FINAL REPORT

CRDC ID: DAQ1901
Project Title: Communicating cotton best production practices with video
Confidential or for public release? For Public Release

Part 1 – Contact Details & Submission Checklist

Principal Researcher: Mrs Tonia Grundy, Development Extension Officer (multimedia)
Organisation: Queensland Department of Agriculture and Fisheries
Ph: (07) 4529 4108
E-mail: tonia.grundy@daf.qld.gov.au

Supervisor: Dr Paul Grundy, Principal Research Scientist
Organisation: Queensland Department of Agriculture and Fisheries
Ph: 0427 929 172
E-mail: paul.grundy@daf.qld.gov.au

Researcher 2: Ms Sharna Holman, Development Extension Officer (cotton)
Organisation: Queensland Department of Agriculture and Fisheries
Ph: 0477 394 116
E-mail: sharna.holman@daf.qld.gov.au

Submission checklist.
Please ensure all documentation has been completed and included with this final report:

☐ Final report template (this document)
☐ Final Technical Report (see Part 3)
☐ Final Schedule 2: IP register
☐ Final financial report
☐ PDF of all journal articles (for CRDC's records)

Signature of Research Provider Representative: VJ Radunz

Date submitted: 16/09/2021

Part 2 - Monitoring & Evaluation

Achievement against milestones in the Full Research Proposal

Milestone	Status	Explanation
Annual list of documentary topics planned in conjunction with CottonInfo	Achieved	Topic list reviewed regularly and updated with input from CottonInfo & CRDC. Videos planned based on list and incoming opportunities.
Script, film, edit & host cotton documentaries	Achieved	60 documentaries and additional multimedia material completed
Interim reporting	Achieved	Progress reports provided 6-monthly
Final report	Achieved	Attached
Additional output: coordinate annual update of *Cotton Pest Management Guide*	Achieved	21-22 edition revised and delivered to printer within required timeframes

Outputs produced

Output	Description
Documentary videos	Videos (60) that fall within the original intent of the project proposal added to the CottonInfo YouTube channel.
Supplementary videos	Additional video material (6) to provide support for other extension efforts (such as twitter campaigns) or other areas of industry interest.
Podcasts	Longer audio-only interview-style podcast files (2). Hosted on CottonInfo website.
Multimedia assistance	Provided assistance with branding/formatting/uploading etc of other cotton industry relevant video material, including field day presentations and seminar recordings produced externally to this project.
Cotton Pest Management Guide updated	Review coordinated, including structural analysis and plain English editing. Publication ready for distribution with Spotlight spring issue.

Outcomes from project outputs

Outcome	Description
Collaboration between presenters and project team	37 presenters from diverse backgrounds and disciplines were involved in the multimedia products created in this project
Improved industry knowledge and awareness	Australian views of channel content average over 30 per day (total channel views average over 1600 per day). CPMG distributed to 3300 subscribers.
Improved range of topics where multimedia extension tools are available	The outputs from this project value add to other extension efforts, including newsletters, manuals and guides and myBMP, and help elevate the profile of CottonInfo as an authoritative source for cotton-related information.
Improved communication options while travel options are limited	Movement restrictions during COVID-19 have had a major impact on face-to-face events. The project has provided support to initiatives such as the 2020 cotton collective and LoRaWAN farm demonstration to ensure their content is easily available.

Part 3 – Technical Report

Contents

Executive summary

The CottonInfo YouTube channel (youtube.com/CottonInfoAust) was created in August 2013 to allow the repository of short informative videos on a wide range of cotton-related topics and add value to existing extension material by presenting information in an entertaining multimedia format that has become increasing popular in a digital world.

The videos capture and present specialist knowledge in a practical and visual way, with a focus on documentaries that have a significant shelf life. Following projects DAQ1302 and DAQ1702, the additional videos generated by this project inform new and established growers and consultants, and serve as an important resource for students and interested members of the public, potentially achieving better engagement with the broader community by presenting factual information about industry practices.

Between 1 July 2018 and 30 June 2021, this project produced 66 videos and 2 podcasts, and has provided assistance to and/or managed the uploading of 50 others, including 6 webinar recordings. Within the same period, the CottonInfo channel received nearly 1.8 million views, with a total estimated watch time of 30, 590 hours (almost 3.5 years).

As at 30 June 2021, the CottonInfo channel contained 285 videos, and had attained over 8500 subscribers and more than 2.5 million views, with an estimated watch time of almost

5 years. The Australian audience ranked third in terms of total watch time and audience retention, and sixth by views. Having a well-educated industry that is adopting best practices is an essential part of ensuring the cotton industry's continued success. The project has assisted the extension of practices that improve productivity, farm profitability, and contribute to environmental stewardship.

Introduction

With the increasing use of mobile devices, extension has shifted from being predominantly hard copy publications and face-to-face presentations to an eclectic mix of traditional and multimedia. Online content is now a major resource for many in the agricultural community, with downloadable publications, interactive apps, and multimedia platforms increasingly being utilised by government and businesses to extend detailed messages to clients.

The CottonInfo YouTube channel (youtube.com/CottonInfoAust) was created in August 2013 to allow the repository of short informative videos on a wide range of cotton-related topics. YouTube was chosen as the most suitable platform, primarily for its overall public popularity and familiarity within the industry and the general public, but also the high level of back-end analytics available at that time. These videos feature industry members and include how-to examples, topic overviews, research outcomes, case studies and key messages; the channel format allows conventional extension material to be easily supplemented with multimedia content by embedding or linking to the videos within newsletters, websites or social media.

Videos add value to the Australian cotton industry's already considerable investment in information products such as the *Australian Cotton Production Manual*, *Cotton Pest Management Guide,* infoPAKS and factsheets, by utilising vision and audio to communicate and extend ideas and concepts in an informative and entertaining way.

The cotton industry's joint extension program, CottonInfo, is designed to service the commercially unmet cotton research and development information needs of growers and to support industry efforts to improve practices, productivity, competitiveness and environmental performance. The videos produced in this project are predominantly CottonInfo-branded, supporting the CottonInfo strategic goal of making R&D information, trusted advice and specialist technical knowledge readily available through a variety of different communication channels.

The primary objective of the project was to build on the repository of easily accessible short multimedia (video) files created in DAQ1302 and DAQ1702 that communicate scientifically-based crop production, crop protection and best practice principles to a diverse audience.

Materials and methods

Identifying suitable topics

Potential video topics were identified and prioritised by considering a range of factors, including the CottonInfo communications calendar, industry 'hot topics', information gaps in the CottonInfo video collection, the suitability of the content for visual presentation, presenter availability, and availability of or ability to acquire additional visual material (cover footage or other graphical elements). Priority was given to hands-on 'how-to' topics.

Filming selections were influenced by the most appropriate time of year to obtain footage, emerging industry issues, and efficient travel arrangements by the camera operator (filming often occurred in conjunction with an industry event, such as a field day or meeting, or travel was planned to obtain footage from multiple presenters). The original topic ideas list was updated over the life of the project, and was reviewed and used as a guide when developing an outline for each season's filming. The project team included two CottonInfo Technical Leads, allowing ease of networking, ideas transfer, footage acquisition and identification of potential topics/presenters.

The list of project topics remained flexible, with adjustments made as industry members suggested topics or volunteered as presenters. Supplementary or new material was often filmed opportunistically or at quick notice. Some topic areas (e.g. pest management or weather-related issues) are not present every season, and topics not included the season's plan were filmed if a presenter or opportunity became available.

Video and audio acquisition

The majority of filming was arranged around other fieldwork and travel to maximise efficiency and minimise costs. Potential presenters were contacted, and time allocated for filming. Often multiple presenters were filmed in a single day.

Video equipment used included Panasonic camcorders (shoulder-mount and hand-held), various tripods and hand-held gimbals, Sennheiser lavalier microphones, Brinno time lapse cameras, Dinolite pro digital microscopes, and DJI Phantom or Mavic RPA models with integrated camera units.

The majority of video footage and cover material was generated by the project team. Video and photos taken by others have been acknowledged in individual video credits, either within the video (e.g. as text on single photographs) or on the closing credits screen.

Sound quality was enhanced with the use of a lapel microphone to provide even audio levels and minimise background noise, particularly wind. The background music used for the majority of the videos was adapted from a track provided with Sony Movie Studio software. Occasionally other music was utilised—either commons licencing with attribution or purchased royalty-free material.

All raw shots with potentially usable footage or audio have been indexed in a database with searchable metadata, to allow utilisation in future videos, either as cover footage, in combination with other presenters, or with journalistic-style narrative voiceovers.

Obtaining cover footage in the field.

Cataloguing acquired footage

To support future video editing, original footage was catalogued with a range of relevant metadata, including file references, descriptions and/or audio transcripts, dates, locations, presenters, camera operators, keywords, and other useful notations, to improve ease of finding relevant cover footage for future productions, and ensure appropriate acknowledgement of sources. About 1250 original video camera shots (>20 hours of footage) taken by the project team were catalogued between July 2018 and June 2021.

Since July 2018, 60 how-tos or production concept videos have been generated (primarily filmed and produced) by the project team and uploaded to the public component of CottonInfo's YouTube channel (youtube.com/CottonInfoAust). A further 6 videos and 2 podcasts not covered by milestone definitions were created by the project team (see 'List of outputs' for titles).

As well as focusing on the primary objective of best practice documentaries on specific industry topics, the project team has provided valuable support to other cotton industry members, from editing and production assistance to branding, transcribing and uploading videos and webinar recordings created externally to the project but approved by CRDC to the CottonInfo YouTube channel. A total of 50 externally sourced items were uploaded.

Video styles and editing

Videos were produced using a range of styles, including presenter-centric 'talking head' general topic discussions, product or equipment demonstrations, and fully scripted productions. The talking head format was considered to be more authentic than a journalistic interview style and reduced overall video length. Shorter videos tend to have higher retention rates, so most videos were edited to a final length of less than 3 minutes.

This project's outputs have also included five fully scripted video parodies (the SOS series), on pesticide application technique, in cooperation with a NSW Stop Off-Target Spraying group (sos-nsw.com). These required additional preparation time for concept development, script writing/editing, and costume and props acquisition.

The majority of video editing has been done with Vegas Movie Studio software. Adobe Premiere, Adobe Media Encoder, and GoPro Studio have also been utilised for specific scenes, re-coding files to ensure compatibility, or fish-eye lens removal. Manipulation of graphics and generation of diagrams has been primarily done using Adobe Photoshop and Adobe Illustrator, and audio edits have used Vegas Movie Studio and Adobe Audition.

Raw footage was trimmed and re-ordered to provide smooth spoken audio narrative, and visual layers added to enhance or reinforce the audio and/or patch where the presenter had been edited mid-sentence. Any additional cover footage requirements identified were sourced from the presenter (photographs, graphs, diagrams etc), or generated within the project to avoid issues with copyright. Overlay text was added where additional emphasis or clarity was required, and music and branding applied.

Approvals and uploading

Videos at advanced draft stage were provided to the presenter for comment to ensure they included all key points and that the presenter was not taken out of context. Presenters were asked to complete a multimedia consent form at this point. Video drafts were then sent to both a technical specialist within CottonInfo and CRDC communications for content checking and any additional comments or suggestions.

After presenter, technical and communications approvals, the edited videos were rendered to high definition (up to 1920x1080), rechecked for visual/audio consistency and correct acknowledgements and spelling, and the audio manually transcribed.

The final files were uploaded to the CottonInfo YouTube channel, where metadata (title, description, keywords and thumbnail identifier) was added. The transcript file was uploaded and manually matched to the video to create closed captions (YouTube's auto-generated captions can be inaccurate and unintentionally amusing). Files generated externally to the project were not manually captioned unless a transcript was provided with the video file.

Once uploaded and captioned, project-generated videos were made visible to the public on the CottonInfo YouTube channel and added to a topic playlist if appropriate. Additional content uploaded, but left unlisted (accessible by url, but not included amongst the channel's upload list page) included multiple individual presentations from field days or videos created for specific promotional purposes. Related sets of unlisted uploads from field days etc are grouped together via a public playlist and displayed via the playlist on the CottonInfo channel home page.

Uploaded video content is available to be utilised (by embedding or linking to the urls) by the CottonInfo or other websites, industry newsletters, or social media feeds.

Periodically, the channel content was reviewed, and content that was no longer current (such as superseded seasonal webinars) removed from public view. The channel home page layout was also adjusted as more videos were added and more topic playlists were created.

Video evaluation and reporting

The analytics provided by the YouTube platform have allowed an in-depth exploration of viewing numbers, watch times, and audience demographics and engagement. Interim counts have been provided in project progress reports, and additional statistics on specific videos have been provided on request to presenters.

Feedback from presenters and members of the CottonInfo team has been integrated into the video topics list, video content, and visual expression. Overall, YouTube audience viewing and retention figures were higher for specific topic documentary videos than field day promotional material, so the project team maintained its focus on the production of production concepts and 'how-to' videos, while providing general support to other industry members for promotional material uploads as required.

A segment on CottonInfo video viewing was included in CRDC's 2021 Cotton Grower Survey, with the aim of determining audience reach and viewing motivation (detailed in the box below). The survey was completed by 233 participants.

CottonInfo regularly produces videos to share information and updates with growers.

Q1. **Over the last 2 years have you watched any of the Cottoninfo videos?**

a. Yes
b. No
c. Wasn't aware of the videos

Q2. (ONLY IF ANSWERED 'YES' TO PREVIOUS QUESTION)
What are the reasons you watch Cottoninfo videos? *Please select all that apply.*

a. Clicked a link in an industry newsletter or tweet
b. Hoped to gain better understanding on a particular topic
c. To learn how to do something specific
d. Looking for induction or training content for workers
e. General browsing for interesting content
f. Video was recommended by friend/agronomist
g. Other (please describe)

Cotton Pest Management Guide review (2021)

In a process beginning in January 2021, the Cotton Pest Management Guide content was examined, and an adjustment to structure proposed. Topic areas were distributed to relevant authors/stakeholders and suggested edits collated in documents sent for desktopping. Where a specific content author could not be identified, the project team did the primary editing. This project liaised with chapter and section authors regarding content queries and additional images, and with the desk-topper and contracted proof-reader regarding content, layout and design.

Results and discussion

Industry support for all video projects has been excellent; this project period featured 37 presenters from government, industry and growers. Many others have also provided feedback comments and other input.

Between July 2018 and June 2021, this project had produced and uploaded an additional 66 videos to the CottonInfo YouTube channel and provided two podcasts for hosting on the CottonInfo website. The project team had also assisted in the production or uploading of videos for other groups or individuals, with services including editing, branding or closed captions. A full list of videos for this period is available in Table 4 of this report.

While the videos on the CottonInfo channel have been produced with a focus on informing the cotton industry, some have full or part relevance within other agricultural industries (for example the Biosecurity 'Top Tips' series).

Viewer metrics

The following information on channel views has been extracted from YouTube's internal analytics software, and includes metrics and analysis of both the project period (1 July 2018 to 30 June 2021) and the lifetime of the channel.

Views and watch time

As at 30 June 2021, the channel had received a total of 2,554,432 views, with a total estimated watch time of 43,417.6 hours (equivalent to almost 5 years' worth of viewing). The peaks indicated in Figure 1a are primarily due to a single video *Irrigating with siphons* that demonstrates starting a siphon, which accounts for 88.6% of the total channel views.

Australian views (Figure 1b) were more evenly distributed over time (the siphon video accounted for 7.2% of views), with peaks usually corresponding to specific promotion of video content through industry newsletters, field days, or social media.

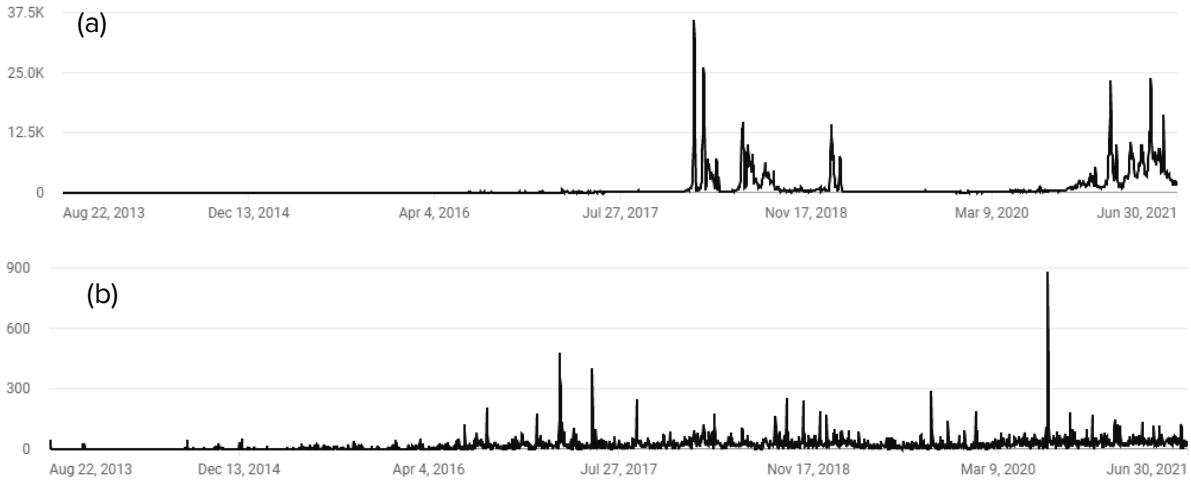

Figure 1. Daily views over the life of the channel: a) total views and b) Australian views.

During the current project period (July 2018 – June 2021), the channel received almost 1.8 million views for an estimated 3.5 years of view time. Australian views during this period were 35,506 (an average of 32.4 per day).

Average daily views vary considerably – and viewing spikes are of sufficient amplitude that they can dramatically influence averages, even when examined over longer periods (Table 1).

Table 1. Average daily views each quarter (Australian views in brackets).

Year	Jan-Mar (90-91 days)		Apr-Jun (91 days)		July-Sep (92 days)		Oct-Dec (92 days)	
2014	0.8		0.4		5.4	(1.1)	7.6	(2.4)
2015	7.6	(0.6)	15.3	(2.9)	25.2	(3.2)	18.8	(2.4)
2016	28.4	(5.4)	42.8	(8.0)	77.5	(24.4)	73.3	(16.8)
2017	123.8	(43.0)	141.4	(30.8)	232.2	(22.6)	224.0	(23.3)
2018	4782.8	(44.0)	2592.0	(28.0)	2097.0	(34.6)	530.3	(34.1)
2019	1822.3	(35.0)	201.7	(19.9)	268.2	(19.7)	177.4	(18.4)
2020	168.4	(24.1)	336.0	(31.8)	525.5	(53.1)	1841.4	(38.6)
2021	5625.2	(39.0)	6140.8	(40.5)				

Australian views and watch time over the three years of this project are shown in Figure 2. Because the majority of videos are short, the viewing patterns for views and watch time are usually quite similar. Spikes in viewing numbers can often be correlated with specific communication efforts. The largest single spike in views over this period was due to a multi-video series developed and promoted by CottonInfo REO Andrew McKay in July 2020 for a LoRaWAN field day. Spikes in watch time that do not correlate to a spike in views are usually webinar-related (Figure 2).

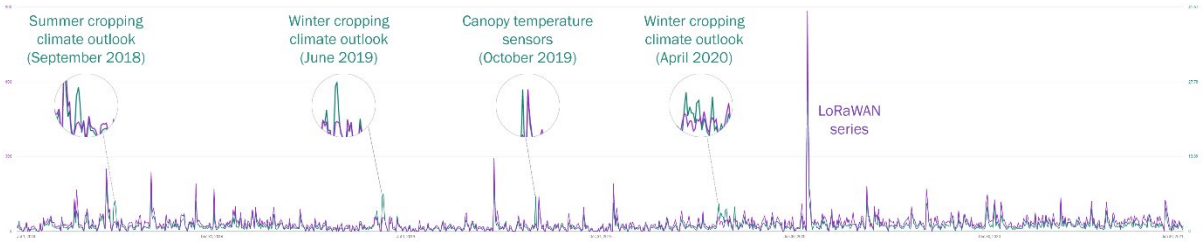

Figure 2. Daily Australian views (purple) vs hours watched (green) over the current project.

Videos popular with Australian audiences have generally been quite different to those that have attracted international interest, apart from *Irrigating with siphons*, which remains the most popular video both within Australia and overall. Individual video popularity can also change quite markedly over time, as only 5 of the most popular 50 videos with Australian audiences during the last three years are in the channel's Australian top ten (Table 2).

Table 2. The 50 most popular videos with Australian viewers during the project period, and their overall relative ranking (if in the top 50 since the channel began).

	Uploaded	Overall ranking	
		Australia	Total
*Irrigating with siphons	07/2014	1	1
*Early morning inversion: what happens to fine spray droplets	02/2017	2	7
*Daytime conditions (for spraying): A demonstration of air movement after an inversion breaks	04/2017	4	25
Integrating alternative energy solutions into irrigation farms	07/2018	11	
More Profit from Nitrogen: enhancing the NUE of intensive cropping and pasture systems	01/2019	12	
LoRaWAN – what it is and how is it used?	07/2020	14	
*Nozzle comparisons: spray quality and drift potential	09/2019	18	
Introduction to LoRaWAN Demonstration Farm video series	07/2020	19	
*Mixing glyphosate and 2,4-D: 2. Handling concentrates	09/2018	20	5
*Mixing glyphosate and 2,4-D: 1. Avoid incompatible formulations	09/2018	21	9
*Understanding agrochemical labels	03/2018	8	
CottonInfo webinar: 2020 winter cropping climate outlook	04/2020	24	
*Tank mix compatibility: Using crystalline ammonium sulphate with 2,4-D	09/2018	26	39
*Important considerations when making planting decisions	05/2016	5	42
Components of a LoRaWAN system	07/2020	31	
CottonInfo webinar: 2019 CottonInfo winter cropping climate outlook	05/2019	34	
LoRaWAN device components and examples	07/2020	36	
Storing Fuel Safely	08/2016	37	
*Sampling for soil insects	06/2020	38	
*Assessing the maturity of a cotton crop	07/2014	25	40
*Biosecurity top tips: Signage at the farm gate reminds visitors to take care	09/2018	39	
*Biosecurity top tips: Washdown areas are not just for visitors	10/2018	40	
Demonstration Farm – grower history	07/2020	41	
CottonInfo webinar: IrriSAT use and applications for irrigation management in cotton	09/2017	43	
*Distinguishing between vegetative and fruiting branches in young crops	12/2018	46	49
*Seed placement	05/2016	13	35
Timing your last irrigation*	08/2017	42	
*Yield prediction using remote images	05/2020	47	
*How to decontaminate a spray-rig	07/2018	48	
Introduction to IoT in Agriculture	07/2020	49	24
The Dashboard – viewing data from LoRaWAN devices	07/2020		
*Biosecurity top tips: Visitor registers help you keep track	10/2018		
Power requirements and LoRaWAN device and gateway options	07/2020		
*What does fall armyworm look like?	03/2020		
LoRaWAN data – behind the scenes	07/2020		
CottonInfo webinar: Summer crop climate outlook (September 2018)	09/2018		
Demonstration Farm – LoRaWAN devices used	07/2020		
*Making the decision to defoliate	09/2015	30	
Goanna Ag – LoRaWAN devices	07/2020		
Understanding weather and climate models: differences, tips and tricks	05/2019		
Demonstration Farm – LoRaWAN benefits	07/2020		
LoRaWAN considerations and DIY challenges	07/2020		
*'Soft' options for mirids	08/2019		
*Planting tips for cotton	07/2014	16	2
*Cotton growth stages: cut-out	08/2015		8
Demonstration Farm – The LoRaWAN dashboard for DIY devices	07/2020		
*Looking at soil constraints	10/2020		
Goanna Ag - history	07/2020		
Goanna Ag – options and why they chose LoRaWAN	07/2020		
*Planter components	01/2016	27	31

* Produced by video project team; LoRaWAN farm demonstration series produced by Andrew McKay in italics

Audience retention

Average percentage viewed across all videos from 1 July 2018 to 30 June 2021 was 56.1% worldwide and 45.9% for Australia. Australians opened more webinars than audiences worldwide, resulting in both lower retention figures and almost twice the average view duration (e.g. watching 10% of a 60 minute webinar results in twice as many minutes viewed as 100% of a 3 minute video) (Figure 3).

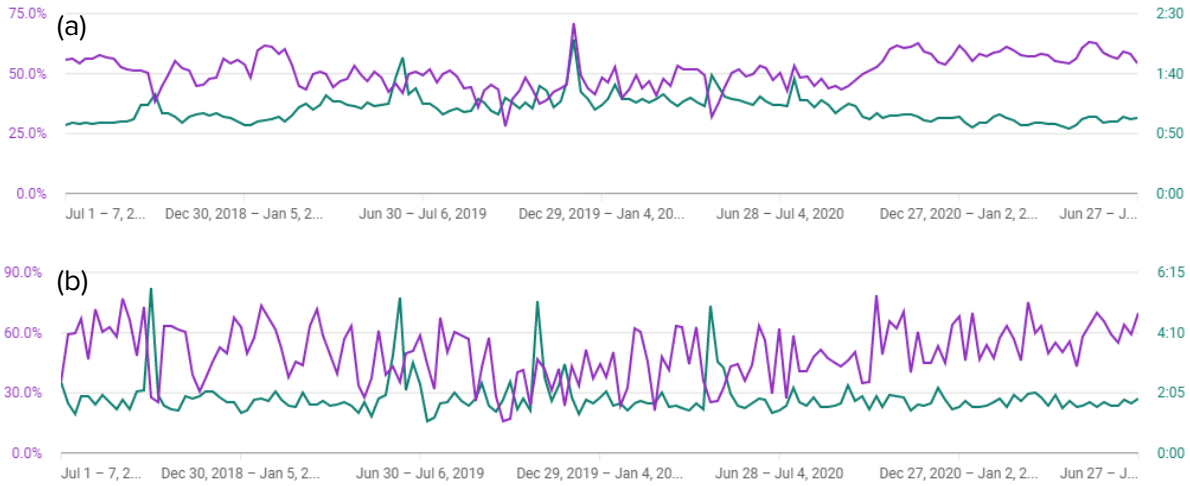

Figure 3. Audience retention (rolling 7 day average) for both view duration (green) and percentage viewed (purple): (a) channel overall, and (b) Australian viewers during the current project.

The average percentage viewed obviously varies widely between videos, however a clear trend of declining percentage viewed with increasing video length is clear (Figure 4). *Note: individual video watch time can exceed 100% if viewers re-watch some or all of the material in a single viewing session.*

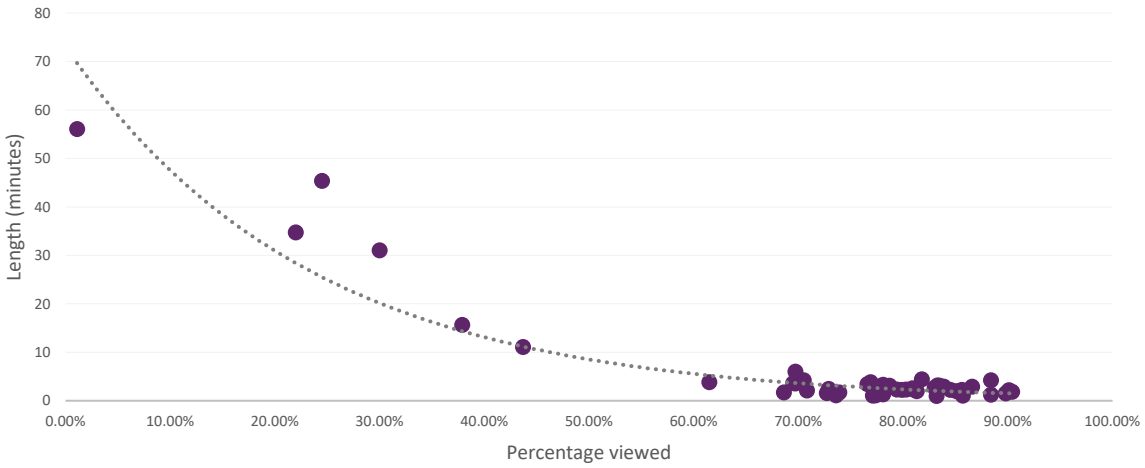

Figure 4. Average audience retention (percentage viewed) of the top 50 videos by Australian views during the project period plotted against video length.

Audience engagement

Between July 2018 and June 2021, the channel gained 6809 and lost 804 subscribers. Additional subscriptions were strongly correlated with periods of heavy viewing (Figure 5).

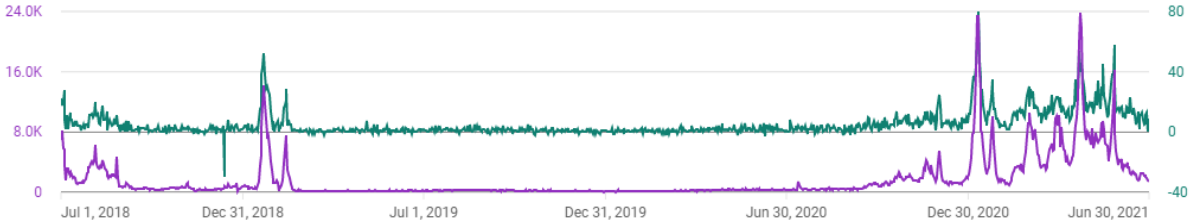

Figure 5. Chanel subscriptions (green) and daily views (purple) from July 2018 to June 2021.

During the project period, there were 21,358,279 impressions (video thumbnails shown to viewers), with a click-through rate of 6.6%, 4463 videos were shared, and the channel received 10,699 likes and 768 dislikes (a ratio of 93.3%). *Note: only YouTube subscribers can like or dislike videos*.

Playlists assisted audience engagement, with at total of 6591 views, and provided the opportunity to group and promote related videos together (Figure 6).

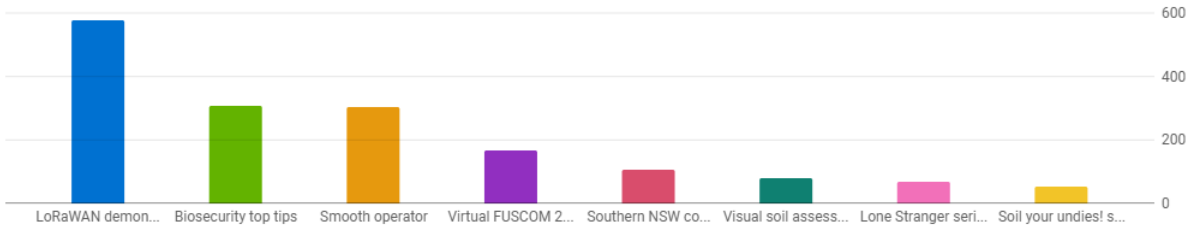

Figure 6. Playlist starts from July 2018 to June 2021 of videos promoted as a series.

Mobile phones remain the viewing device of choice overall, however nearly half of Australian viewers are using a computer to watch content (Figure 7).

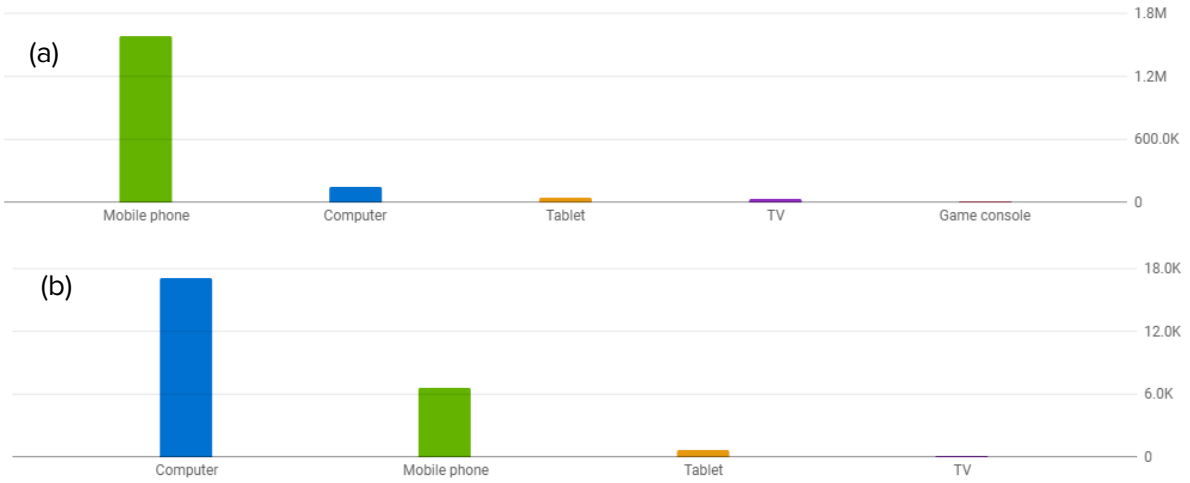

Figure 7. Display devices July 2018June 2021: a) overall and b) Australian audience.

Audience demographics

CottonInfo videos have been watched around the world. A combination of higher populations and smaller farm sizes in countries such as India has contributed to the relatively high proportion of overseas views compared with Australia. Watch time by country generally followed the same pattern (Table 3), although Australia ranked higher in both watch time and average view duration.

Table 3. Countries with more than 15,000 views overall.

Country	Views		Watch time (hours)	
India	1,208,826	47.3%	18,484.8	42.6%
United States	118,391	4.6%	2,577.9	5.9%
Pakistan	89,753	3.5%	1,506.2	3.5%
Saudi Arabia	68,570	2.7%	1,162.1	2.7%
Turkey	62,715	2.5%	1,020.1	2.4%
Australia	**59,258**	**2.3%**	**1,970.6**	**4.5%**
Indonesia	46,508	1.8%	766.9	1.8%
Russia	45,464	1.8%	797.0	1.8%
Egypt	41,363	1.6%	708.2	1.6%
Iraq	40,583	1.6%	645.3	1.5%
Vietnam	37,400	1.5%	618.1	1.4%
Thailand	33,382	1.3%	554.3	1.3%
Uzbekistan	29,911	1.2%	553.6	1.3%
Morocco	23,966	0.9%	406.1	0.9%
United Arab Emirates	22,550	0.9%	362.6	0.8%
Bangladesh	21,922	0.9%	333.0	0.8%
Algeria	20,761	0.8%	363.3	0.8%
Mexico	20,152	0.8%	366.7	0.8%
Brazil	19,497	0.8%	314.5	0.7%
Cambodia	17,986	0.7%	306.1	0.7%
Italy	17,136	0.7%	280.9	0.7%
Kuwait	16,102	0.6%	280.9	0.7%
Malaysia	15,957	0.6%	279.5	0.6%

Between July 2018 and June 2021, two thirds of the international audience have been 18-34 year olds, while Australian viewers have had a more even spread in ages, with two distinct audiences in younger and middle-aged cohorts (Figure 8). Females comprised 25.3% of views in Australia, compared to 7.2% overall.

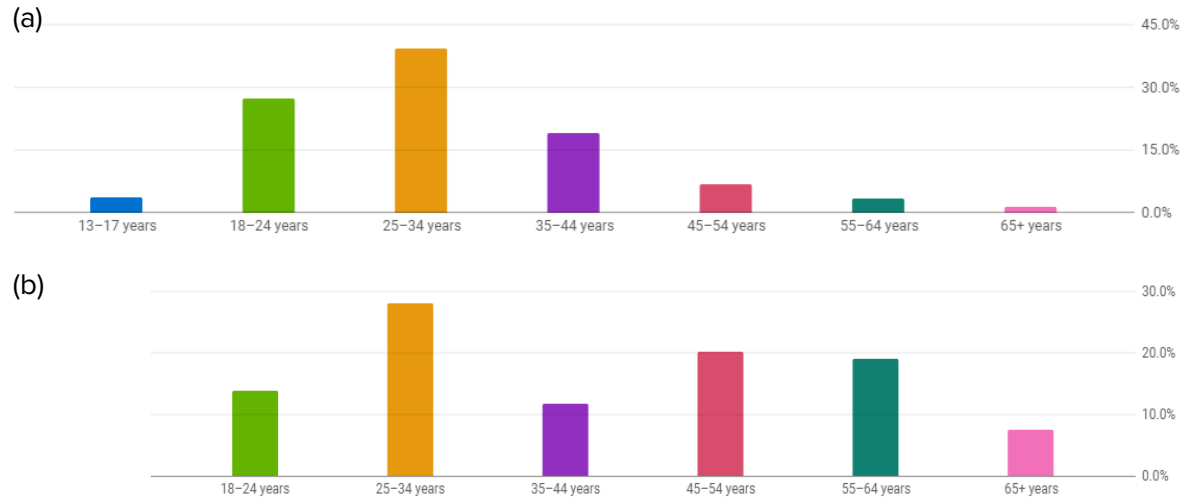

Figure 8. YouTube channel audience by age during the project: a) overall and b) Australian.

Accessibility

Videos are primarily being accessed via their individual watch pages (96.6%). Traffic was predominantly directed by a combination of browse, search and suggested videos within YouTube. External traffic accounted for 3.9% of views overall, but 12.1% within Australian audiences between July 2018 and June 2021. Playlists were an important method of reaching video content in Australia, but only accounted for 0.5% of traffic overall (Figure 9).

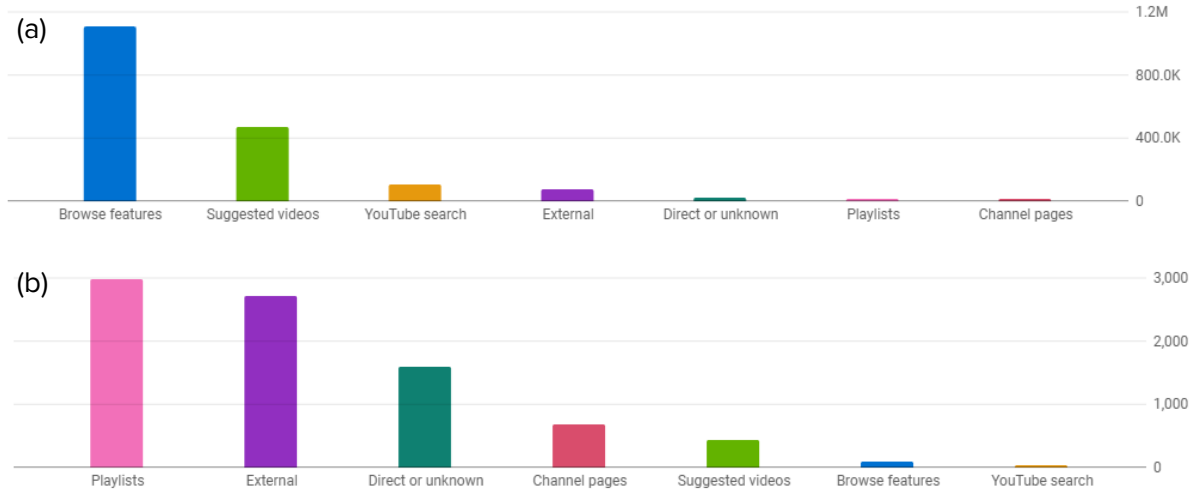

Figure 9. Sources of traffic: a) overall and b) for Australian audiences during the project.

Closed captions in English are manually generated and matched for all project-produced short documentaries. During this project period, 1.3% of Australians (5.7% overall) used these manually generated subtitles. The average view duration for Australian audiences was 8% longer where these manual subtitles were utilised. A small number (231) of international viewers used YouTube's translation option to view auto-generated subtitles in their own language.

Cotton Grower Survey 2021

Of the 2033 growers surveyed in this year's Cotton Grower Survey conducted by CRDC, 56% reported watching at least one CottonInfo video over the last two years. Small farms were more likely to report having watched videos (62% versus 54% and 48% for medium and large enterprises respectively), however larger farms had a higher response rate to each of the reasons for watching. General browsing topped the list of reasons (75%), followed closely by aiming to gain a better understanding on a particular topic (72%) (Figure 10).

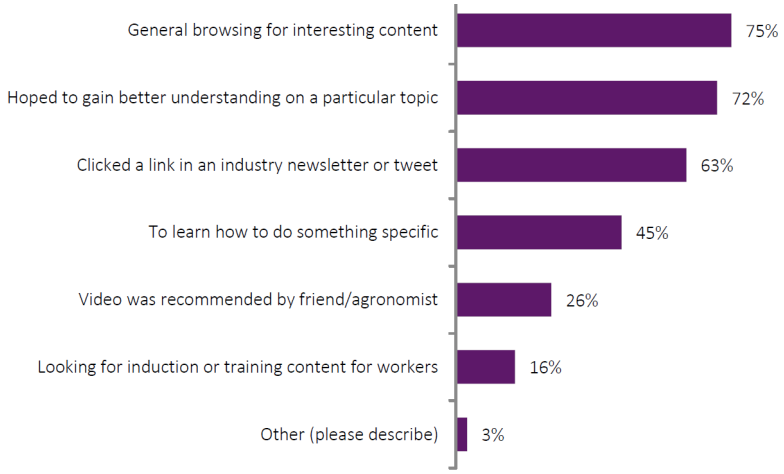

Figure 10. Reasons for watching CottonInfo videos (Source: Australian Cotton Grower Survey 2021).

Almost two in three respondents (overall and across all farm sizes) indicated they had watched videos after clicking on a link in a newsletter or tweet, rising to three in four in Southern Queensland (Darling Downs and Macintyre Balonne). Those in Southern NSW were most likely to watch videos recommended by a friend or agronomist, and the use of videos for training or induction content was most popular in Northern NSW and Macquarie regions.

Cotton Pest Management Guide 2021-22 edition

The Cotton Pest Management Guide received extensive structural and content editing for the 2021-22 edition. Sections within chapters were re-arranged where possible to ensure consistency, the index revised, and a glossary included. Comments relevant to northern production were added where appropriate and additional photos were sourced where space permitted, including a new page of natural enemy images. Links to relevant videos were added, and the potential integration of QR codes flagged for next year's edition.

Plain English and content consistency were the primary focal points when editing. Several sections, including the preambles to the IRMS and Bollgard RMP were tightened significantly, and tables were combined where possible if their content overlapped.

The review involved significant liaison, both with content authors and chapter coordinators to complete the content updates, and also with the contracted desk-topper and proof-reader.

The review was completed within agreed timelines. Hard copies of this edition are distributed with the spring issue of Spotlight, and the electronic version will be made available for download from the CottonInfo website.

Conclusions

Videos and other multimedia products provide an efficient and effective method of communicating key concepts and methodology that delivers information in a format that stimulates the audience's visual and auditory pathways. By recording the knowledge and experience of industry experts and making it easily accessible, they facilitate a direct conduit between the viewer and industry best practice.

This project has aided in the development and production of multimedia products that provide ongoing support to CottonInfo's extension activities by offering an opportunity for content experts to share their knowledge in a visually informative way. The video content has been carefully curated to both maximise currency and provide ongoing value well beyond their initial upload period.

The comprehensive review of the *Cotton Pest Management Guide* resulted in a structural reorganisation of content to improve consistency, and a plain English edit of some chapter sections. The result is a more concise edition with additional images that will provide improved information delivery.

Multimedia continues to be an important component of a comprehensive extension capability. It can be used to provide value to extension efforts by increasing reach and reinforcing traditional messaging. The ability of video to convey how-to concepts and maintain client contact during periods where face-to-face extension has been limited has made this communication medium a valuable addition to CottonInfo's suite of information products.

Key words

Extension, multimedia; video; audio; online; visual impact, accessibility

List of outputs

Table 4 lists the 66 project-generated videos that have been added to the CottonInfo channel since 1 July 2018 (six of these are 'additional' videos generated for specific purposes that have not been counted against the official milestone requirements).

Included in Table 4 are two podcasts (presented by Sharna Holman) that were made available to industry on the CottonInfo website:

- *Crop to Top* 1. Benchmarking water use efficiency
- *Crop to Top* 2. Workforce requirements of cotton industry

The project team also assisted with the upload (and editing where required) of videos produced by others:

- Integrating alternative energy solutions into irrigation farms (AgEcon)
- 3 videos for the More Profit from Nitrogen series (iCd Project Services)
- Understanding weather and climate models (Jon Welsh seminar)
- Collaboration and innovation provides big benefits for Australian irrigators (EvokeAg)
- Introduction to IOT in Agriculture (Paul Stewart) and 18 LoRaWAN videos (Andrew McKay)
- 5 presentation recordings for the CSD 2020 cotton management tour
- 9 presentation recordings for the Cotton research update (August 2020)
- 7 presentation recordings for FUSCOM 2020
- CottonInfo webinars:
    - Summer crop climate outlook (September 2018)
    - Winter cropping climate outlook (May 2019)
    - Yielding well with limited water (August 2019)
    - Canopy temperature sensors (October 2019)
    - Winter cropping climate outlook (April 2020)
    - Re-occurring wilt (September 2020)

Table 4. List of project-generated videos uploaded since 1 July 2018.

	Title	youtu.be/	Presenter	mins
1	How to decontaminate a spray-rig	-zDQwolEcB0	Jeremy Rennick	2:54
2	Biosecurity top tips: signage at the farm gate reminds visitors to take care	paA9I-4oR3s	Georgie Krieg	1:21
3	Biosecurity top tips: prevent disease transfer between fields	bXIEsY87CXo	Tim Shuey	0:58
4	Biosecurity top tips: disease surveys find out what is (and isn't) in your fields	fHWzrImgUy4	Linda Scheikowski	0:50
5	Tank mix compatibility: Using crystalline ammonium sulphate with 2,4-D	LS8espZcyu4	Malcolm Salisbury	1:49
6	Mixing glyphosate and 2,4-D: 1. Avoid incompatible formulations	OFmER9GHsRU	Malcolm Salisbury	3:07
7	Mixing glyphosate and 2,4-D: 2. Handling concentrates	7Eeuql8bPKU	Malcolm Salisbury	2:19
-	Lone Stranger: Farm hygiene tips from the 2018 Australian Cotton Conference	AUIAalvJsnk	various	1:46
8	Cut-out in cotton 1: Understanding what happens	umM8nrc4myc	Mike Bange	1:40
9	Cut-out in cotton 2: Getting the timing right	GOQShEPXILo	Mike Bange	2:29
10	What are stygofauna?	aboHvkBZ4V4	Kath Korbel/Stacey Vogel	2:51
11	Biosecurity top tips: Visitor registers help you keep track	ef3II9IBFL0	Damien Ebbern	1:03
12	Biosecurity top tips: Washdown areas are not just for visitors	gTzdSeB801o	Matt Toscan	1:10
13	Groundwater health index: 1. Sampling stygofauna	OkNcK-zIZ6Y	Kath Korbel	2:47
14	Groundwater health index: 2. Sampling water quality and microbes	yhdjtJyrsK8	Kath Korbel	3:28
15	Distinguishing between vegetative and fruiting branches in young crops	7PXIAuinmeY	Paul Grundy	2:14
16	Biosecurity top tips: Minimising mealybug movement	sMCg7ZL7vZs	Damien Erbacher	1:01
17	Collecting stem and leaf samples for disease testing	4mCk2883lO0	DAF pathology team	2:22
18	IPM in action: mealybug predators	k5-0XrzBEeg	Paul Grundy	1:39
19	Late season weeds	4gqLpEu5uTE	Eric Koetz	1:10
20	Bee aware: are there bees in or near your cotton crop?	LBRUaqZaVoQ	Sharna Holman	1:50
-	Logs provide excellent fauna habitats in natural on-farm areas	fmjTt15Ohm4	V: Tonia Grundy	1:11

	Title	youtu.be/	Presenter	mins
21	Herbicide research trials 2018-19	bML3ytTU2MQ	Eric Koetz	1:09
22	What is IPM? Things to consider when making pest management decisions.	BdQRLx4hN5o	Paul Grundy	2:32
23	'Soft' options for mirids	zmz70fX4v5U	Paul Grundy	2:16
24	Benefits of cover cropping	gm7KoanLTOA	Andrew Erbacher	1:45
25	Cut-out in cotton 3: Physiological indicators	kF4JdNRsFG8	Mike Bange	1:32
26	Nozzle comparisons: spray quality and drift potential	Gw5tgH3P38I	Jeremy Rennick	3:08
-	Improving connectivity of habitat corridors & patches –an overview	KifPZv2ny5c	Stacey Vogel	2:27
-	Improving connectivity of habitat corridors & patches –a grower's perspective	sJP07AN4gYY	Scott McCalman	2:07
27	Going bankless - a grower perspective	JRRC04aXDis	Tom Cush	3:28
28	Making the most of limited water	geivoDHvG5E	Warren Conaty	1:42
29	Integrating WHS on-farm	fOGdX4ILLfk	Jess Crawford	2:17
30	Impact of adjuvants on drift	RqkGxTtKt5E	Malcolm Salisbury	2:04
31	Canopy temperature sensors as an irrigation tool	i2fPMCVG9dU	Hiz Jamali	1:28
32	Installing canopy temperature sensors	pg1SxzOubHk	Hiz Jamali	1:46
-	PODCAST: *Crop to Top* 1. Benchmarking water use efficiency		Sharna Holman	15:17
-	PODCAST: *Crop to Top* 2. Workforce requirements of cotton industry		Sharna Holman	20:09
33	Counting establishment	nO27dD-mff8	Larissa Holland	1:15
-	What does fall armyworm look like?	RWdN_6Xtzvc	-	1:06
-	Helicoverpa eating weeds after recent rain	KlaYXmgVxyI	-	1:06
34	Tips on planting nature corridors	WFJA_IJdo-8	Scott McCalman	2:56
35	Hand-held NIR for nutritional analysis	OUuI0PjRH24	Tim Weaver	2:19
36	Yield prediction using remote images	y7ns4AccRMc	Alison McCarthy	1:45
37	Silverleaf whitefly: implications for lint quality and colour	uVSSlqUg5q0	Simone Heimoana	2:29
38	How to do segmented picking	ALDjsT_o3iE	Paul Grundy	3:14
39	Potential impacts of a changing climate	OtG1BCqVxdU	Katie Broughton	1:35
40	Sampling for soil insects	i_ODxTAeASw	Paul Grundy	3:50
41	Variable rate irrigation using VARIwise	fL1DG07Fge8	Alison McCarthy	2:15
42	Looking at soil constraints	g48UEPvylu4	Brendan Griffiths	4:50
43	Visual soil assessment 1: What is VSA?	kZB2KJyKIps	Oliver Knox	1:33
44	Visual soil assessment 2: Assessing texture	2CTQgnfqHBI	Oliver Knox	2:04
45	Visual soil assessment 3: Assessing structure	Rv2BYMjnW-g	Oliver Knox	3:11
46	Visual soil assessment 4: Porosity, mottling and colour	DgxtSAwtaWQ	Oliver Knox	2:28
47	Visual soil assessment 5: Other soil attributes	SSC_jfS2Srg	Oliver Knox	4:50
48	What is the difference between development and growth?	slJq3uRNqnA	Paul Grundy	3:07
49	Don't apply all your N up-front	nC5E4zAvz3c	Jon Baird	2:19
50	Be a smooth operator: avoiding inversions	l27-U3GZiNs	Sam & Isaac	1:41
51	Be a smooth operator: keeping it coarse	xijjdzE8Lqw	Sam & Isaac	1:06
52	Be a smooth operator: low is the go	UsQLTWS8KCQ	Sam & Isaac	1:19
53	Be a smooth operator: no need for speed	kFGcj1s893w	Sam & Isaac	1:23
54	Be a smooth operator: read the label	mpLxTSff25k	Sam & Isaac	1:10
55	What is causing my cotton squares to shed?	XMQr2mC25zc	Paul Grundy	1:55
56	How to sample for silverleaf whitefly (SLW) in cotton by counting nymphs	gWkTKMmJYLw	Paul Grundy	2:59
57	Commercial opportunity: help stop problem pests flying under the radar in cotton	fXRub0YUCWQ	Paul Grundy & Derek Long	1:26
58	Optimising furrow irrigation with SISCOweb	-saHo7ZdQhY	Malcolm Gillies	2:10
59	The Madden–Julian oscillation (MJO) – a key player during the cotton growing season	Xab5n3HxHA	Jon Welsh	3:59
60	Post-harvest management of Fusarium wilt	NGeQ4FTH7IM	Beth Shakeshaft	2:37

Another 50 videos, presentations and webinars have been added to the channel to support virtual field days and conferences, including FUSCOM, Southern NSW cotton research update, CSD cotton management tour 2020 and a LoRaWAN demonstration series. Webinars have been reviewed, and some older recordings removed from public view.

Travel restrictions due to COVID19 have adversely impacted the acquisition of presenter footage. Discussions with presenters about availability will resume as these restrictions ease. Presenters of project videos uploaded during DAQ1901 are summarised in Table 5. Participants in the SOS series wished to remain anonymous.

Table 5. Project collaborations.

Collaborator	Organisation	Video topic
Jon Baird	NSW DPI & CottonInfo	• Don't apply all your N up-front
Michael Bange	CSIRO (formerly)	• Cut-out in cotton 1: Understanding what happens • Cut-out in cotton 2: Getting the timing right • Cut-out in cotton 3: Physiological indicators
Katie Boughton	CSIRO	• Potential impacts of a changing climate
Warren Conaty	CSIRO	• Making the most of limited water
Jess Crawford	CHRRUP	• Integrating WHS on-farm
Ben Crawley	NSW DPI & CottonInfo	• Crop to Top Podcast 1. Benchmarking water use efficiency
Tom Cush	Cotton grower	• Going bankless - a grower perspective
Damien Ebbern	Cotton grower	• Biosecurity top tips: Visitor registers help you keep track
Andrew Erbacher	DAF	• Benefits of cover cropping
Damien Erbacher	Cotton consultant	• Biosecurity top tips: Minimising mealybug movement
Malcolm Gillies	USQ	• Optimising furrow irrigation with SISCOweb
Brendan Griffiths	UNE	• Looking at soil constraints
Paul Grundy*	DAF & CottonInfo	• Distinguishing between vegetative and fruiting branches in young crops • IPM in action: mealybug predators • What is IPM? Things to consider when making pest management decisions • 'Soft' options for mirids • How to do segmented picking • Sampling for soil insects • What is the difference between development and growth? • What is causing my cotton squares to shed? • How to sample for SLW in cotton by counting nymphs • Commercial opportunity: help stop problem pests
Simone Heimoana	CSIRO	• Silverleaf whitefly: implications for lint quality and colour
Larissa Holland	CSD	• Counting establishment
Sharna Holman*	DAF & CottonInfo	• Bee aware: are there bees in or near your cotton crop? • Crop to Top Podcast 1. Benchmarking water use efficiency • Crop to Top Podcast 2. Workforce requirements of cotton industry
Hiz Jamali	CSIRO	• Canopy temperature sensors as an irrigation tool • Installing canopy temperature sensors
Oliver Knox	UNE & CottonInfo	• Visual soil assessment 1: What is VSA? • Visual soil assessment 2: Assessing texture • Visual soil assessment 3: Assessing structure • Visual soil assessment 4: Porosity, mottling and colour • Visual soil assessment 5: Other soil attributes
Eric Koetz	NSW DPI & CottonInfo	• Late season weeds • Herbicide research trials 2018-19
Kath Korbel	Macquarie University	• What are stygofauna? • Groundwater health index: 1. Sampling stygofauna • Groundwater health index: 2. Sampling water quality and microbes
Georgie Krieg	Cotton grower	• Biosecurity top tips: signage at the farm gate reminds visitors to take care
Derek Long	USQ	• Commercial opportunity: help stop problem pests
Scott McCalman	Cotton grower	• Improving connectivity of habitat corridors & patches –a grower's perspective • Tips on planting nature corridors
Alison McCarthy	USQ	• Yield prediction using remote images • Variable rate irrigation using VARIwise
Nicole McDonald	USQ	• Crop to Top Podcast 2. Workforce requirements of cotton industry
David Perović	NSW DPI	• Crop to Top Podcast 1. Benchmarking water use efficiency

Jeremy Rennick	Croplands	• How to decontaminate a spray-rig • Nozzle comparisons: spray quality and drift potential
Malcolm Salisbury	Nufarm	• Tank mix compatibility: Using crystalline ammonium sulphate with 2,4-D • Mixing glyphosate and 2,4-D: 1. Avoid incompatible formulations • Mixing glyphosate and 2,4-D: 2. Handling concentrates • Impact of adjuvants on drift
Linda Scheikowski	DAF	• Biosecurity top tips: disease surveys find out what is (and isn't) in your fields • Collecting stem and leaf samples for disease testing
Beth Shakeshaft	NSW DPI & CottonInfo	• Post-harvest management of Fusarium wilt
Tim Shuey	DAF	• Biosecurity top tips: prevent disease transfer between fields • Collecting stem and leaf samples for disease testing
Matt Toscan	Cotton grower	• Biosecurity top tips: Washdown areas are not just for visitors
Stacey Vogel	Consultant & CottonInfo	• What are stygofauna? • Improving connectivity of habitat corridors & patches –an overview
Tim Weaver	NSW DPI	• Hand-held NIR for nutritional analysis
Jon Welsh	AgEcon & CottonInfo	• The Madden-Julian Oscillation (MJO) – a key player during the cotton season

*Project production team members who have also acted as presenters. List does not include Sam & Issac (last names withheld at their request) who collaborated with the 5 SOS videos.

Part 4 – Summary for public release

Project title:	Communicating cotton best production practices with video	
Project details:	CRDC project ID:	DAQ1901
	CRDC goal:	5. Driving RD&E impact (ES2)
	CRDC key focus area:	5.1 Impact and effectiveness
	Principal researcher:	Tonia Grundy, Development Extension Officer (multimedia)
	Organisation:	Queensland Department of Agriculture and Fisheries
	Start date:	01/07/2018
	End date:	30/06/2021
Objectives	• Create original video content for CottonInfo YouTube channel • Coordinate the annual revision of CottonInfo's *Cotton Pest Management Guide* (2021 only)	
Background	Video continues to be an important component of a comprehensive extension capability. It provides information in a format that stimulates the audience's visual and auditory pathways, potentially increasing reach and reinforcing traditional messaging. The ability of video to convey how-to concepts and maintain client contact during periods where face-to-face extension has been limited has made this communication medium a valuable addition to CottonInfo's suite of information products.	
Research activities	This project has aided in the development and production of original multimedia products that provide ongoing support to CottonInfo's extension activities by providing opportunity for content experts to share their knowledge in a visually informative way. The project has also managed the CottonInfo YouTube channel and provided upload and channel management and reporting support for multimedia material produced elsewhere. The final project year included coordination of the 2021-22 update for the industry's *Cotton Pest Management Guide.* Together these activities have significantly contributed to maintaining CottonInfo's reputation as a leading provider of easily accessible and up-to date information on cotton research and best practice.	
Outputs	This project has generated 68 new videos and podcasts, and assisted with the development or availability of a range of other multimedia material that has allowed the extension of cotton-related best practice information and provided an avenue for the distribution of extension material in lieu of face to face events that have proved problematic to organise during a period of travel restrictions. The *Cotton Pest Management Guide* was reviewed and updated in cooperation with content authors/experts, and will be distributed with CRDC's spring 2021 edition of *Spotlight* magazine.	

Impacts	The multimedia content generated by this project is available and easily accessed by both industry members and the wider public. The videos add value to the industry's extension efforts as they can be utilised within general or specifically targeted extension initiatives, and assist with promotion of the CottonInfo initiative. The *Cotton Pest Management Guide* Is one of the Australian cotton industry's flagship publications, and this comprehensive review to improve readability and expand content will assist the industry to continue to utilise best practice in cotton production.
Key publications	The videos generated by this and the preceding video projects are available to view at CottonInfo's YouTube video channel (youtube.com/cottoninfoaust). The latest *Cotton Pest Management Guide* is available for download from the publications area of the CottonInfo website (https://www.cottoninfo.com.au/publications/cotton-pest-management-guide).