work with the cross-RDC Climate Initiative Baselines and Beyond project. A technical area will be selected to develop partial budgets.

3.7 General Targets

In addition to the specific targets outlined above, there are a number of general targets in the CottonInfo Strategic Plan that need to be addressed in the 2021-22 AOP, as follows:

TARGET: 10 NEW PROJECTS WITH ADOPTION PATHWAYS THAT INCLUDE COTTONINFO ANNUALLY.

2021-22 Activity: The target projects for adoption pathway development will be finalised when contracting timing is completed with CRDC. While CottonInfo has a process in place for developing adoption pathways for individual projects, we are looking at transitioning to program level adoption pathways to better align with CRDC research management.

TARGET: 200 EXTENSION ACTIVITIES DELIVERED. 85% OF PARTICIPANTS REPORT AN INTENTION TO CHANGE.

2021-22 Activity: Under this AOP, the CottonInfo team will aim to deliver over 50 extension activities impacting more than 1000 participants.

TARGET: 85% GROWERS WITH DEVICES LINKED TO THE OFFICE.

2021-22 Activity: CottonInfo will work with digital agriculture providers and products, such as CSD's CottonTracka, and continue to build team capacity in using digital tools to support individual grower on-farm trials. Digital tools provide a significant opportunity for growers and consultants to test management options, providing new opportunities for extension to support informed practice change.

3.8 Team Skills Development

In 2019-20, the CSD extension team instigated a program of technical training for all extension staff, including the CottonInfo REOs. This year, the CottonInfo team will build on this platform through monthly team meetings alternating with the existing team teleconferences.

The objectives of these online meetings will be:

A significant opportunity to increase the impact of extension is to better utilise digital technology to enable action learning on-farm. The ability to use sensors to automatically collect data and improved data analysis options are opening the door for growers and consultants to run on farm trials with less time and effort. CottonInfo has started to process of engaging with digital agriculture providers (such as PCT, Goanna Ag and John Deere) to work with them to build out teams capacity to exploit this technology.

BUILD ON THE PROGRAM

Cotton crop production training from CSD to look at a technical update each month. This will serve as a mechanism for providing an informal interaction between researchers in this technical area to cover the progress of research as well. It is planned that the meetings will include up to an hour of presentation and discussion on the scheduled technical topic.

AUSTRALASIA-PACIFIC EXTENSION NETWORK (APEN) MENTORING SCHEME

Four REOs have taken the opportunity to participate in the Australasia-Pacific Extension Network (APEN) mentoring scheme in 2020.

EXTENSION SKILLS AND KNOWLEDGE REVIEW

An overview of a particular extension topic will be covered, where possible relating to upcoming activities in the AOP. There is also the possibility of utilising recordings of APEN webinars on extension capacity building.

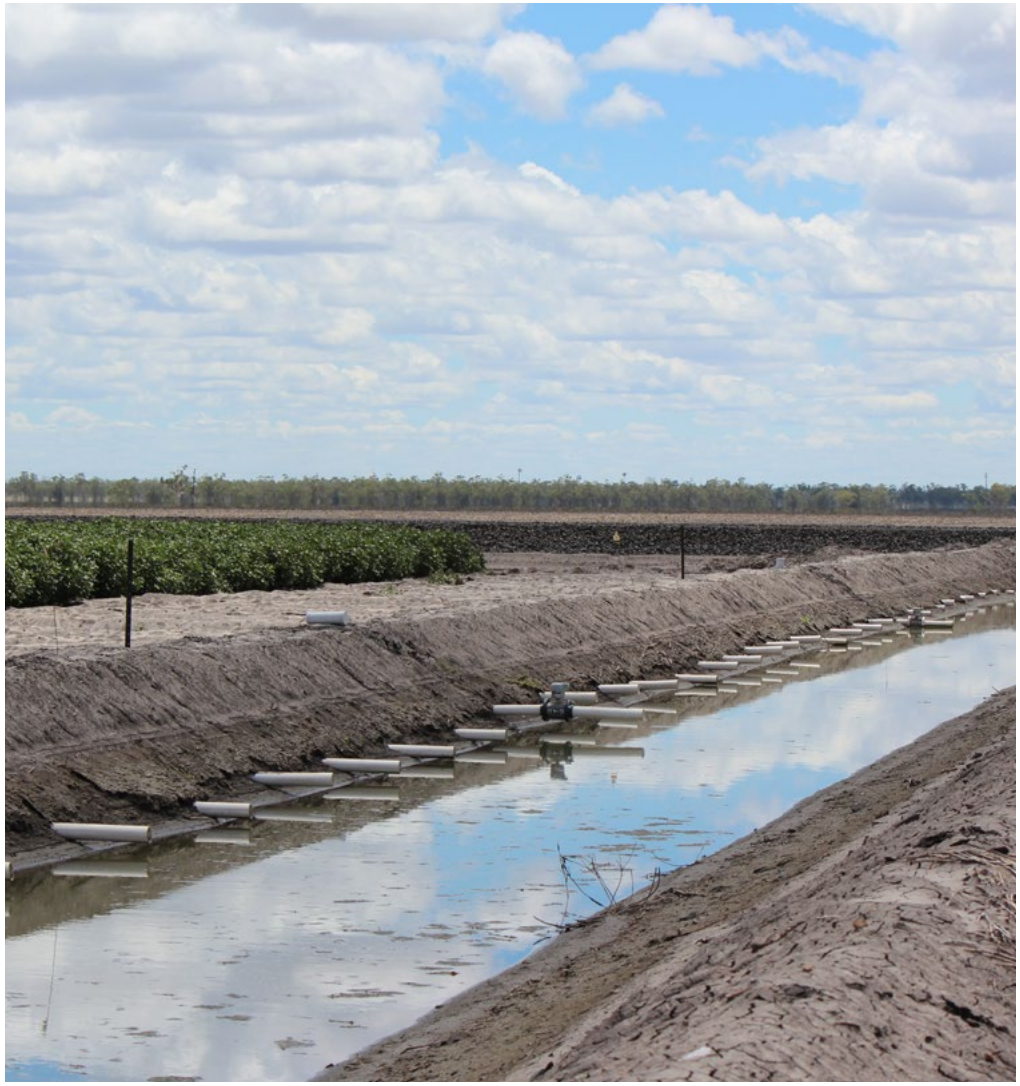
TEAM DISCUSSION

Team discussion on planning and delivery of the AOP, as is covered in the normal team teleconferences.

3.9 Evaluation

CottonInfo's impact is measured through monitoring and evaluation (M&E), guided by the CRDC M&E Strategy. The purpose of the strategy is to demonstrate the extent to which CottonInfo has contributed towards the specified targets within the CottonInfo Strategic Plan. It also helps guide future strategic priorities, activities and provides timely feedback to understand barriers and any unintended consequences of extension adoption.

It is a continuing challenge to measure and report on the impact of extension activities. Strategies include asking for feedback on intention to change at the time of the activity, following up with growers at a later date to record actual changes and utilising industry surveys to follow general trends in practice. We are working with the CRDC M&E Manager to improve the mechanisms of monitoring and reporting evaluation. This includes set templates for data gathering and use of PowerBI for reporting.



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