Hort Innovation

Final Report

Area Wide Integrated Pest Management Support for Qfly in Table Grapes

Project leader:

Jeff Scott

Delivery partner:

Australian Table Grape Association

Project code:

TG18002

Project:

Area Wide Integrated Pest Management Support for Qfly in Table Grapes TG18002

Disclaimer:

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Content

Summary

Queensland Fruit Fly (Qfly) occurs in the east (in parts of Northern Territory, Queensland, New South Wales and Victoria). Qfly is mobile, over short distances only, and has the ability to move from vineyard to vineyard, for example, or from native or urban hosts into commercial production areas. Qfly has over 100 known plant hosts, including table grapes, and this wide host range makes Qfly management over large areas difficult.

Management of Qfly requires the use of multiple tools and strategies, successful Qfly programs include protein bait spraying, male annihilation technique (MAT), hygiene and monitoring.

The project will assist Table Grape growers in Sunraysia to understand and adopt field practices that enable them to effectively manage Qfly on farm, to produce clean, marketable fruit, mitigating the risk of rejected consignments, participate in an area wide management program and contribute to continued market access.

An initial meeting was held with Allison McGregor (consultant and project manager), Sunraysia Pest Free Area (Deidre Jaensch), Andrew Jessup (JANREN Consulting), Vic DPI (Lauren Donaldson), scouts, citrus growers who are already trapping and baiting, resellers, spray manufacturers, and BioTraps (Colin Bain). It was determined to conduct eight planned workshops. The eight workshops was designed to attract an anticipated audience of 30 growers and/or pest scouts at each workshop, however a series of thirteen workshops and field days were presented to table grape growers, agronomists, pest scouts and consultants between December 2018 and May 2019.

- 246 table grape growers, pest scouts and chemical resellers attended seven workshops in Mildura and Robinvale in December 2018 and January 2019. The workshops focused on the biology of Queensland Fruit Fly plus hands on demonstrations of identification, baiting and trapping. Almost all the attending growers signed in with their TG code indicating that they were registered for export.
- 44 table grape growers were among 118 attendees at six field days in Swan Hill, Robinvale and Mildura in May 2019. The field days focused on baiting equipment, and some of the practical questions that had been raised in the first seven workshops were addressed. The field days were held in collaboration with the Greater Sunraysia Pest Free Area and opened to all fruit growers. Citrus and stone fruit growers brought experience to the field days that was beneficial to the attending table grape growers.

Attendees at the workshops and field days were provided with an information package that included A4 sheets about Qfly biology and area wide management. Each attendees also received a yellow plastic trap and an FT Mallet (male pheromone lure) to prompt them to start trapping/baiting. Attendees at the field days also received a magnifying lens that clips to a mobile phone, to help with Qlfy identification.

Feedback was sought via interviews with table grape growers and service providers, and an online survey of field day attendees.

Recommendations after evaluation of the project and feedback from workshop attendees relate to:

Recognizing the role scouts and agronomists play in implementing AWM

Working with equipment dealers, because they design and assemble bait sprayers.

Harmonize protocols, so that growers can comply with requirements for Qfly for export, ICA-20 and also area-wide management

Making DPI trap data more readily available

Providing updated chemical lists that show which chemicals can be added to bait and/or used as cover sprays, and their relative costs in a Qfly program, and on the same document show the Australian and export MRLs.

Growers wanting help to compare the economics of baiting and cover spraying.

Reviewing droplet size recommended for spray baits so size is optimum for spray retention on leaf surfaces

Identifying where the intervals between cover sprays for other insect pests in table grapes extend too long to provide crop protection against Qfly.

Building an autonomous (robot) bait sprayer

Clarifying which traps have equivalent purpose or mode of action and which traps have different purpose or mode of action.

Keywords

Queensland Fruit Fly; Area Wide Management; Table Grapes; Spray Baiting

Introduction

In close consultation, this project sought to provide high-level support and to increase awareness of how to combat the emerging presence of fruit fly on table grape properties. If left unchecked, fruit fly populations will rapidly increase and have the potential to infect marketable table grapes destined to major export countries. This will not only render a commercial loss to the farmer but has the potential for overseas countries suspending exports of table grapes until remedial action is undertaken and accepted by those countries. The Australian table grape industry has experienced significant growth in recent years, primarily driven by growing export demand. Table grapes are produced throughout Australia, although Victoria accounts for 71% of production around the major growing regions of Sunraysia and the Murray Valley. In 2016-17, 171,637 tonnes of table grapes were produced, valued at $534.4 million. Sixty two percent of that fruit went to export markets, making table grapes the second-most valuable horticultural export product after almonds.

Countries importing Australian table grapes have very clear phytosanitory requirements regarding Queensland Fruit Fly (Qfly), as stated in the Federal Governments MICoR - Manual of Importing Country Requirements; grapes must undergo cold treatment to ensure there are no flies in imported fruit.

Queensland Fruit Fly (Qfly) occurs in eastern Australia. Qfly is mobile over short distances, able to move within or between vineyards and orchards, or from native or urban hosts into commercial production areas. The wide host range of Qfly, which includes table grapes, makes management over large areas difficult.

Hort Innovation's Table Grape Strategic Investment Plan 2017-2021 (SIP) identifies improving Qfly management as an ongoing national priority. One goal is to eventually see reinstatement of PFA status in the Riverland and Sunraysia, as well as recognition of PFA status by all export markets. Improving Qfly management will therefore improve industry's export market opportunities.

Project TG18002 supports industry Outcomes 3 and 4 of the Table Grape SIP.

- Outcome 3 aims to safeguard the Australian table grape industry from future biosecurity risks and to improve production efficiency by growers applying knowledge, skills and tools, together with R&D and extension.
- Outcome 4 relates to enhancing skills and capacity of growers and ensuring that growers and other members of the value chain are fully aware of industry developments.

The Greater Sunraysia Pest Free Area (PFA) has invested heavily in community awareness and reducing Qfly numbers in urban areas in Sunraysia. Hort Innovation has also previously invested in several R&D and extension projects relevant to Qfly management in table grapes, for example:

- Project AH03002 piloted an Area-Wide Management (AWM) trial for Qfly in the Central Burnett region of Queensland, using protein bait spraying, MAT and hygiene in citrus, table grape and mango orchards, and included management within the urban area.
- Project ST15015 "Adaptive area wide management of Qfly using SIT" considered the likelihood of success employing an AWM approach in Sunraysia (protein bait spraying, MAT, hygiene and monitoring in commercial production zones, and management in other landscapes). ST15015 also developed support materials (guidelines for commercial producers on how to implement an area-wide management approach, production of specific table grape fact sheets, workshops to introduce the principles of AWM and coordinated fruit fly management on-farm).

The current project TG18002 aimed to build capacity among Sunraysia table grape growers by building on knowledge/information from the previous projects. TG18002 oversaw the delivery of workshops to major growing regions of Australia. These workshops increased the understanding among growers of field practices, towards ownership and self-efficacy in Qfly management. The long-term goal with regard to AWM of Qfly by table grape growers is effective management of Qfly on farm; producing clean, marketable fruit; participating in an area wide management program; mitigating the risk of rejected consignments; and so contributing to continued market access.

Methodology

The following methodology was determined to meet the project outcomes:

Grower workshops: the project was designed to conduct up to 8 workshops, however;

Thirteen activities were presented for table grape growers and their service providers between December 2018 and May 2019.

All activities included catering (breakfast or lunch or dinner) to encourage growers and service providers to talk to each other before/during/after the event.

- See Table 2 Summary of seven workshops, December and January 2018-2019 and Table 3 Summary of six field days, May 2019

Table 2: Summary of seven workshops, December and January 2019**Table grape growers were given clear directive by ATGA that they had to attend a workshop**

Invitations to the December and January workshop and the May field days were emailed by the Australian Table Grape Association to all table grape growers registered with ATGA. Follow-up telephone calls were made targeting growers with large connections to a network of other growers to engage them in the project. The ATGA utilised its extensive email list to email all growers in the major growing regions. Advertising of the upcoming workshops and field days was undertaken in the ATGA fortnightly E-Newsletter and finally the ATGA decided to declare the December and January workshops compulsory for exporting growers, however the May field days were not advertised as being compulsory.

The ATGA engaged with the Greater Sunraysia PFA Consultative Committee who also sent out invitations and advertised on their website and facebook page.

See Appendix 4: Example workshop invitations

ATGA recorded the names and export registration (TG) numbers of participants who attended four grower workshops in December and January.

Format and content of the workshops

Workshops were designed to provide information about Qfly biology in a table grape context as well as some practical, hands-on experience of identification and baiting.

Growers listen to other growers. With that in mind, field days were planned around growers sharing their experiences with baiting and demonstrating their baiting rigs to other growers.

- Fields days include demonstrations of :
  - Tractor-mounted tanks on a three-point-linkage (two examples at Cardross)
  - small (100 L) tank mounted onto a low trailer towed by an ATV (quad bike) (Woorinen, Tooleybuc, Cardross, Yelta)
  - small 100 L tank in the tray of a UTV (Euston (two examples), Cardross, Yelta, Colignan)
  - 400 L tank on a trailer towed by a UTV (Colignan).

Providing resources to agronomists, resellers, scouts and equipment dealers

Three of the workshops were held specifically for service providers:

- Two workshops for chemical resellers were held in January.
- A third workshop/meeting was held in January for agronomists and scouts to talk together with researchers and the PFA about ways to engage table grape growers in area-wide management.

Dealers who supply baiting equipment to growers were invited to the grower workshops, but as a separate activity they were also approached individually to discuss making their bait sprayer designs better suited to baiting in table grapes.

Media focus on grower innovation and on growers teaching growers

The ATGA CEO Jeff Scott coordinated with project team together with the Greater Sunraysia PFACC in preparing media releases to promote the May field days. The information was also promoted through the Australian Table Grape Association by email and on the website, and by the Greater Sunraysia Pest Free Area.

The angle of the media releases was on growers being innovative, to give new interest to a topic that media and readers may consider an old story. A story about an innovative grower generated media interest. The story was picked up by ABC Radio Mildura Swan Hill, Fresh Plaza, and the Sunraysia Daily during the week before the field days. The story also appeared on the Australian Table Grape Association website.

Collaboration, and a working group to continue engagement by the table grape industry

ATGA, project staff and the Greater Sunraysia PFA collaborated to plan and present the workshops and field days, and to address issues identified in the training workshops.

The ATGA continued its collaboration with the Greater Sunraysia PFACC to have a joint field day with stone fruit and citrus growers which provided useful insights for table grape growers, and helped justify running so many field days (to target table grape growers) over such a large geographic area.

The ATGA maintained communication with pest scouts and chemical reps, to build the relationships with the ATGA and Sunraysia PFACC. This led to a more formal steering committee being formed to prepare the May field days, and a pest scout and chemical reps were involved in presenting the field days. The steering committee reconvened after the field days to review the outcomes. The field day planning committee now forms the core of an ongoing group to keep focus on engaging the table grape industry in Area Wide Management.

Contributors (host growers, growers providing equipment, scouts, chemical industry representatives) were sent letters thanking them for this input, on behalf of the ATGA, the Sunraysia PFACC and the Hort Innovation Table Grape Levy project.

ATGA CEO Jeff Scott Attendance at All Workshops and Field days

ATGA CEO Jeff Scott attended all workshops and field days as the facilitator and gave a brief introduction at the commencement at each of the activities explaining the content and intent of the workshop or fields day and introduced all guest presenters. Time was also dedicated to ensuring all facility management and the necessary security provisions were put in place before the commencement of each activity.

Evaluation

Ongoing evaluation during Project led to minor adjustments to format and content after the December workshops.

Afternoon workshops during harvest were avoided in January. Workshops included more detail about changes in the Qfly detections in PFA grid traps across the table grape growing districts. The major presenter, Allison McGregor designed a calculator to assist growers compare the work rates (cost and time) associated with cover-spraying or bait spraying. A list of chemicals registered for Qfly control, and their costs, was compiled as a hand out. Growers wanted a shift in the focus from Qfly biology to grower practices. Industry feedback after the January workshops made it clear that a proposed series of hands-on field sessions should be delayed until after harvest.

Growers and service providers were interviewed for feedback regarding impact and adoption. Six structured interviews with growers were recorded. Feedback from service providers was collected in a mix of formats, as interviews or during various interactions in the latter part of the project.

In early June a participant survey was emailed to field day participants by the Greater Sunraysia PFACC

Outputs

The ATGA worked with the project team to achieve the outputs as specified in the project. The ATGA worked closely with Allison MacGregor, project leader of TG18001 and the following table outlines the project outcomes.

Table 1: Summary of outputs from Project TG18001

Output	Comment/detail	Completion date
Project initial planning meeting to develop a communication plan	Provided to Hort Innovation in Milestone 102	11th December

Workshop materials/handouts	100 sets of handouts printed and assembled to disburse to table grape growers in 'show bags'. Bulk purchase of traps and FT mallets to hand out in 'show bags'.	11th December
Invitations to December workshops	A4 pdf of workshop invitation emailed by ATGA to all table grape growers registered for export. ATGA declared the workshops compulsory for exporting growers.	11th December
Grower training - workshops 1 and 2 in Irymple and Robinvale	173 table grape growers attended workshops 1 and 2.	11th December
Workshop materials/handouts	Second bulk purchase of traps and FT mallets to hand out in 'show bags'. 500 of each handout printed and 100 'showbags' assembled to distribute to table grape growers who had missed out, via resellers and agronomists	20th December
Evaluation / reflection on w/shops 1 & 2	Evaluation provided in Milestone 106	10th January
Communication	Workshops reported in The Vine	10th January
Invitations to January workshops	ATGA sent workshop invitations to all table grape growers registered for export. ATGA declared the workshops compulsory for exporting growers.	10th January
Grower training - workshops 3 and 4 in Irymple and Robinvale	56 table grape growers attended workshops 3 and 6	10th January
Agronomist, pest scout and chemical reseller training – workshops 5 to 7 in Irymple, Mildura and Robinvale	17 service providers attended workshops 4, 5 and 7, which were tailored to their needs/interest	10th January
Focus on pest scouts	Follow up discussions with five pest scouts regarding their roles in Qfly management.	14th March
Qfly baiting field days planned in collaboration with PFA	ATGA, project staff and PFA collaborate to plan hands-on field days and to address issues identified in the training workshops.	14th March
Growers challenged to build a bait sprayer	Peter Argiro, project staff and ATGA collaborate to design, build and give profile to a cheap and basic baiting unit. Project staff communicate with spray machinery distributers about design of purpose-built equipment for bait spraying in table grapes. The bait sprayer and human story attracts media interest that is then used to promote the field days.	3rd May
Work rates calculator	Work rates calculator developed to assist growers compare costs of cover spraying and baiting.	3rd May
Working group for Qfly in table grapes	Working party formed (project staff, ATGA, a pest scout, chemical industry, a grower and Greater Sunraysia PFA) towards giving legacy to project TG18001.	3rd May
Workshop materials/handouts	100 showbags (handouts/traps/lure/hand lens) assembled to distribute to table grape growers. PFA also assembled almost identical bags for citrus growers and for stone fruit growers (some sheets were specific to the crop).	3rd May

Media promoting May field days	Radio, newspaper, ATGA website and facebook media promote story about building a cheap and basic baiting unit.	3rd May
Invitations to May field days	ATGA sent workshop invitations to all table grape growers registered for export.	3rd May
Events 8 to 13 – grower field days	Six field days focused on bait spraying, with growers teaching growers. At least two and as many as five rigs were demonstrated at each field day. 44 table grape growers were among 118 attendees at field days in Woorinen, Tooleybuc, Euston, Cardross, Yelta and Colignan.	3rd May
Impact assessment	Feedback interviews with growers and service providers regarding impact and adoption.	30th May
Communication	Story about comparing labour efficiencies of baiting and cover spraying prepared for *The Vine* magazine.	16th June
Impact assessment and project evaluation	Surveys emailed by PFA to field day participants, and survey responses reviewed. Project evaluation	25th June

Workshops and field days

Refer to:

- Table 2: Summary of seven workshops, December and January 2019 and
- Table 3: Summary of six field days, May 2019.

Seven workshops were held in December 2018 and January 2019. The focus at these workshops was biology and identification, and trapping and baiting.

Workshop format was adjusted according to each audience: growers or agronomists/scouts or chemical resellers.

- A large number of table grape growers attended, albeit many with reluctance.
- Two sessions specifically for resellers were to provide opportunity for resellers to ask questions and have discussion without feeling self-conscious in front of their grower-clients.

- Pest scouts or agronomists and resellers play a crucial part in area-wide management, identifying Qfly and recommending treatments. The session for pest scouts was to discuss the roles of scouts in area-wide management: as communicators, diagnosticians, giving advice. The session was also to explore how scouts might become further engaged, towards increasing adoption of area-wide management. Several scouts registered to attend, but only two attended this session. January is their busiest time, with their client growers preparing to send fruit to export. Further, the scouts had already attended one of the sessions with their client growers and were reluctant to spend more time. Regardless of poor attendance, useful feedback was garnered at the pest scout session.

A series of six smaller, more hands-on field demonstrations were planned to show table grape growers a wide range of baiting equipment and demonstrate in-the-field practical information about fruit fly baiting.

Growers were very reluctant to attend further training or field days until harvest was over. Growers with equipment to show other growers were similarly unwilling to make their baiting equipment available for other growers to see until harvest was over. The six field days were therefore delayed until early May (May 1st, 2nd, 3rd).

Field days were held in Woorinen, Tooleybuc, Euston, Cardross, Yelta and Colignan, in collaboration with the Greater Sunraysia Pest Free Area, and open to all fruit growers.

More than 110 fruit growers attended the six May field days. Table grape growers attended five of the six events, and made up almost the entire audience at Euston and Yelta. The Tooleybuc event day was not well attended and did not attract any table grape growers.

Growers shared their experiences with other growers, which was very positive. Citrus growers and stone fruit growers tended to have more experience with baiting than table grape growers, and involving growers with a variety of different crops brought a range of previous baiting experience and ideas to each workshop.

Growers provided a variety of baiting equipment for each field day.

- Tractor mounted tanks on a three-point-linkage (two examples at Cardross)
- small (100 L) tank mounted onto a low trailer towed by an ATV (quad bike) (Woorinen, Tooleybuc, Cardross, Yelta)
- small 100 L tank in the tray of a UTV (Euston (two examples), Cardross, Yelta, Colignan)
- 400 L tank on a trailer towed by a UTV (Colignan).

Pest Scouts contributed to the six field days; Rachel McClintock and Jake Prosser are both registered pest scouts providing scouting and agronomy services to export table grape growers.

- Rachel McClintock spoke at each field day about why she puts plastic traps and MAT traps out in her client table grape growers' blocks. She also described when she starts finding Qlfy in table grapes, and what she looks for on bunches.
- Jake Prosser provided a series of high resolution photographs he has taken recently showing examples of sting marks, tracks caused by larval movement under the berry skin, and seemingly intact berries

with larvae inside those same berries. Sets of these photos were enlarged to A3, laminated and handed around at the field days to show multiple examples of affected table grapes. Similar photographs of other fruit types were also made available for growers with other crops.

Chemical industry representatives from AgNova, Corteva and Organic Crop Protectants attended each field day. A representative from Biotrap also attended the Yelta and Colignan field days.

- AgNova representative Graeme Hardwick provided a demonstration and led discussion at each field day about mixing bait; in particular about gum: how to use gum; why using gum increases the longevity of bait sprays; how to spray bait containing gum using a 12-Volt pump on a small herbicide tank without burning out the solenoids.
- Organic Crop Protectants provided a demonstration of their new Specialized Pheromone & Lure Application Technology (SPLAT) and a ute-mounted gas gun, calibrated to deliver 100 shots of SPLAT per hectare.
- Corteva and BioTrap representatives did not lead any discussion but were able to answer questions about rates, volumes, timing, traps, and bait placement for Naturalure and Hymlure.

Table 2: Summary of seven workshops, December and January 2019

Workshop #	Workshop	Workshop	Workshop 3	Workshop 4	Workshop 5	Workshop 6	Workshop 7
Location	Irymple	Robinvale	Irymple	Irymple	Mildura	Robinvale	Robinvale
Audience	Table grape growers	Table grape growers	Table grape growers	Chemical resellers	Pest scouts and consultants	Table grape growers	Chemical resellers
Date	11/12/18	11/12/18	09/01/19	09/01/19	09/01/19	10/01/19	10/01/19
Time	8-10 AM (Breakfast at 7:30am)	1 - 3 PM (lunch at 12:30 pm)	8-10 AM (Breakfast at 7:30am)	1 - 3 PM (lunch at 12:30 pm)	5:30 PM	8-10 AM (Breakfast at 7:30am)	1 - 3 PM (lunch at 12:30 pm)
Format	One hour of powerpoint presentations One hour of hands-on demonstrations	One hour of powerpoint presentations One hour of hands-on demonstrations	One hour of powerpoint presentations One hour of hands-on demonstrations	One hour of powerpoint presentations One hour of hands-on demonstrations	90 minute discussion about scouts roles and ways to increase participation in area wide management.	One hour of powerpoint presentations One hour of hands-on demonstrations	2 hours of powerpoint presentation interspersed with questions, discussion and using hand lenses to ID flies.
Workshop venue	186 Morpung Ave Irymple (property of Pat Zappia)	698 Anzac Road Robinvale (property of Fred Tassone)	Vic Department of Agriculture, Irymple	Vic Department of Agriculture, Irymple	The Office, Mildura	76 Salamaua Road Robinvale (property of Nick Muraca)	Robinvale Resource Centre, 68 Herbert Street, Robinvale
Presenters or other expertise present	Andrew Jessup Alison MacGregor Lauren Donaldson, DPI Jeff Scott, ATGA	Andrew Jessup Alison MacGregor Jeff Scott, ATGA	Andrew Jessup Alison MacGregor Jeff Scott, ATGA Deidre Jensch, Sunraysia PFA Lauren Thomson, DPI	Andrew Jessup Alison MacGregor Jeff Scott, ATGA Deidre Jensch, Sunraysia PFA	Andrew Jessup Alison MacGregor Deidre Jensch, Sunraysia PFA	Andrew Jessup Alison MacGregor Jeff Scott, ATGA Deidre Jensch, Sunraysia PFA	Andrew Jessup Alison MacGregor Deidre Jensch, Sunraysia PFA
Participants attending	91	82	39	8	2	17	7

Table 3: Summary of six field days, May 2019

Workshop #	Field day 1	Field day 2	Field day 3	Field day 4	Field day 5	Field day 6
Location	Woorinen	Tooleybuc	Euston	Cardross	Yelta	Colignan
Date	01/05/19	01/05/19	02/05/19	02/05/19	03/05/19	03/05/19
Time	12.30 - 2.30 PM (Lunch at 12 noon)	4 - 6 PM (Dinner at 6 pm)	8 - 10 AM (Breakfast at 7.30 am)	4 - 6 PM (Dinner at 6 pm)	8 – 10 AM (Breakfast at 7.30 am)	1 - 3 PM. (Lunch at 12.30 pm)
Topics covered at all workshops	When and how to find Qfly on commercial vineyards / orchards. Trapping: types of traps, placement of traps, number per hectare MAT to kill male Qfly Spray baiting: attractants, adding chemical, why add gum, how to mix gum, challenges using gum through a small pump. Comparison of labour costs per hectare: baiting vs cover spraying. Comparison of product costs per hectare: bait sprays vs trap vs cover sprays. How to rig up a bait sprayer: innovative or off-the-shelf examples of bait sprayers. New technologies for applying bait: Specialized Pheromone & Lure Application Technology (SPLAT) and the Splatogator.					
Workshop venue	McCalman Street, Woorinen Woorinen Football Netball Club,	Crn Wood Street and Yanga Way, Tooleybuc Chetwynd Park	156 Taylors Road, Euston Property of Joe & Mick Garreffa	161 Dairtnunk Avenue, Cardross SuniTafe Farm	683 Calder Hwy, Yelta Palms Vineyard	3749 Kulkyne Way, Colignan Property of Ken & Rob Mansell
Baiting equipment demonstrated	Two spray units	Three spray units	Three spray units	Five spray units	Three spray units	Three spray units

Outcomes

Table grape growers are aware of Qfly biology and management of QFly

As a result of the ATGA making the initial workshops "Compulsory" for all registered growers for export, a resounding 246 Australian table grape growers increased their understanding of the biology of Qfly after attending one of seven workshops presented in December 2018 and January 2019. Almost all of those 246 growers had signed in with their export registration TG code, indicating that they are registered for export.

Some of the same table grape growers also attended a field day in May 2019. Forty-four table grape growers were among the 118 participants at the May events.

Participants at all events were given hands-on demonstrations of baiting and Qfly identification and took home an information pack ('showbag') with detail on Qfly biology and management as well as a Biotrap and an FT mallet. Attendees at the May field days also received a magnifying hand lens that is attached to the camera on a smart phone.

- Appendix 3: Factsheets and other items provided in the 'showbag' for participants.

As a result of the coordinated efforts of the ATGA in conducting these workshops and field days by utilising its extensive database contact list of all table grape growers and associated stakeholders, all of the registered growers for export (at that time) have now been educated in area wide pest management of Queensland fruit fly. The coordinated approach of the ATGA along with Alison MacGregor, team leader of the other Hort Innovation project coinciding with this project TG18001, has led to all growers now having a greater understanding of fruit fly management.

Outcomes from the overarching project TG18001 and this project TG18002 include:

- Growers can easily compare the costs of baiting and cover spraying
  - See Appendix 5: Work rates calculator to compare cost of cover spraying against cost of baiting.
- Growers learning from other growers via the 6 field days focusing on hands-on demonstrations particularly with varieties of basic baiting equipment that growers use to manage fruity fly
- A survey of attendees and interviews with growers revealed that the growers valued seeing a range of simple rigs and hearing other growers' experiences with baiting.
- Engagement of service providers - Scouts play a key role in implementation of area wide management. The ATGA coordinated with the project team to engage and get input from pest scouts, as they are critical to the implementation of area wide management by table grape growers.
- Equipment dealers are better informed
- Review of grower spray diaries to identify intervals between growers' cover sprays that leave grapes vulnerable to Qfly

Interviews and survey to review practice change and extension.

Six growers and several service providers offered their thoughts about adoption, practice change and extension of the project and after the May 2019 field days, a survey was emailed to attendees by the Greater Sunraysia PFA. 17 attendees responded.

- See Appendix 9: Evaluation – Feedback from follow-up interviews with growers and service providers and
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- Appendix 10: Evaluation – Feedback from survey responses after **the May field days**

Barriers to adoption of area wide management were identified

> Three key reasons were identified that explain lack of engagement
    - Table grape growers do not feel that they are immediately or financially impacted by Qfly.
    - There is a belief their normal spray program for other pest and disease was sufficient in preventing populations of Qfly from building up in vineyards.
    - A belief that exports under cold treatment mitigates fruit fly concerns
> Other barriers to adoption of trapping and baiting were identified

Monitoring and evaluation

Project TG18002 aimed to identify best practice for table grapes growers in managing fruit fly, to build on pre-existing knowledge and information and to build capacity among table grape growers.

The project focus was assisting growers to adopt area-wide management practices for Qfly, as well as increasing their understanding of Qfly, so that they can effectively manage Qfly on farm, produce clean, marketable fruit, and so they can participate in an area wide management program and so contribute to continued market access. The following tables details the performance of the combined TG18001 and 2 projects

Table 4 discusses performance of project in the context of key project evaluation questions.

Table 5 provides a detailed evaluation of the Communication Plan.

Information from interviews with table grape growers and service providers about adoption, practice change and extension of the project was used to evaluate project success. Feedback from the interviews, and the survey results are provided as appendices:

- Appendix 9: Evaluation – Feedback from follow-up interviews with growers and service providers
- Appendix 10: Evaluation – Feedback from survey responses after the May field days

Table 4: Project key evaluation questions

Key evaluation questions	Relevant?	Project specific questions	Evaluation
Effectiveness			
To what extent has the project achieved its expected outcomes	Yes	Did table growers attend training on the biology and control strategies for Qfly.	Table grape growers attended four workshops and six field days focussing on management of Qfly. 246 table grape growers attended the workshops. 44 table grape growers attended the field days. Several of the field day attendees had already attended a workshop. ATGA registered the Export TG numbers of the growers attending the December and January workshops.
		Is there evidence of increased adoption of Qfly management by table grape growers?	Scouts were already tracking Qfly numbers in orchards, using traps and identifying stings in fruit. Scouts are better informed now about trapping. Growers are applying cover sprays if Qfly are detected. Growers consider this more economical than an additional bait spray. Minimal increase in adoption of Qfly baiting is evident within the short life of project TG18002 but growers and service providers are better informed.
Relevance			
2. How relevant was the project to the needs of intended beneficiaries?	Yes	Is there evidence of relevance?	ATGA made attendance at a workshop compulsory for export growers. As they registered to attend, many made it clear that they were reluctant and did not perceive Qfly as being an issue of concern to them. They also conveyed contradictory feedback; they felt that everyone needs to understand Qfly and recognise that at some stage they will all have to manage it. In the 2018/19 season the project was a low priority for growers compared to harvest and other production or business concerns. Added to this, Qfly numbers were relatively low in 2019. Table grape growers are reluctant to engage with AWM because they comply already with export protocols for Qfly management by cold treatment during shipping. Cold treatment is preferred by growers because it requires no extra effort from growers. The follow up field days were not compulsory but were attended by 44 table grapes growers (estimated as nearly 20% of export growers). This indicates that some growers are wanting more information and are concerned about Qfly. Some pest scouts or agronomists attended more than one workshop and returned to the field days, to support their clients and learn.

			Promoting simplicity of design for home-made baiting sprayers was a good idea, although growers were also sheepish/embarrassed to talk about their design, because of the simplicity. Growers responded well to learning from other growers.
Process appropriateness			
3. How well have intended beneficiaries been engaged in the project?	Yes	To what extent were the target engagement levels of industry levy payers achieved? Have regular project updates been provided through linkage with the industry communication project?	A very high proportion of levy-paying table grape growers have now attended training about the biology and control of Qfly through the workshops. The degree of genuine engagement was possibly low as many were reluctant participants in the training. Pest scouts were enthusiastic about the need for their clients to attend workshops. However the scouts did not all attend because it conflicted with paid scouting work. A range of stakeholders were engaged through being asked to participate in the field days. This brought stakeholders together, allowing some practical issues to be raised. For example at different times, the scouts and chemical reps and resellers and equipment dealers and growers were able to share experience.
4. To what extent were engagement processes appropriate to the target audience/s of the project	Yes	Did the project engage with industry levy payers through their preferred learning style?	The workshops included a one-hour slide show about the biology of Qfly. This was not an ideal format for the audience. Some provided feedback that it was boring. The hands-on activities at the workshops were well received. The field days focussed on more outdoor practical information and growers teaching growers. This was well received. Serving a meal with the workshops and field days was appropriate as it allowed for social connections between growers in the audience but also between the audience and presenters. Growers possibly came to the field days just to see the SPLAT technology and the Splatogator. Expecting pest scouts to support the field days and workshops without payment was considered by scouts to be unreasonable. They feel that they are too often expected to offer their professional services for free. As a target audience, they would be better engaged by being contracted into the project. Growers valued hearing the honest experiences of a pest scout, rather than from researchers/government, who some described as paid to keep Qfly in the district The project team made an excel spreadsheet that calculates work rates to allow simple comparisons of labour (time and cost) associated with cover spraying or bait spraying. This was well received.
Efficiency			
5. What efforts did the project make to improve efficiency?	Yes		Grower skills were improved. Interview and surveys indicated that growers learned new information. During the hands-on sessions in workshops, growers struggled to use a hand lens effectively. This represented a barrier to growers identifying Qfly in traps. This was overcome in the field days by providing growers with a smart-phone mounted lens.

A trap and a male pheromone lure was distributed to every grower, to get them started with trapping.

Growers were offered assistance with design if they wanted to build a simple bait sprayer. This process provided an opportunity to engage an equipment manufacturer and resulted in the manufacturer better understanding the unique requirements of baiting in table grapes.

Inviting a chemical rep and a pest scout to present at the field days provided a strong message that using those services is normal and cost effective.

Collaboration between the project team, ATGA and the Greater Sunraysia PFACC meant that field days and the table grape specific information could be extended more widely, reaching table grape growers in the Swan Hill area, and also brought a range of crops into the discussions, which table grape growers benefited from. The PFA also used asked other peak industry bodies (dried fruits, citrus and stone fruit) to circulate the field day flyers to growers. The PFA facebook posts were shared by local councils and Lower Murray Water.

Collaboration within the planning committee also became the basis for an ongoing committee to maintain engagement in the table grape industry.

Evaluation of the communication plan

Table 5: Evaluation of the project communication

Stakeholder GROWERS					
Objectives	Message content	Delivery	By when, or frequency	Measure of achievement	Comments
Take responsibility	Qfly management will become part of the export protocols. Let's make it as seamless as possible.	Workshop	Dec-Jan	246 growers attended compulsory workshops in December and January.	Growers at workshops were warned that Qfly control will likely become part of the export protocols. Growers protested about ATGA saying that the workshops were compulsory. Had attendance not been compulsory, very few growers would have attended. Attendees also said it was important that growers know about Qfly management so that everyone can take responsibility. The growers felt the workshop timing was poor, right before harvest.
Understand Qfly biology Confident to trap	Simple calendar of activities for Qfly management so it becomes a normal part of every pest and disease management program and export hygiene program. Take home a trap to hang and check. See assembly of various male and female traps to understand differences and relevance of each.	Workshop and follow up by scouts, AM and AJ. All participating growers receive a kit containing: information from Hort Innovation a trap and FT mallet to attract and kill male flies in the trap. Participants at the May field days also received a	Two workshops in December (Irymple, Robinvale). Five workshops in January. (Irymple, Mildura, Robinvale) Six field days in May (Woorinen, Tooleybuc, Euston,	246 growers attended compulsory workshops in December and January. The workshops included one hour of information about Qfly biology, followed by hands on sessions about: Qfly identification; Using traps; Mixing bait; Spraying bait 44 table grape growers attended field days in early May. The field days focused on: Where and when scouts find Qfly (esp in TG); mixing bait and gum – do's and don'ts; chemical options for baiting and spraying Qfly; labour costs of baiting vs cover spraying; Growers teaching growers – bait sprayer demonstrations; New technology – SPLAT.	Some growers with new awareness about Qfly are not yet confident to plan trapping or baiting, and want input from consultants. Information shared via TG18002 may have gone no further than raising questions, so simple messages must continue being sent, via multiple sources, so growers can gradually assimilate it into a plan. Growers struggled to use a hand lens to see and identify Qfly. An addition was made to the show bags at the May field days: attending growers all received a Smartphone lens – a high definition optical magnifying lens compatible with smart phones/tablets. At the six field days in May, participants were shown enlarged, laminated photos of sting
Confident to identify Qfly	Have a hands on ID experience with backup material for ID of Qfly.				

Confident to bait or use cover sprays	Have a hands on experience of the attractant, insecticide and application equipment	smartphone magnifying lens.	Cardross, Yelta, Colignan).		marks on grape berries, the subtle appearance of damage by larvae under berry skins, and berries split open to expose larvae. Interest in these pictures highlighted that growers were not previously familiar with what to look for on grapes. Growers protested about the cost of baiting and wanted comparative information about the costs of labour and chemicals for Qfly baiting or cover sprays. Responses to the survey after the field day indicates that growers most valued the demonstration of bait sprayers and liked hearing from / learning from other growers. The new SPLAT technology was a drawcard that attracted people to the field days but, in the end, growers most liked hearing from each other.
Consider trapping useful and willing to pay scouts or farm hands to check traps	Have an experience of using trap information to trigger baiting and reduction in Qfly populations. Trapping and monitoring can be cost effective.	Evaluation of growers using traps, evaluation of scouts being asked to check traps.	Feb-May	Ongoing discussions with growers and scouts about growers' responses to trap data.	Most large vineyards employ agronomists as pest scouts. Most but not all scouts are trapping for their growers. One scout is also perimeter-baiting his growers vineyards. Another is deploying male lures in blocks where traps indicate Qfly are present.
Consider baiting useful		Evaluation of growers using bait, evaluation of spray diaries	Feb-May	Survey and grower feedback, information from scouts reveals growers and agronomist/scouts attitudes to baiting, and levels of adoption.	Growers know baiting is not part of the current protocols. While cold treatment remains the protocol requirement, they will resist baiting, because it is an extra activity and not required yet for export. Of growers who attended the baiting field days, approx. 50% already had some experience baiting. Some baited previously to comply with ICA-20 but stopped when they began to export. Growers perceived that baiting would be costly compared to cover spraying. An excel

					spreadsheet was prepared to help them compare costs. Relying on growers to provide bait sprayers was risky. Some of the units arranged for Woorinen, Tooleybuc and Colignan were cancelled at short notice by the growers, due to difficulty transporting equipment to the field day site. Growers were reluctant to show their rigs because they felt they were too simple. They believed other growers would not learn anything from their own simple example. Actually growers were intrigued and inspired by the simplicity of basic rigs.
Can access chemical information	Info on agchem products that are registered for Qfly in table grapes or available under permit with consideration of export MRLs, and mixing and application rates.	Handouts prepared in consultation with ATGA	January	Distribution of information about ag chemicals registered for Qfly control or baiting, or permitted under permit. A page was prepared and given out at field days based on APVMA data from April 2019. The page did not have Hort Innovation logo. It did have a disclaimer.	Information distributed does not refer to MRLs. The information can be updated to refer to MRLs.
No shame associated with finding flies Data about population fluctuations is readily available	Qfly are everywhere in the district now, but you can keep them out of your fruit.	Data from DPI should be more available Mechanisms to share trap data at a sub-district level so that non-compliant growers start assuming that they also have flies		PFA loaded links about how growers request a PIC code so that they receive their local trap data. Ongoing discussions with Greater Sunraysia PFA about how TG growers can access trap data.	Table grape growers want to know when and how many flies are being found in grapes Growers don't know how to apply for a PIC code, which would let them receive local alerts. Those that have PIC codes are unclear whether silence between alerts means they are no longer receiving information or whether silence means there are no flies in traps. There was no advance on making DPI trap data more readily available. This needs further consideration as growers are asking for it.

Stakeholder SCOUTS					
Objectives	Message content	Delivery	By when, or frequency	Measure	Comment
Understand biology	Confident to trap and identify Qfly.	Workshop for scouts	Jan	The workshop – meeting for scouts was poorly attended. Some scouts attended the grower sessions instead, to support their clients. Some growers asked whether scouts could represent them at the workshop. Scouts were provided with Qfly information.	Scouts are already trapping and identifying Qfly. Workshop timing was not ideal for scouts as they have a regular schedule of properties to monitor and no option to booking extra activities in Dec-Jan. Scouts were generally well informed.
Have time to check traps in vineyards while they are monitoring export crops	It is practical and viable to check traps as part of contracts to service growers with monitoring for export protocols.	Provide fast ways to record and upload trap data and provide clear info about thresholds for spraying.	May	Scouts interested in collaborating and considering ways to aggregate their records.	Scouts are already trapping and identifying Qfly, and recommend treatments when they find Qfly. No advance yet on providing a platform to upload trap data.
Recommend baiting or cover sprays	Info on agchem products that are registered for Qfly in table grapes or available under permit with consideration of export MRLs, and mixing and application rates.	Handouts prepared in consultation with ATGA	May	Distribution of information about ag chemicals registered for Qfly control or baiting, or permitted under permit. A page was prepared and given out at field days based on APVMA data from April 2019. The page did not have Hort Innovation logo. It did have a disclaimer.	Information distributed does not refer to MRLs. The information can be updated to refer to MRLs.

Stakeholder RESELLERS					
Objectives	Message content	Delivery	By when, or frequency	Measure	Comment
Understand biology	Confident to talk about and identify Qfly.	Workshop for resellers	Jan	Two January workshops presented specifically for resellers. Sessions for resellers provided opportunities for resellers to ask questions and have discussion away from their grower-clients. This way they could freely ask questions rather than channeling clients' views or questions. Resellers received all the same handouts as the growers. Extra 'show bags' of information and traps given to Robinvale resellers for them to distribute to table grape growers.	Resellers previously had some but not all information. They responded well and were generally very positive with feedback about having sessions that were just for them. A vocal chemical rep in the audience during the Irymple reseller workshop pushed his product and was openly critical of other companies' products. Challenging the basic messages was not viewed by resellers/scouts/growers healthy scientific debate, but as undermining the main message, and annoying. A potentially similar situation was managed better at the May field days.
Understand differences between male and female traps for monitoring, MAT, baiting and cover spraying.	Take a trap to hang and check. See assembly of various male and female traps to understand differences and relevance of each.				
Can recommend baiting or cover sprays.	Info on agchem products that are registered for Qfly in table grapes or available under permit with consideration of export MRLs, and mixing and application rates.	Handouts given at workshops and emailed to growers.			

Stakeholder SPRAY MACHINERY DEALERS					
Objectives	Message content	Delivery	By when, or frequency	Measure	Comment
Dealers understand the challenges of bait spraying and offer a variety of suitable equipment	Dealers are important service providers to make baiting easy and effective. They sell nozzles, tanks, pumps, lines etc and assemble a range of small purpose-built sprayers.	Dealers are invited to workshops and other discussions to hear feedback re growers' experiences of bait spraying.	Dec-May	An equipment dealer provided the project team with names of growers who had purchased baiting sprayers. One dealer attended just one workshop. The one local equipment dealer who is making purpose-built bait sprayers (for citrus) was visited six times during the project. The aim of the visits/discussions was to engage then to re-think designs suited to table grape vineyards.	Equipment dealer became more engaged after being asked to help locate baiting equipment in commercial use, after visits to their store and after being invited to have input into the design of purpose built table grape bait sprayer. Dealers do not realise that growers are changing the set up on sprayers once they leave the dealer. Feedback to equipment dealers about testing of baiting equipment will help them to stay relevant.

Stakeholder TRAP AND BAIT SUPPLIERS					
Objectives	Message content	Delivery	By when, or frequency	Measure	Comment
Suppliers of traps and bait are able to meet grower demand for traps/bait and information.	Suppliers understand the position of growers regarding trapping and baiting and are able to supply information and male traps and bait.	Information and products (traps/bait) from a range of suppliers is available for growers to see-hold-discuss at workshops.	Dec-May	Examples of a range of traps were shown at field days and workshops. Suppliers were engaged and available to talk to growers about options. Growers know they can contact reps directly for information. Reps provide information about the retail prices of products. Workshops and field days were attended by companies making traps and baits: - AgNova (fruition, natflav, xantham) - Biotrap (hymlure, yellow traps, DDVP, xantham, FT mallets) - Barmac (Ceratrap traps, bait) - Corteva (Naturalure)	There was some discussion between bait/trap suppliers during workshops and field days about lack of evidence or science behind different baiting recommendations. This type of conversation is better kept private as it undermines the more important message (ie that growers need to act). Bait recommendations include applying with a 400-600 micron droplet. Droplets that large are not retained on vertical foliage. The biologists need to talk to spray application people to make sure that the delivery of bait will be efficacious.

Stakeholder HORT INNOVATION					
Objectives	Message content	Delivery	By when, or frequency	Measure	Comment
Distribute approved HI information	Distribute fliers,cards and posters to all TG growers.	Workshop materials and handouts distributed as a kit to workshop participants	Dec-May	Workshop handouts were predominantly Hort Innovation publications	There are two documents that are yet to gain Hort Innovation approval. They have been distributed with a private logo up to this point
HI aware of all project activity with TG growers	Messages sent to TG growers are consistent with HI messages.			Messages sent to TG growers are consistent with HI messages.	Table grape growers received a consistent message that matched the details in the Hort Innovation publications handed out.

Stakeholder DPI					
Objectives	Message content	Delivery	By when, or frequency	Measure	Comment
DPI aware of all project activity with TG growers	Messages sent to TG growers are consistent with DPI messages.	Discussion with DPI re availability of DPI trap data for table grape growers.	Dec-March	All information distributed to TG growers, and summary of the events have been provided to DPI via the PFA steering committee. DPI were invited to attend the December and January workshops. DPI attended in December but not in January.	Growers are still asking for timely data from the government traps. They have been told about registering for a PIC code as a way to receive data but few have PIC codes. More information from DPI to facilitate registration for PIC codes might be useful. The steering committee that continues a focus on Qfly in TG should include representation from DPI. Representation has not been arranged yet.

Stakeholder Greater Sunraysia PFA					
Objectives	Message content	Delivery	By when, or frequency	Measure	Comment
PFA aware of all project activity with TG growers	Messages sent to TG growers are consistent with PFA messages.	Collaboration with PFA on written material and workshop development	Dec-May	Staff from the Greater Sunraysia PFA attended the January workshops and helped coordinate the May field days. All information from all workshops has been shared with the PFA. The PFA uploaded information after the field days, when ATGA was without a communications staff person. This was very helpful.	The steering committee should be managed as a tablegrape subcommittee of the existing PFA committee. Collaboration was very effective. PFA budget covered catering costs at the May field days and also covered purchasing the hand lenses. Collaboration between the TG project and PFA enabled the PFA to engage with commercial growers in ways that they had previously found difficult. This was to the advantage of both projects.
Qfly facebook page	Link growers to the PFA facebook page	Growers engaged with PFA information via ATGA login	Dec-ongoing	The PFA uploaded information after the field days, when ATGA was without a communications staff person. This was very helpful.	ATGA are yet to load all the workshop and field day documents to the ATGA website. This is being arranged now.

Stakeholder ATGA					
Objectives	Message content	Delivery	By when, or frequency	Measure	Comment
ATGA aware of all project activity with TG growers	Messages sent to TG growers are consistent with ATGA messages.		Dec-May	ATGA aware of all project activity with TG growers	Rebecca Wells and Rowena Norris provided support throughout the project and Jeff Scott ATGA CEO was informed and attended facilitated workshops
ATGA collaborates to engage growers	Growers receive project information and invitations via ATGA so that there is unity in the messages.	Jeff Scott and Rowena Norris included in all communications.		ATGA collaborates to engage growers	ATGA used the grower database and website to invite all growers to workshops and field days.
growers see Qfly info on ATGA website	Grower portal contains industry relevant updates about Qfly.	Growers engaged with Qfly information via ATGA login	Jan-Feb	growers see Qfly info on ATGA website	Qfly information was loaded to the ATGA website
Scouts and growers can upload trap data to a common database so all growers can track population fluctuations	Scouts and growers load trap data to an industry database in return for trend data that triggers more trapping or baiting.	Progress dialogue between the ATGA, Scouts, PFA, Ag Victoria to facilitate wider and ongoing access by growers and scouts to trapping data	Progress towards this throughout project.	Scouts and growers can upload trap data to a common database so all growers can track population fluctuations	No advance on making scouts trap data more readily available. This warrants further consideration as growers are asking for it.

Recommendations

The recommendations from the project are found in the final report of TG18001. It has been highlighted that the engagement of the ATGA in coordinating the growers to participate in these workshop and field days has been beneficial. The ATGA commenced the initial workshops as compulsory attendance for any grower who was registered in their data base for exports. In total 246 growers attended. If not for the engagement of the ATGA and the influence behind compulsory attendance far fewer than 246 growers would have attended.

Recommendations from the workshops and field days as reported in TG18001 were as follows:

Industry must continue to find ways to normalise bait spraying, by giving recognition to lead growers who are baiting, and by encouraging openness about Qfly presence in grapes.

From the premise that growers are good at understanding complexity – commercial viticulture is very complex - recognize that growers arrive at their understanding via many small experiences. Area-wide management is complex. Continue to send and reinforce simple messages via multiple sources, so growers can gradually understand and assimilate each component of AWM into management, one piece at a time.

Identification

Consider a variety of ways to make magnification and identification easy because many growers and resellers struggle with using hand lenses.

Publish more photo guides showing examples of sting marks on grape berries, the subtle appearance of damage by larvae under berry skins, and berries split open to expose larvae.

Costs:

Growers protested about the cost of baiting and wanted comparative information about the costs of labour and chemicals for Qfly baiting or cover sprays. Growers need opportunities to compare the work rates (labour and machinery time and costs) of baiting with costs of cover spraying. The excel spreadsheet by Alison MacGregor that was given to growers at TG18001 field days should continue to be made available via the PFA and ATGA and given to pest scouts and agronomists.

Harmonise protocols for monitoring and treatment for export, ICA-20 and area-wide management

Growers know that baiting is not part of their protocol for exporting table grapes. For as long as cold treatment remains the export protocol requirement, growers will resist baiting, because it is an extra activity and not required yet for export.

Trap data and PIC (Property Identification Codes)

Make DPI trap data more readily available and with timely releases of the information. Table grape growers want to know when and how many flies are being found in grapes, or traps in or near vineyards.

Assist all table grape growers to apply for a PIC (Property Identification Code). Most growers didn't know how to apply for a PIC or that having a code would allow them to receive local alerts about Qfly numbers recorded in DPI traps near their vineyard.

Support Service Providers

Recognise that many pest scouts and agronomists have an excellent understanding of Qfly, are already trapping and identifying Qfly, are usually very practical and understand economic drivers of management. Growers, in turn, trust their pest scouts, and will treat vineyards as they are advised by the scout or agronomist. Scouts and agronomists therefore play a critical role in helping growers understand AWM; an adviser who understands the benefits of AWM will also encourage adoption.

Don't expect scouts to attend workshops just before or during harvest. Timing of workshops in TG18001 was not ideal for scouts as they have a regular schedule of properties to monitor and no option to booking extra activities in Dec-Jan.

Give agronomists and scouts a page with a step-by-step formula for AWM that they can share with their grower clients, particularly with clients who reject the notion of trapping or baiting.

Encourage contactors to offer baiting on vineyards. Note that growers will want some form of evidence that the baiting was done.

Maintain contact with equipment dealers as they design and assemble bait sprayers, so that they tailor the sprayers to vineyard spraying. Dealers don't realise that growers are changing the sprayer setup once they leave the dealer. Feedback to equipment dealers about testing of baiting equipment will dealers to make equipment more suited to vineyards.

New technologies

Commission an autonomous (robot) bait sprayer that can direct itself to specified (eg every 3rd) vine trunks in specified (eg alternate) rows, carrying a 100-litre tank containing bait. Being a relatively small and safe autonomous vehicle, this would be an ideal university project for a postgraduate or even undergraduate student.

Growers learn from growers

Incorporate 'growers teaching growers' into extension whenever possible. Feedback in TG18001 made it clear that growers respect the experiences of and information from other growers.

Chemical recommendations for control of Qfly in bait or cover sprays

Create a calendar of the sprays that growers apply to control light brown apple moth, mealybug, thrip, mites or other insect pests. Identify whether insecticide options against those pests are efficacious against Qfly. Identify where the intervals between those sprays are too long to provide protection against Qfly. Provide recommendations to the table grape industry regarding baiting in those identified windows. Growers at workshops felt that the option to bait between cover sprays was more reasonable than baiting concurrently to applying cover sprays.

Provide updated chemical lists that show which chemicals can be added to bait and/or used as cover sprays, and their relative costs in a Qfly program, and on the same document show the Australian and export MRLs. The project team of TG18001 intended to provide this list with MRLs, but getting accurate table grape MRL data for each insecticide in each export market was a task too large considering the scope of TG18001.

Review the droplet sizes recommended for spray baits (eg the recommendations to use a 400-600 micron droplet) as these may be contrary to information from nozzle manufacturers and spray technologists about optimum droplet size for spray retention on vertical surfaces. Retention trials would be quite easy and inexpensive to arrange.

Clarify which traps have equivalent purpose or mode of action and which traps have different purpose or mode of action.

Intellectual property, commercialisation and confidentiality

No project IP, project outputs, commercialisation or confidentiality issues to report.

Acknowledgements

Allison MacGregor – Project Leader of TG18001

Appendices

Appendix 1: Program logic model

Table 6: Program Logic Model

SIP Outcomes	Inputs	Outputs	Outcome / accomplishments		
		Strategies and participation	Short term	Medium term	Long term
Demand-building strategies and increased prices for Australian table grapes supported by improvements in product quality **Establish practices to enhance product quality throughout the value chain**		Promote integrated management of Qfly (trapping and baiting) consistent with Area Wide Management	Table grape growers use Qfly control strategies (trapping and baiting) that increase fruit quality and avoid any detectable residue on grapes at harvest.	Phytosanitary measures are consistent with the image of Australian grapes being high quality and clean and green, through integrated control of Qfly (trapping and spray baiting) in table grape vineyards and less reliance on harsh or persistent insecticides to control Qfly.	High product quality with minimum chemical input means that Australian table grapes remain in high demand in export markets.
Production efficiency improved and biosecurity threats mitigated by growers applying knowledge, skills and tools **Undertake R&D and extension to develop and promulgate improvements in productivity and efficiency across the value chain.**	Grower training in biology of Qfly and principles of AWM.	Seven workshops, eight field days, facebook promotion via the PFA, newsprint and radio media, and distribution of printed extension material.	Table grape growers recognise the importance of Area Wide Management of Qfly.	Table grape growers recognise the importance of Area Wide Management of Qfly.	Table grape growers engage with AWM and adopt integrated practices leading to production efficiency and reduced risk of Qfly being detected in exported fruit.
	Respond to grower feedback about barriers to adoption of Qfly management.	Work-Rate Calculator distributed to industry via the PFA and Australian table Grape Association.	Table grape growers consider the economic value of trapping and baiting compared to cover spraying.	Table grape growers experience cost savings and improved crop quality by trapping and baiting.	

Improved capability across the industry to implement improvements in supply and quality	Grower training in practical aspects of identification and management of Qfly, and adoption of AWM.	Extension activities and materials generated during the project (December 2018 to May 2019).	Extension material made available to growers attending the workshops and field days, and also to other growers who did not attend. Material promoted by the PFA and ATGA	Increased use of pest scouts or agronomists to spray bait for their clients.
Ensure growers and other members of the value chain are fully aware of industry developments.	Workshops focusing on training of pest scouts and chemical resellers	Two workshops for resellers and one for pest scouts to allow them to ask questions and gain deeper understanding of Qfly away from their clients.	Resellers and pest scouts provide better informed information to their grower clients.	

Appendix 2: Communication plan

Hort Innovation monitoring and evaluation

Table 7 Monitoring and evaluation – Audience and their information needs

Audience	Information need
Primary	
Project team	Information on the biology of Qfly, and principles of Area Wide Management Feedback from target audience (table grape growers) about barriers to adoption or engagement
Hort Innovation	Project progress reports and evidence of practice change.
Greater Sunraysia Pest Free Area	Collaboration to ensure consistency of extension messages being distributed
Secondary	
Growers	Information on the biology of Qfly, and principles of Area Wide Management
Pest scouts	Information on the biology of Qfly, and principles of Area Wide Management
Spray machinery sales outlets	Feedback about challenges associated with spraying fruit fly baits
Chemical Industry	Feedback about challenges associated with spraying fruit fly baits and trapping
Chemical resellers	Information on the biology of Qfly, and principles of Area Wide Management
Consultants and agronomists	Information on the biology of Qfly, and principles of Area Wide Management
Media	Updates on progress – good stories about table grape growers adopting AWM
Researchers and managers of similar programs for other horticultural crops	Communication about the project to other industries in the Greater Sunraysia Pest Free Area: Citrus, Stone fruit, Winegrape, Dried grape industries.

Communication Plan developed by the project team at project commencement

Table 8: Communication plan

Stakeholder	Objectives	Message content	Delivery	By when, or frequency
Growers	Take responsibility	Qfly management will become part of the export protocols. Let's make it as seamless as possible.	Workshop	Dec-Jan
	Understand Qfly biology	Simple calendar of activities for Qfly management so it becomes a normal part of every pest and disease management program and export hygiene program. Take a trap to hang and check. See assembly of various male and female traps to understand differences and relevance of each.	Workshop and follow up by scouts, AM and AJ. All participating growers receive a kit containing information from HI and a trap and FT mallet to attract and kill male flies in the trap.	Dec-Jan
	Confident to trap			
	Confident to identify Qfly	Have a hands on ID experience with backup material for ID of Qfly.		

	Confident to bait or use cover sprays	Have a hands on experience of the attractant, insecticide and application equipment		
	Consider trapping useful and willing to pay scouts or farm hands to check traps	Have an experience of using trap information to trigger baiting and reduction in flies population. Trapping and monitoring can be cost effective.	Evaluation of growers using traps, evaluation of scouts being asked to check traps.	Feb-May
	Consider baiting useful		Evaluation of growers using bait, evaluation of spray diaries	Feb-May
	Can access chemical information	Info on agchem products that are registered for Qfly in table grapes or available under permit with consideration of export MRLs , and mixing and application rates.	Handouts prepared in consultation with ATGA.	January (not ready in time for the Dec workshop)
	No shame associated with finding flies	Qfly are everywhere in the district now, but you can keep them out of your fruit.	Mechanisms to share trap data at a sub-district level so that non-compliant growers start assuming that they also have flies	project end
	Data about population fluctuations is readily available		Data from DPI should be more available.	
Scouts	Understand biology	Confident to trap and identify Qfly.	Workshop for scouts	Jan
	Have time to check traps in vineyards while they are monitoring export crops	It is practical and viable to check traps as part of contracts to service growers with monitoring for export protocols.	Provide fast ways to record and upload trap data and clear info on thresholds for spraying.	project end
	Recommend baiting or cover sprays	Info on agchem products that are registered for Qfly in table grapes or available under permit with consideration of export MRLs , and mixing and application rates.	Handouts prepared in consultation with ATGA.	January (not ready in time for the Dec workshop)
Resellers	Understand biology	Confident to talk about and identify Qfly.	Workshop for resellers	January
	Understand differences between male and female traps for monitoring, MAT, baiting and cover spraying.	Take a trap to hang and check. See assembly of various male and female traps to understand differences and relevance of each.		
	Can recommend baiting or cover sprays.	Info on agchem products that are registered for Qfly in table grapes or available under permit with consideration of export MRLs , and mixing and application rates.	Handouts given at workshops and emailed to growers.	
Spray machinery dealers	Dealers understand the challenges of bait spraying and have range of equipment	Dealers are important service providers to make baiting easy and effective. They sell nozzles, tanks, pumps, lines	Dealers are invited to workshops and other discussions to hear feedback	Dec-May

		etc and assemble a range of small purpose-built sprayers.	re growers experiences of bait spraying.	
Trap and bait suppliers	Suppliers of traps and bait are able to meet grower demand for traps/bait and information.	Suppliers understand the position of growers regarding trapping and baiting and are able to supply information and male traps and bait.	Information and products (traps/bait) from a range of suppliers is available for growers to see-hold-discuss at workshops.	Dec-Feb
DPI	DPI aware of all project activity with TG growers	Messages sent to TG growers are consistent with DPI messages.	Discussion with DPI re availability of DPI trap data for table grape growers.	Dec-March
PFA	PFA aware of all project activity with TG growers	Messages sent to TG growers are consistent with PFA messages.	Collaboration with PFA on written material and workshop development	Dec-March
	Qfly facebook page	Link growers to the PFA facebook page	Growers engaged with PFA information via ATGA login	Jan-Feb
ATGA	ATGA aware of all project activity with TG growers	Messages sent to TG growers are consistent with ATGA messages.		Dec-May
	ATGA collaborates to engage growers	Growers receive project information and invitations via ATGA so that there is unity in the messages.	Jeff Scott and Rowena Norris included in all communications.	
	growers see Qfly info on ATGA website	Grower portal contains industry relevant updates about Qfly.	Growers engaged with Qfly information via ATGA login	Jan-Feb
	Scouts and growers can upload trap data to a common database so all growers can track population fluctuations	Scouts and growers load trap data to an industry database in return for trend data that triggers more trapping or baiting.	Progress dialogue between the ATGA, Scouts, PFA, Ag Victoria to facilitate wider and ongoing access by growers and scouts to trapping data.	Progress towards this throughout project.
Hort Innovation	Distribute approved HI information	Distribute fliers,cards and posters to all TG growers.	Workshop materials and handouts distributed as a kit to workshop participants	Dec-May
	HI aware of all project activity with TG growers	Messages sent to TG growers are consistent with HI messages.		

Appendix 3: Factsheets and other items provided in the 'showbag' for participants

Not included in this appendix:

Two A2 size posters published in collaboration with Hort Innovation

- Queensland Fruit Fly, What can I do?
- Is it Queensland Fruit Fly?

Figure 1: Kit containing a Biotrap V2 X trap, male attractant FT Mallet, Qfly ID card, and other handouts and posters prepared for distribution to w

Monitor & manage QLD fruit fly quick guide

- Fruit is most susceptible from the start of colourbreak (April/May); active management throughout the season ensures low numbers at high risk periods. Over mature fruit (i.e. missed during harvest) is highly susceptible.

Citrus Australia | NSW Local Land Services Western | NSW Department of Primary Industries

Monitor & manage QLD fruit fly quick guide

- Fruit is most susceptible from the start of colourbreak (April/May); active management throughout the season ensures low numbers at high risk periods. Over mature fruit (i.e. missed during harvest) is highly susceptible.
- Place a male trap at head height every 300 to 450m or 10-20 ha and in high risk areas (i.e. shed, house garden, neighbouring property). Male traps are better at attracting flies from a broader distance (> 100 m downwind) than female traps (10 m). Monitor and record traps every week from Nov. to May and fortnightly from June to Oct..
  - One sporadic male fly might be a solitary traveller; be on high alert or bait spray in trending or risky situations.
  - More than one male fly can indicate a local problem and a need to bait spray; check records and assess.
    - Try to identify the source by installing additional traps (i.e. four corners of the orchard) and look for alternative hosts; treat accordingly (e.g. remove rouge fruit tree and/or clean up fruit).
    - Rake or sweep fallen fruit from under trees into the inter-row and mulch fruit.
    - Bait spraying: weekly bait spray for at least 4 weeks across the orchard since the last detection (ideally bait spray for a 1.5 km radius and encourage participation from neighbouring properties). Pencil/stream nozzle aimed at waist height, best during mild conditions, every second row, apply 15-20L of mixture per ha.
    - Additional action can be installing male annihilation pads (MAT) in the orchard or on the boundary row.

More information: NSW LLS (Gregory Moulds 0427 311 445) or NSW DPI citrus plant protection guide. (Ver 1.1 2017)

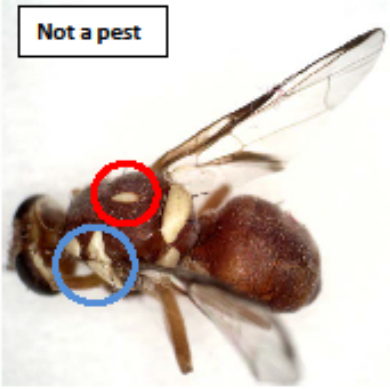
Guide to common flies caught in traps

Queensland fruit fly

Horizontal "GT" stripes (blue circle). Wings are all clear and abdomen has a yellow band.

Use a 10 X hand lens

Not a pest



Newman fly

Vertical "tiger" stripes (blue circle). Yellow tear dot mark often on back (red circle). Wings have a black tip and abdomen is all brown.

Not a pest

Island fly

Wings are distinctly mottled black. Predominately found in female traps.

Queensland Fruit Fly

Why manage?
To produce clean, marketable fruit

What is Qfly, and why do I need to manage it?

In Australia there are two main species of fruit flies; Queensland Fruit Fly (*Bactrocera tryoni*) and Mediterranean Fruit Fly (*Ceratitis capitata*). Queensland Fruit Fly (Qfly) occurs in the east (in parts of Northern Territory, Queensland, New South Wales and Victoria) and Mediterranean Fruit Fly occurs only in the west (in parts of Western Australia).

Qfly is mobile, over short distances only, and has the ability to move from vineyard to vineyard for example, or from native or urban hosts into commercial production areas. The wide host range, or polyphagous, nature of Qfly makes management over large areas difficult; Qfly has over 100 known plant hosts.

Qfly is native to Australia, but is a serious insect pest of Australian horticulture. Having a large host range means that more than three quarters of Australian fruit and vegetable exports are susceptible. With available management efforts, estimates of production losses in endemic areas range from 0.5% to 3% annually but without control, production losses due to Qfly can be much higher.

Adult female flies lay eggs into maturing fruit, which hatch inside the fruit and the larva feed within the fruit. When the female 'stings' the fruit to lay eggs, a wound or 'sting' mark can result.

It is important to manage Qfly in field, to produce clean and marketable fruit.

Management Objectives

To produce clean, marketable fruit

To increase buyer confidence

To underpin market access

To contribute to AWM

To progress regional fruit fly status

Adult fly 'stings' and larval damage.
Photo: A. Loch

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SITplus. Australian Government Department of Agriculture and Water Resources Hort Innovation CSIRO hort frontiers Strategic partnership initiative FRUIT FLY FUND

Queensland Fruit Fly

Management challenges
To produce clean, marketable fruit

Managing Qfly across a region can be challenging;

- **Qfly are polyphagous**; the flies are capable of laying eggs into the fruits of many different plant types; they have a very large host range.
  This means Qfly are a problem to many of the horticultural industries we have in Australia. Qfly could be present not just on your property but also on your neighbours - even if they are growing something different. Urban areas provide host plants for Qfly too. That's why an area wide approach is ideal, it considers everywhere that Qfly might be.

- **Qfly are mobile**; the flies are capable of moving (short distances only).
  This means that even with appropriate management within a vineyard the flies can still be close by (and fly in from surrounding orchards, native vegetation or urban fruit trees). Extra resources are required to approach fruit fly management on an area-wide or regional basis. Be proactive and look around for where Qfly might be, work with your neighbours so that everyone benefits.

- **Qfly are multivoltine**; the flies can have multiple lifecycles each year.
  This means they can be a problem to manage because there could be different life stages to manage, and incomplete management impacts on the ability to keep fly numbers down. In some horticultural production regions, Qfly could have up to 5 generations a year, so management throughout the season is important; from before flies emerge through to postharvest clean up.

- **Qfly have a large geographic and climatic range**; the flies are present throughout parts of the Eastern states of Australia, except Tasmania.
  Qfly survive under a range of temperatures and conditions. Do you have conditions suitable for Qfly? Check and see if there are flies being detected in your region. If so, be proactive and manage early even if you haven't seen any flies yourself.

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Qfly Lifecycle and ID

Know your pest
To produce clean, marketable fruit

Adult Qfly

The adult Qfly can be up to 8 mm long, with a red to dark brown body. The fly has a narrow waist between the thorax and the abdomen, and the thorax is patterned with cream to yellow shoulder markings and stripes. The wings are transparent. The female can be identified by the ovipositer, or 'sting' at the base.

Qfly can overwinter as adults, becoming active again as temperatures increase. After emerging from pupae, or from overwintering, protein and sugar sources are required for sexual maturation, and egg maturation after mating. Flies can occasionally been seen walking around plants early in the morning looking for protein, but rest during the hottest part of the day, usually within leafy canopies. Mating occurs at dusk and female flies generally only mate once, but can mate multiple times.

Eggs are laid about 2 days post-mating with up to 20 eggs being laid into maturing fruit still on the tree or vine, not rotten fruit on the ground. **Adults can live for several months, depending on environmental conditions and food availability.**

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Monitoring

Monitoring Qfly
To produce clean, marketable fruit

Why monitor?

On your own property you can monitor Qfly yourself to get an idea about the general trends in the Qfly population over time, rather than measuring the population at a particular point in time. It's still difficult to know from trap catch numbers exactly how many flies you might be dealing with in your immediate area, or predict what Qfly numbers will be in one season. Monitoring over time using traps can indicate if Qfly arrives from outside the area, or from spring emergence.

Across your region, monitoring Qfly over time, across your defined area, will give you some really good information on how the fly behaves in your region, where to focus efforts, and enable you to assess the impact of your efforts over time.

You may also have a government monitoring trapping network in your region – see over the page for more information.

How does monitoring work?

In general, traps used for monitoring on farm are those traps targeting the male fly population. These are non-sticky, pot-type traps made of clear plastic. A lure is used to attract the Qfly to the trap (FT Cuelure). The trap contains a toxicant so once the fly is inside the trap it dies and remains in the trap so you can check the trap regularly and count the Qflies.

Tips for success

- Place traps within host plants
- Place traps within the canopy, avoiding areas that get very hot
- Place traps at about 1.5-2m high
- Replace lures and toxicants as recommended
- Use a network of traps, not just one
- Check traps regularly, empty and record numbers

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Male Annihilation Technique

Adding MAT to your Qfly management
To produce clean, marketable fruit

What is MAT?

MAT is an 'attract and kill' strategy for male flies. The aim is to reduce male fly populations to low levels, reducing the mating opportunities for females. There are several different MAT types available, different shapes and sizes, and with different insecticides.

How does it work?

MAT involves the distribution of MAT 'stations' or 'cups' that attract male flies with the male fly attractant cue-lure. The stations also contain an insecticide. The flies feed upon the MAT and are killed.

How is it applied?

MAT are usually placed throughout the block at a density of up to 20/hectare from Spring through to Autumn (e.g. August, November & February). MAT can also be used around the perimeter of the property or block, to reduce the number of male flies entering. MAT typically need replacing every 3-4 months, check the label requirements. In areas with winter trap catches MAT may be useful throughout the year.

Tips for success

- Increasingly effective over large areas
- Replace as recommended (on label)
- Use when Qfly is present in the region
- Use in combination with bait and hygiene

NOTE: CueLure will impact on Lynfield traps used in export trapping networks; if you plan to export please check if there are any limits to the use of in-field MAT. Contact your state government department for more information.

MAT stations
Photos: AHR fruit fly booklet, Bugsforbugs

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Hygiene

Management at a larger scale
To produce clean, marketable fruit

What is hygiene?

Hygiene means keeping your property, including all vineyards, orchards, garden spaces and other non-crop areas clean and free from unmanaged fruit that might be harbouring fruit fly. This reduces the fly's ability to live and reproduce in the landscape and is critical to preventing fruit flies becoming established in your area.

How does it work?

Hygiene works by you removing all possible places that the fly can complete its life cycle (except your commercial crop of course). This means picking all berries from the vine post-harvest, and picking up any infested berries that have dropped to the ground. It is important to then dispose of the berries appropriately. Contact your local council or state department for further advice.

Removing any unwanted or neglected hosts is also crucial, as these are potential breeding sites for Qfly – then you will not have to worry about them. If you have wind breaks, or other trees in the vineyard that are Qfly hosts, keep them to a manageable height so you can pick all the fruit from them too.

Hygiene also refers to on-farm biosecurity practices that prevent Qfly from entering a property from the start. Do you have an on-farm biosecurity plan?

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Protein Bait Spray

Adding Bait Sprays to Qfly management
To produce clean, marketable fruit

What is a bait spray?

A bait spray consists of a protein source (such as a yeast autolysate) and an insecticide. The sprays can be strategically commenced to match the emergence of flies after winter, and to protect ripening berries as they become more susceptible to Qfly attack. The advantage of bait spray is that it is a targeted spray with minimal effect on non-target organisms such as beneficial insects.

How does it work?

Bait sprays attract and kill Qfly. Both male and female Qfly need protein in order to sexually mature. Female flies are especially attracted to the protein during maturation and egg development, and when feeding on the protein come in contact with the insecticide.

How is it applied?

Generally bait sprays are applied to the trunk or foliage of trees (where the Qfly is likely to be active) but in vineyards bait sprays can be applied as a series of spot or strip sprays to the upper part of the trellis, using a jet stream nozzle for example. Sprays should avoid contacting fruit, preventing any residue concerns and any fruit damage. Follow the recommendations on the label, and record any sprays. The activity of bait sprays is generally short lived, especially during periods of high temperatures or rainfall. Repeat applications may be required in this case. Frequency of sprays can be adjusted according to risk.

Recommendations usually prescribe application for 6-8 weeks prior to harvest to protect maturing fruit, but best results for managing the pest are achieved when bait applications commence early in the season (matching the first emergence of Qfly) and when applications are consistent. Vineyards may be neighbouring other crops that mature earlier, or an urban setting where there are early hosts and where flies are active earlier. Look around, monitor and make sure you manage proactively before any flies move in.

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Area wide management

Management at a larger scale
To produce clean, marketable fruit

What is area wide management?

AWM is a pest management strategy employed across a well-defined local area or region, that includes a suite of management tools targeting all fly habitats within that area, in order to reduce the total Qfly population. A reduced population in all habitats reduces the likelihood of Qfly moving into vineyards and orchards from habitats such as backyard gardens and/or native hosts. AWM is an ideal approach for mobile pests such as Qfly.

Ensuring all habitats within an area are appropriately managed is not an easy task; AWM requires that any and all control methods are coordinated. In Australia hygiene, MAT, and bait sprays are available for use, and suitable in many crop types. Finding the best suite of methods for your area takes time and planning. Methods are consistent across AWM programs worldwide, relying primarily on **hygiene**, **bait sprays**, and **MAT**, and sometimes with additional tactics (biocontrol agents and SIT).

AWM is a long-term undertaking, for long-term solutions.

Tips for success

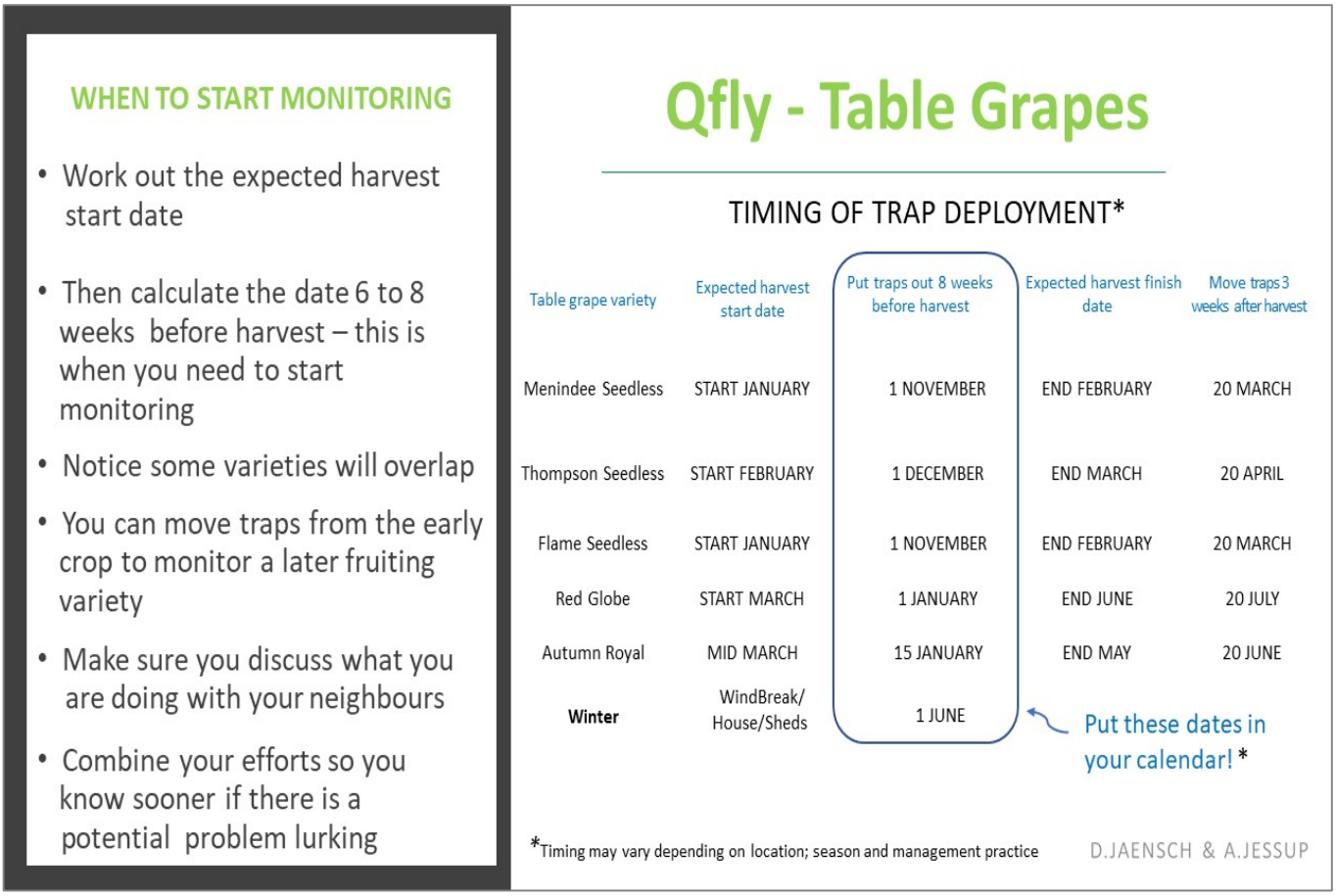
Know your pest – understand Qfly biology and behaviour
Know your land – find out where all the Qfly host plants are, and habitat in your region
Know your neighbours – make sure everyone is involved – Qfly doesn't discriminate!

What is SIT?

SIT involves the release of large numbers of sterile male fruit flies. These sterile flies outnumber the wild male population limiting the opportunity for wild females to mate with wild males. The outcome of this is that the wild females will not produce viable offspring, and the population is progressively suppressed. SIT works best once the fly population is at a stable low level, making it a valuable tool within an existing AWM approach, not a stand-alone tactic. To learn more about implementing AWM programs that can incorporate the use of SIT visit the areawidemanagement.com.au website.

visit **www.areawidemanagement.com.au** to learn more

SITplus. Australian Government Department of Agriculture and Water Resources Hort Innovation CSIRO hort frontiers Strategic partnership initiative FRUIT FLY FUND


WHEN TO START MONITORING
• Work out the expected harvest start date
• Then calculate the date 6 to 8 weeks before harvest – this is when you need to start monitoring
• Notice some varieties will overlap
• You can move traps from the early crop to monitor a later fruiting variety
• Make sure you discuss what you are doing with your neighbours
• Combine your efforts so you know sooner if there is a potential problem lurking
Qfly - Table Grapes
TIMING OF TRAP DEPLOYMENT*
Table grape variety
Expected harvest start date
Put traps out 8 weeks before harvest
Expected harvest finish date
Move traps 3 weeks after harvest
Menindee Seedless
START JANUARY
1 NOVEMBER
END FEBRUARY
20 MARCH
Thompson Seedless
START FEBRUARY
1 DECEMBER
END MARCH
20 APRIL
Flame Seedless
START JANUARY
1 NOVEMBER
END FEBRUARY
20 MARCH
Red Globe
START MARCH
1 JANUARY
END JUNE
20 JULY
Autumn Royal
MID MARCH
15 JANUARY
END MAY
20 JUNE
Winter
WindBreak/ House/Sheds
1 JUNE
Put these dates in your calendar! *
*Timing may vary depending on location; season and management practice
D.JAENSCH & A.JESSUP

snaptrap http://www.snaptrap.com.au/#camera

HI-RES SNAPTRAP CAMERA IMAGES

Review trap contents online. Zoom in to see all the detail. Flag photos of new insects. Copy photos into your pest monitoring apps.

FITS STANDARD INSECT TRAPS

Snaptrap smart-trap boxes fit onto standard code-of-practice traps used for insect monitoring.

SENSORS & MODELLING

Snaptrap smart-traps log temperature, humidity, air pressure and more. This helps you analyse insect behaviour and plan pest control costs.
Snaptrap's software provides lifecycle modelling, chill accumulation and other decision information.

REVIEW ANYWHERE ANYTIME

Snaptrap lets you review current and historical images, anywhere, anytime. Delegate monitoring and supervision.
Save daylight hours for more important work.

SOLAR, WIRELESS

Snaptrap smart traps run on solar power and use the mobile phone network so you can use them almost anywhere. They work even in very low signal locations. You can analyse patterns over your orchard blocks, and over wider regions.

Figure 2: Growers received a hand lens magnifier that clips onto a 'smart phone', turning the phone camera into a microscope. The magnified image can be saved in a photo of video.

Appendix 4: Example workshop invitations

The example shown below was duplicated for the December and January workshops.

Text was adjusted to each target audience (growers, or resellers or scouts, Mildura or Robinvale).

Australian Table Grape Association Inc.

Area Wide management of Queensland Fruit Fly
Table Grape Workshop

7:30	Breakfast
8:15	Why are pest fruit flies a problem to grape production and marketing? How to monitor for presence of pest fruit flies and for build-up of fruit fly populations What to look for and where
	Baiting and cover spays
	Area Wide management
	Post harvest treatments
9:30	Vineyard demonstrations of trapping and baiting
10:30	Summary and close
Presenters	Andrew Jessup, JANREN CONSULTING, and Alison MacGregor

Date and Location

Tuesday 11th December
186 Morpung Ave
Irymple

(property of Pat Zappia)

Register now

Phone 0419 229 713 (Alison MacGregor)

email atga@ncable.com.au

A MacGregor

JANREN CONSULTING

Hort Innovation






Australian Table Grape Association Inc.

Area Wide Management of Queensland Fruit Fly
Table Grape Workshop

12:30	Lunch
1:00	Why are pest fruit flies a problem to grape production and marketing?
	How to monitor for presence of pest fruit flies and for build-up of fruit fly populations
	What to look for and where
	Baiting and cover spays
	Area Wide Management
	Post-harvest treatments
2:15	Vineyard demonstrations of trapping and baiting
3:15	Summary and close
Presenters	Andrew Jessup, JANREN CONSULTING, and Alison MacGregor

Date and Location

Tuesday 11th December
698 Anzac Road
Robinvale

(property of Fred Tassone)

Register now

Phone 0419 229 713 (Alison MacGregor)

email jscott@atga.net.au

A MacGregor

JANREN CONSULTING

Hort Innovation

Appendix 5: Work rates calculator to compare cost of cover spraying against cost of baiting

Will you bait spray or cover spray Qfly this season? How long will it take and what is the labour cost?

Labour represents a significant cost in the annual pest and disease program. This calculator helps you compare workrates and costs of different scenarios. Comparison can be made per hectare or per orchard or per season or per operator or per application.

eg cover spray: 1000L/ha, 6.7 kph, 4 sprays/yr			eg bait spray: 15L/ha, 14.5 kph, 10 bait sprays/yr		
Treatment area	25	hectares	Treatment area	25	hectares
Pump capacity	160	L/min	Pump capacity	4	L/min
Nozzles	L/min	number	Nozzles	L/min	number
Flow rate and how many	2	8	*Flow rate and how many*	1.2	2
Flow rate and how many	1.5	10	*Flow rate and how many*		
Flow rate and how many	0.7	8	*Flow rate and how many*		
Tank volume	2000	L	Tank volume	100	L
Row spacing	3.3	m	Row spacing	3.3	m
Volume applied	1000	L/ha	Volume applied	15	L/ha
Rows sprayed	drive every row		Rows sprayed	drive every second row	
Labour and machinery cost	$60.00	$/hour	Labour and machinery cost	$40.00	$/hour
Time to refill tank	20	minutes	Time to refill tank	15	minutes
Number of treatments	4	sprays/year	Number of treatments	10	sprays/year
Per treatment			**Per treatment**		
Travel speed	6.7	km/hr	Travel speed	14.5	km/hr
Time spraying/ha	0.52	hrs/ha	Time spraying/ha	0.12	hrs/ha
Total job time (incl refills)	17.3	hrs/patch	Total job time (incl refills)	3.9	hrs/patch
Labour cost	$1,036	$/patch	Labour cost	$157	$/patch
Dilute volume required	25,000	L	Dilute volume required	375	L
Tanks required	12.5	tanks	Tanks required	3.8	tanks
Per year			**Per year**		
Labour cost per year	$4,142	$/patch/yr	Labour cost per year	$1,573	$/patch/yr

Disclaimer: This sheet was prepared by independent consultant Alison MacGregor to illustrate the effect on work-rates and labour costs of varying aspects of the spray operation. Scenarios derived in this sheet do not represent recomendations. No person should act based on the contents of this sheet without obtaining specific, independent professional advice in respect of this information, taking into account your individual circumstances and objectives.

A MacGregor

Alison MacGregor | Horticultural and Viticultural Services | ABN: 86 548 568 861
T: 0419 229 713 | PO Box 1979 Mildura VIC 3502

Figure 3: Example printout from work rates calculator (Microsoft Excel) designed to compare spraying scenarios eg cover spraying costs (left) with bait spraying costs (right).

Appendix 6: Article published in The Vine, July 2019

Bait vs cover-spray cost calculator

Which is more cost effective for Queensland fruit fly control in table grapes - bait spraying or cover spraying? How long will it take, and what is the labour cost? These were questions raised by table grape growers at recent Qfly workshops.

Queensland fruit fly is a pest of concern to the table grape industry as was attested to by the high attendance at a series of thirteen workshops focusing on management of the pest. Held in Mildura, Robinvale and Woorinen between December and May, the workshops were funded by the Hort Innovation Table Grape Fund in collaboration with the Australian Table Grape Association (ATGA) and the Greater Sunraysia Pest Free Areas.

Consultant Alison MacGregor helped organise the workshops, and listened to growers' feedback.

"Labour already represents a significant cost in the annual pest and disease program and growers are worried that Qfly control adds an extra labour cost." she said. "Before they start treating Qfly, growers want to know what the outlay will be, for using cover sprays or bait sprays to control Qfly."

"Cover-spraying appeals to some growers because insecticide treatments are part of their regular pest and disease program. Certainly when a Qfly treatment coincides with an insecticide spray for mealybug or light brown apply moth, then it makes sense to cover spray. But if you are just treating Qfly, then bait spraying can be a much quicker and cheaper option – and doesn't leave residue on bunches and doesn't upset your IPM program".

To help growers work out how long it takes, to either cover spray or bait spray, and what the associated costs in wages and machinery are, Ms MacGregor created a simple Chemical Work-Rate Calculator.

Ms MacGregor said the aim of the calculator was to be very simple and offer comparisons; per hectare, per orchard, per season, per operator, or per application.

"Its really easy! You enter the size of your treatment area, and spray volume and pump capacity, and what labour costs into the beige boxes in the program. The program then automatically calculates out how long you will spend spraying and how much it will cost in labour, with the figures appearing below in the blue boxes."

The calculator and other information from the Qfly workshops and field days can be downloaded from the Australian Table Grape Association website http://www.australiangrapes.com.au/category/tools-resources/ , or from the pest-free area website, https://www.pestfreearea.com.au/baitsprayfieldday.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The calculator is an Excel worksheet with four colour-coded worksheets – an instruction page, a worksheet for your own business and two example sheets.

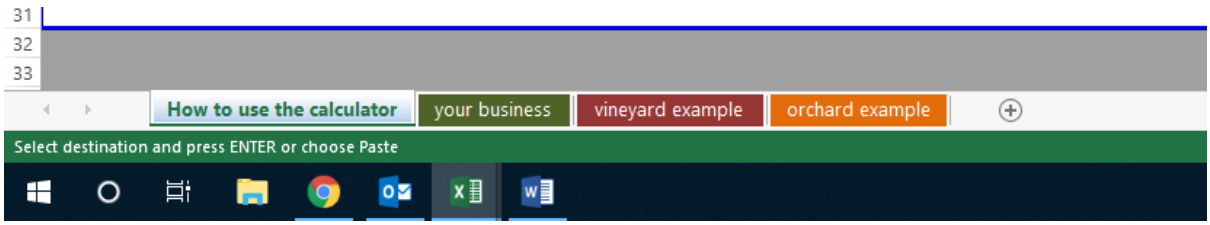

Figure 4: Click on the tabs at the bottom of the screen to move between the instructions, your own worksheet, and some examples.

The program should open on the home page How to use the calculator. To access the different worksheets simply click on the coloured tab at the bottom of the screen.

Information in the Vineyard (red tab) and Orchard (orange tab) examples cannot be changed.

To enter your information click on the green 'Your Business' tab at the bottom of the screen. Fill in the beige boxes and see your results appear in the blue boxes at the bottom of the page.

Try one scenario in this column (eg a high volume spray using the tractor)

Compare it with a different set up in this column eg a low-volume bait spray

eg cover spray: 1000L/ha, 6.7 kph, 4 sprays/yr			eg bait spray: 15L/ha, 14.5 kph, 10 bait sprays/yr		
Treatment area	25	hectares	Treatment area	25	hectares
Pump capacity	160	L/min	Pump capacity	4	L/min
Nozzles	L/min	number	Nozzles	L/min	number
Flow rate and how many	2	8	*Flow rate and how many*	1.2	2
Flow rate and how many	1.5	10	*Flow rate and how many*		
Flow rate and how many	0.7	8	*Flow rate and how many*		
Tank volume	2000	L	Tank volume	100	L
Row spacing	3.3	m	Row spacing	3.3	m
Volume applied	1000	L/ha	Volume applied	15	L/ha
Rows sprayed	drive every row		Rows sprayed	drive every second row	
Labour and machinery cost	$60.00	$/hour	Labour and machinery cost	$40.00	$/hour
Time to refill tank	20	minutes	Time to refill tank	15	minutes
Number of treatments	4	sprays/year	Number of treatments	10	sprays/year
Per treatment			**Per treatment**		
Travel speed	6.7	km/hr	Travel speed	14.5	km/hr
Time spraying/ha	0.52	hrs/ha	Time spraying/ha	0.12	hrs/ha
Total job time (incl refills)	17.3	hrs/patch	Total job time (incl refills)	3.9	hrs/patch
Labour cost	$1,036	$/patch	Labour cost	$157	$/patch
Dilute volume required	25,000	L	Dilute volume required	375	L
Tanks required	12.5	tanks	Tanks required	3.8	tanks
Per year			**Per year**		
Labour cost per year	$4,142	$/patch/yr	**Labour cost per year**	$1,573	$/patch/yr

Ms MacGregor said the program had inbuilt safeguards to ensure its accuracy. For example, a warning will appear if the inputted pump capacity is less than the flow from the nozzles.

The calculator assumes patches are square, then takes into consideration the fact that turning at ends of rows and spraying one side only along the boundary of a patch both add to spraying time, and also that larger patches have less edge and row end. The calculator accounts for turning and boundary rows, by adding 15% spraying time to treatment areas smaller than 500 hectares, and 2% to treatment areas larger than 500 hectares.

Disclaimer: The Chemical Work-Rate Calculator was prepared by independent consultant Alison MacGregor to illustrate the effect on work-rates and labour costs of varying aspects of the spray operation. Scenarios derived in this sheet do not represent recommendations. No person should act based on the contents of this sheet without obtaining specific, independent professional advice in respect of this information, taking into account your individual circumstances and objectives.

Appendix 7: Media

MEDIA RELEASE

Table grape growers using inventiveness to fight fruit fly

Publication date: 23 April 2019

Caption: Peter Argiro's self-rigged spray unit for fighting fruit fly on his Merbein table grape property.

A TABLE GRAPE grower from Sunraysia has built a new rig that applies bait spray for fruit fly in an innovative attempt to reduce pest management costs on his farm.

Peter Argiro and his family run a 100-hectare vineyard in Merbein, Victoria.

He said foliar spraying each vine from the tractor was a timely and costly process, therefore he designed the new rig out of a necessity to find a faster and economical way to bait the property.

"We had an understanding of the units out there but hadn't found something to meet our "needs, so we decided to design our own rig," he said.

"The main thing was making it adjustable, to fit through our different vine canopies.

"Once we had the design, it took us about four hours to hook up a small tank and electric pump to adjustable arms. This allows us to get across large areas quickly and at much less cost than before."

Mr Argiro new unit will feature at a field day event to be held in early May.

Through a Hort Innovation funded table grape project, the Australian Table Grape Association in collaboration with the Greater Sunraysia Pest Free Area will run six (6) field events across the region.

This field days will give Victorian growers a chance to see new innovations to baiting and spray rigs currently in operation.

Hort Innovation funded project coordinator Alison MacGregor is helping to coordinate the field days and connect with growers on the ground to discuss innovative techniques to spraying that can best service farms.

“Growers are great inventors. Their designs are practical, and they are inspired by their experience,” she said.

“It is my hope that the field days inspire growers to think about what rig design could work best for them on their property.”

The field days are the Wednesday 1, Thursday 2 and Friday 3 of May and are supported by the Australian Table Grape Association, Hort Innovation, using the table grape R&D levy and funds from the Australian Government and the Sunraysia Pest Free Area.

For more information or to register, please see www.pestfreearea.com.au or call 03 5022 0327

Appendix 8: Photographs

Figure 5: Single example (left) and set of boxes (below) of pest and non-pest flies (Queensland fruit fly, Newman Fly and Island Fruit Fly) available for demonstration at table grape grower workshops.

Boxes were provided by Deidre Jaensch of the Greater Sunraysia Pest Free Area, Madden Ave Mildura.

Figure 6: 93 growers attended the first workshop, in Irymple

Figure 7: Growers hearing from Pat Zappia about his equipment and method of applying bait

Figure 8: The workshop provided growers with an opportunity to look closely at Qfly and other flies.

Photos taken at the May field days by Rebecca Wells, Australian table Grape Association

Figure 9: Qfly baiting field days, May 2019

Figure 10: Demonstrating the OCP 'Splatogator' and SPLAT baiting

Figure 11: Three point linkage mounted sprayers (left) and close up of the jets (right).

Figure 12: Examples of ATV or UTV baiting units at the field days.

Appendix 9: Evaluation – Feedback from follow-up interviews with growers and service providers

Table 9: Summary feedback from interviews with table grape growers about adoption, practice change and extension of project TG18001 and TG 18002

Questions		Responses
Had you previously done any baiting or cover spraying specifically for Qfly?	A	No, we are not baiting and don't use any specific Qfly sprays. We have six yellow traps on 40 acres. We need new ones in spring because they got trashed by the cane stripper. We saw no flies this year. Previously we have had lots of flies in traps but we never sprayed specially for Qfly. We want to steer away from yet another tractor spray.
	B	No. We have a scout who puts out traps and checks them. She has never found any Qfly in our vineyard. We just seem to be lucky. We have figs as well and we have never even had Qfly in the figs.
	C	Yes, a few years ago when we were sending fruit to South Australia we were monitoring traps and trap baiting, as per the ICA-20. But not since the declaration 5 years ago, and not since we started sending all our fruit to China, because the China protocol is fully met by cool storage.
	D	No previous baiting or specific Qfly management in the commercial table grapes (12 acres) or dried fruit. In trees, yes I have used bait and samurai, with 90% success, in 30 fruit trees (our fruit salad domestic orchard). Even with baiting and spraying, the flies still appeared towards the end of the season. Otherwise (*if I dont bait/use samurai*) the fruit is riddled with flies. The neighbor has a fruit salad orchard and won't treat with anything. There are Government traps on our property, and I know that there are Qfly in those traps, and I see Qfly in the (domestic, fruit salad) orchard. I know they are there.
	E	Yes we have been baiting with a hand wand, but not the whole vineyard. We have to start baiting a much larger area now.
	F	We have to bait to comply with the ICA-20 to send fruit to South Australia.
What do you remember most about the Qfly workshops or field days?	A	I was amazed to find out how far they will travel. 200 m for a male. Also how they reproduce.
	B	From the (*Dec*) workshop, I realized that if you have citrus nearby its probably more of an issue. At the (*May*) field day, we saw that there are lots of options (*for baiting*), which is good.
	C	Probably the most interesting thing, in terms of increasing adoption, was seeing how we can cover more land with less product – streamlining. Economics is everything! For growers to adopt any new idea, it has to be easy and have a cost benefit.
	D	I need to do something. There are so many options - it's a bit overwhelming. I will employ a scout because I want help deciding what will actually solve this situation. The wife will be so happy if her fruit salad orchard is clear of Qfly.

	E	It was good when Rachel spoke about what she has seen in table grapes. It was good that she used real vineyard examples. That took me by surprise. Also finding out that the flies are seen in the early varieties and that they are most active when the season first warms up. Hearing that she even found flies last year, in vineyards that are sprayed. And finding out that it's also in citrus and stonefruit and that treatment is in the stonefruit protocols. It wont be long before we have to do something in the china protocols. It was good hearing about what Nutrano have learned from baiting, and how they mix gum in advance, and about what they changed and what they do now. That was good. Hearing about different traps was good. There were plenty of (*bait rig*) ideas for growers to see; so they can make something (*build their own rig*).
	F	Growers just do what they have to. We only bait because we have to. We only went to the workshop because we had to. Basically people were pretty bored. We had all been up all night putting protectants on (*for downy mildew*) so it was bad timing. I was overseas when the field days were on in May.
Did you take any action after attending the workshop?	A	No.
	B	Nothing on farm has been required because scout hasn't found any Qfly. Everyone (*every table grqpe grower*) is putting insecticides out. Timing of sprays depends on the weather, so maybe it's their timing that helps some people have no signs of Qfly. All the export fruit gets cold treated, because that's required in the protocols. The cold treatment happens anyway during shipping, so it adds no extra effort or cost to management. Any on-farm treatment would add extra cost and effort. So no-one will bother with extra treatments unless they have to.
	C	No. We send all fruit china, so the transit temperature requirement for china covers Qfly control. All the exporters will say the same. They don't need to do anything else yet. Qfly control on the vineyard is not a china requirement and growers know that. So we are talking hot air to growers. In transit cold suits grapes.
	D	Contacted the PFA and A. MacGregor for more information. Talked to the neighbor about spraying their crop, but they are very Eco and won't spray. Now I am going to lease 3 acres from the neighbor, so that can now be treated. But the neighbor still has other untreated crop so that just shifts the boundary further away and doesn't stop having an insect pressure boundary. I could discretely offer to bait the neighbor.
	E	We want a faster, better way of baiting. It will cost a lot to bait a bigger area, and we are hoping to save on labour. We want to make something that's fast, but also cheap so we don't see the labour savings vanish into a machinery investment. But we need to keep looking at nozzles to get the rig working better.
	F	Nothing new. We have to bait, so we bait. We make it as painless as possible. We have already made changes to our rig. This is the second model. The first generation design for the baiting rig had nozzles, but the mixture is too hard on the pump. The solution was quick …. chop off the nozzles! Now the hoses are open ended, and there is no pressure in the line. The 12V pump just has to feed the bait through the hoses and gravity drains it onto the foliage. Spraying from above the foliage means that the bait sits in the sun and won't last as long as bait applied to shaded parts of the canopy, but its quick to apply so I won't be changing anything now.
	A	I will just stay with checking traps.

Will you be doing any Qfly control next season?	B	No I don't expect to be doing anything new because I don't have Qfly here yet. At the same time, industry needs to start understanding that Qfly is here to stay! But you have to understand that growers get fed up with extra everything. Extra sprays, extra paperwork, extra everything. If something is in the protocol then growers will deal with it, i.e. if you have to do something, then you just do it.
	C	No. Just relying on cold storage as per the China protocol. If we didn't already know where all the fruit was going then we might be more concerned, and motivated to bait. For now, cold treatment is all we need to do. I don't see any of the bigger players changing practices unless it's in the protocol. Stonefruit growers have to bait or treat because they can't cold store, but adoption by grape growers will be much slower because they know they just have to use cool storage. ATGA previously put lots of effort into reassuring China that cool storage in transit guarantees no Qfly.
	D	Yes. After this conversation I am going to buy FT mallets or Qfly wicks if I can find out who supplies them (*detail about suppliers and costs has been sent*). I will also call RM (*a scout*). I will also start baiting, and ask the neighbor whether I can bait their property.
	E	Yes, and play with our new bait rig. Now we just need time and to test the nozzle set up and make sure we don't get any bait on bunches.
	F	Baiting as usual.
What other information do you need?	A	Need to be told when and how many flies are being found in grapes. Maybe also it would be good to see pictures of what they look in grapes.
	B	Nothing yet.
	C	We need minor use permits to include Qfly on more existing insecticides so that everyone can talk about using these for Qfly. We need a spray calendar that shows all the treatments that are already being applied to grapes (for LBAM, mealybug, etc) and then also adds any extra necessary sprays for Qfly that aren't covered by those other sprays. It needs to be a very simple, cheap treatment plan that incorporates Qfly controls into the annual spray program – sprays we are already doing. Otherwise growers won't adopt it. Growers will get interested when they know how they can incorporate Qfly control into their existing spray program. They don't want to do more; they want to do the minimum to comply. They will be happy to spray Qfly if the same spray doubles up to control say LBAM or mealybug, and if that spray keeps Qfly totally under control. We also need a long term plan including a plant for communicating with industry. When market access was granted it was with the understanding that if there was any Qfly then the cool transit would fix it. We wanted to eradicate it through market control. Now we seem to have changed the story, saying everyone has to be involved in vineyard management. We have to be careful that china don't get the impression that we have significant Qfly populations. We can't be seen to have a problem without a solution.
	D	A step-by-step guide about what to do. There are so many options! (He is not confident that he knows how they all fit together. Has doesn't know where to begin. Has all the show-bag but hasn't threaded the detail together. He was interested in understanding more about over wintering, and focussing on citrus and trees near the house).
	E	Just to make sure that the baiting rig is going to work well. I saw the excel spreadsheet. The spreadsheet made sense to me, because I had already had a play with it. Growers won't use it if they aren't already wanting to know the costs. It assumes you are already asking questions about the costs. The Splatogator looks pretty good for tree guys but probably not useful for table grapes.

	F	We need the Victorian ICA-20 to be updated to include Samurai as a Qfly treatment. Growers are using Samurai now instead of Tokuthion for mealybug control, and its controlling Qfly.
What would be a good format to get that info?	A	Text messages please. I don't have an email. My wife does the emails but I don't really see them.
	B	Pest scouts are the best way to get info to growers. Otherwise email information, or post it on the ATGA website. Attending a field day is ok but some growers just never go to anything so you can't reach everyone via field days.
	C	Be very careful about how any publicity is managed, because we can't risk making export markets nervous. Most of the big growers use an agronomy service. Perhaps one approach might be to get the scouts together and give them more information. That might help distribute the information. Most growers do what their agronomist tells them. I don't know how you get information out to growers. The thing about field days is that it's always the same growers who come. I could have told you who would turn up. They were the converted. None of the bigger players attended. The only time you get all growers turning up to info sessions is when something will directly affect their immediate season. Otherwise growers just stay away.
	D	Personal visits and consultancy. I will call RM (*a scout*) today, and book a consultant, to make a tailored program for the vineyard (commercial table grapes and dried grapes) and for the home fruit-salad orchard, and for dealing with the neighbor issues. As simple but effective as possible, and a program that caters to the range of crops.
	E	Getting growers together is good. In a shed is good and near the vines is good. Timing was bad. Busiest time of the season is bad. Better to give growers information coming into spring.
	F	Not by making events compulsory. I wont be changing my baiting rig. It was so quick to make, I can drive at 25 kph and it is problem free.

Table 10: Summary feedback from interviews with service providers about adoption, practice change and extension of project TG18001, and some other comments from service providers

Pest Scout 1	Scout 1 sees Qfly in vineyards, particularly in early varieties. "Growers don't realise their fruit have stings. Growers don't know what they are looking at. They don't recognize sting marks. Fruit can look fine on the outside, but if there is a sting mark, and you open the fruit, it will likely have larvae inside.". Scout 1 knows that client growers are not managing Qfly, and so carries a bait rig around on the ute tray, and after checking the traps and checking vines, he baits the vineyard perimeter. This is part of his service now. Scout 1 provided a series of images of grapes with sting marks, which were enlarged and printed onto A3 and laminated to hand around at the May field days.
Pest Scout 2	Scout 2 sees Qfly in vineyards and is frustrated that after years of workshops and training and meetings and information, there is so little practice change among growers in Sunraysia. While the idea of having specific table grape workshops is great, whether anything will change is less certain. Scout 2 heard varying responses from growers about the workshops they attended. Overall responses were positive, but Scout 2 doubted that attendance at a compulsory workshop is going to lead to practice change. Scout 2 feels that sensor and bluetooth technologies like Rapid AIM offer a revolution in detecting and managing Qfly. Scouts and consultants could invest in that kind of technology, but while there is no area wide imperative to manage Qfly, it's a wasted investment, and that's really frustrating. A great opportunity is being missed.
Pest Scout 3	Scout 3 sees Qfly in vineyards. Sting marks start appearing in early varieties (flame and menindee) in the first week of January. They are not found in all vineyards but definitely they are around in some vineyards. Often the infected bunches are on vines in close proximity of a fruit tree, near a house on the block or on a headland. Scout 3 places male-attracting lures in clients vineyards, convinced that buying/assembling/installing about 50 Qfly wicks per client/vineyard at the start of the season is a relatively cheap and definitely worthwhile way of reducing the impact of Qfly. She also installs and checks yellow (protein) traps to confirm whether Qfly are present. As a result of attending the table grape sessions, PS3 has revised the layout of traps and wicks. If Scout 3 finds any Qfly, she recommends a spray. Her clients have been affected by Qfly but, because they act quickly, they have not lost crop. When growers attending workshops heard that scouts are seeing Qfly in vineyards, the growers got very upset and fearful about a backlash from buyers if this was public knowledge. Some growers think Qfly in tablegrapes should all be kept secret, and that stops them acknowledging that they have to manage it. If a scout goes public, saying that Qfly numbers are building up, then growers will lose trust in the relationship with that scout. Consequently, scouts don't talk about what they find. In the end, secrecy doesn't really help anyone, but it protects the client-scout relationship and that cant be ignored. In the December Qfly workshops, there was discussion about the fact that scouts had found Qfly in table grapes already during December, and this led to an angry backlash by some growers. The scouts bore the brunt of that anger, and had to rebuild trust among their clients.
Pest Scout 4	Scout 4 said that none of their growers have Qfly or were baiting Qfly. The spray program in table grapes keeps Qfly under control. Two growers used to do some baiting, but were not needing to now. If Scout 4 does see anything, the grower immediately sprays.
Supplier of bait and traps	Lots of efficacy claims about baits and xantham are not substantiated. For example we don't have sufficient evidence around the real value of using gum. Some of the information about lures is based on uncertain science.
Reseller	Not selling much bait.
Consultant	The recommendation to spray protein bait in large (400-600 micron) droplets is fine if the bait is applied to bark – then large droplets will land and stay. But most droplets of that size applied to a vertical leaf surface will coalesce and immediately run off. Has anyone measured retention of bait sprays applied to foliage? I think the recommended droplets

	might need to be smaller. The gum may help retain some of the wetness on foliage, but this is still likely to be very inefficient.
Equipment manufacturer/sales	We build bait spraying units for growers. The sprayers we make are usually for citrus growers. We installed sensors on a couple of unit. The sensor detects the tree trunk, and then the nozzle turns on to spray the trunk. We usually just use a cone nozzle with the core removed (*the spray doesn't get atomized it just squirts out the nozzle in a stream*). I hadn't thought about how that would work on table grapes because all the units we have built so far have, I think, been for citrus. I can see that the table grapes need a different nozzle (*the canopy is close, and you can't get residue on bunches*). If fan nozzles or air induction nozzles work, it would be good to know.
Growers who purchased bait units with sensors	Three growers had units that were built with sensors to detect tree trunks and automatically turn nozzles on and off. The project team interviewed these growers to understand whether the sensors were a useful tool. Because the travel speeds for baiting can be quite fast, the solenoids must turn on and off very frequently during baiting. The solenoids and pump didn't cope with such frequent on-off switching, particularly applying the bait thickened by gum. Consequently none of the sensor units were being used. Those three sites had reverted to using smaller units and switching on and off by hand.
Grower trialling a robotic herbicide unit	A grape grower in Merbein has a self-propelled unit mounted with a 100 L tank that he has programmed to travel down vine rows and apply herbicide. This is a trial unit. Extension of this idea to build a robot sprayer that detected and sprays vine crowns with bait would remove the labour cost from baiting. Programming the unit to turn at the ends of rows remains a challenge. No attempt was made in this project to convert the unit to a bait sprayer but the concept could be explored. The potential to get smarter with AWM by using robotics has been raised with James Underwood of Green Atlas and with rbecca Wells of the MRIC. A perfect PhD project.
Mallee Regional Innovation Centre	The concept of a robotic bait sprayer has been discussed with Rebecca Wells, Chief Executive of the Mallee Regional Innovation Centre (MRIC) https://eng.unimelb.edu.au/mric/home, a collaboration between Melbourne and La Trobe Universities and SuniTAFE. Rebecca was on the project team as a representative of ATGA, planning committee and attended all six May field days but left ATGA after the last field day to take up the role with MRIC. Further discussion would be required to secure support for a PhD student to develop and robot bait sprayer.

Appendix 10: Evaluation – Feedback from survey responses after the May field days

A survey was emailed to 118 people who attended field days in May. Seventeen people responded to the survey (17% of the attendees).

Q1. What crops do you grow?

Only five of the seventeen respondents grow table grapes (Figure 13). (44 of the 118 overall attendees had been table grape growers (Table 11).

Q2. Post codes of respondents.

At least one survey respondent came from each of the districts that hosted a field day. More than half the respondents came from within 25 km of Mildura, and in this respect the respondents did not equally represent all six field days.

Q3. Which statement best describes your experience with bait-spraying?

More than 20% of the respondents had never bait sprayed. These respondents represent an important target audience for information about baiting (Figure 14).

More than half of the respondents were already routinely bait spraying. The fact that they attended and that they chose to complete the survey suggests that already considered Qfly an important issue before they attended the field day. They are probably not the main audience that TG18001 was aiming at.

'Early adopters' are already engaged. The survey result supports that comment made in one of the six grower interviews that the expected, engaged growers attended the field day, and that the ones who needed to be there were notably absent.

Q4. Which event did you attend?

Most respondents had attended the Cardross event. This was also the largest audience and where the most (five) spray rigs were demonstrated (Figure 15).

According to field day registration data, fifteen table grape growers attended the Cardross event.

It is worth noting here that seventeen respondents attended 22 events, meaning that one or more respondents attended two or more events. Respondent attending more than one event were therefore either growers demonstrating rigs, chemical reps or presenters. This is likely to introduce some bias into the survey results.

Q5. Overall, how would you rate the workshop you attended?

The average overall rating was 76% (range 33% - 100%) (**Error! Reference source not found.**).

The grower who rated the field day at 33% was also disappointed that the control options discussed were too expensive and not organic.

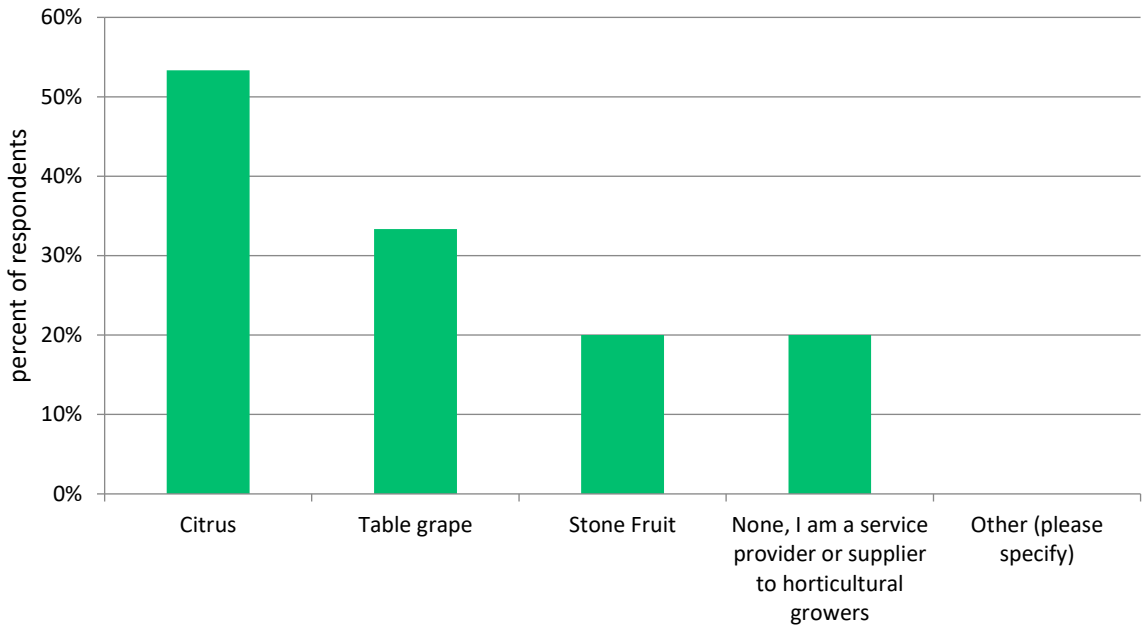

Figure 13: Crops grown by respondents

Table 11: Number of attendees for each field day location and type of commodity grown

		Commodity grown#							
Location	Attendees	Table Grapes	Citrus	Stone Fruit	Dried Fruit	Vegetables	Other*	Service industry	*Other commodities
Woorinen	14	4	2	11	1	2		3	
Tooleybuc	7		6	6			6	1	Wine grapes
Euston	14	10					1	4	Pomegranates
Yelta	22	10	4	4	3	1	1	2	
Cardross	34	16	15	4	7	2	3	3	Avocadoes; Pomegranates; & Persimmons
Colignan	27	4	24				1	1	Wine grapes
	118	44	51	25	11	5	12	14	

#some growers produced more than one commodity therefore the total number of commodities is greater than the total number of attendees.

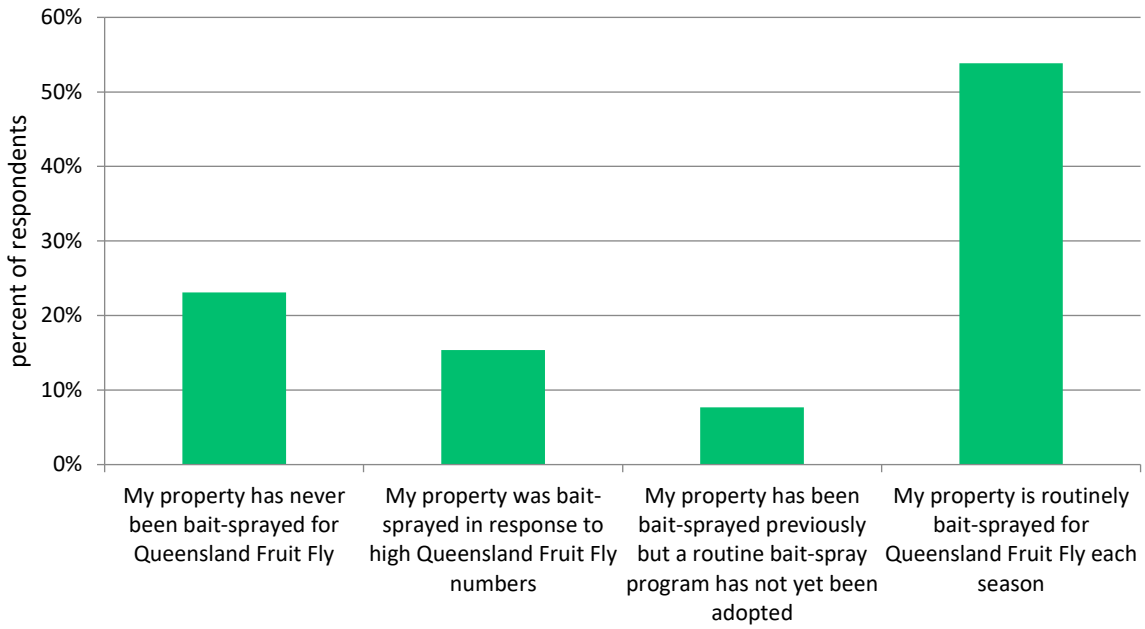

Figure 14: Respondents previous experience with bait spraying

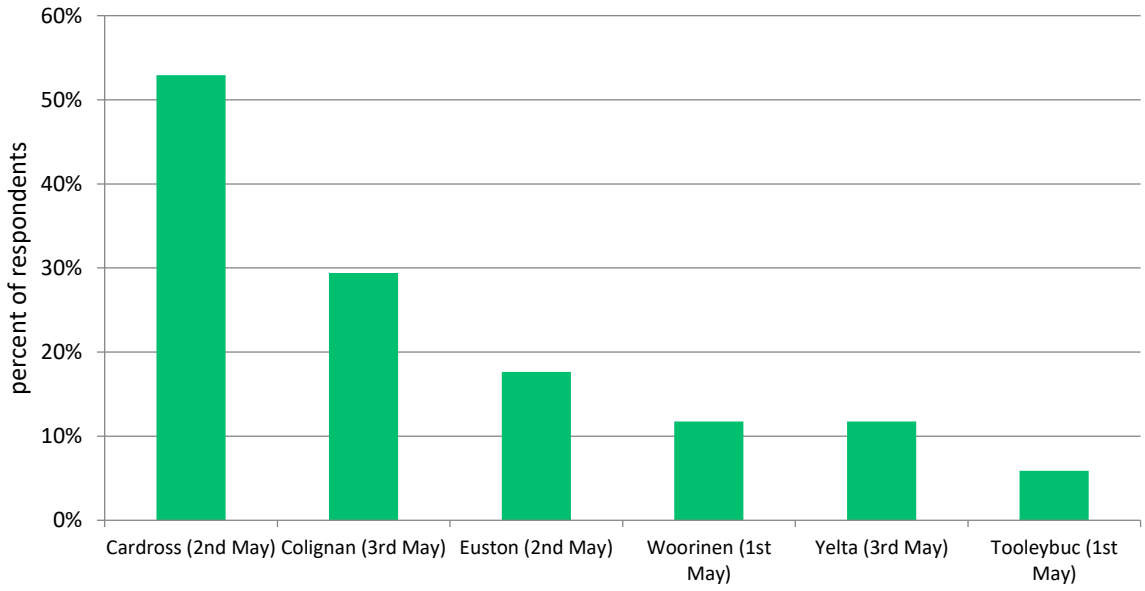

Figure 15: Event attended by respondents

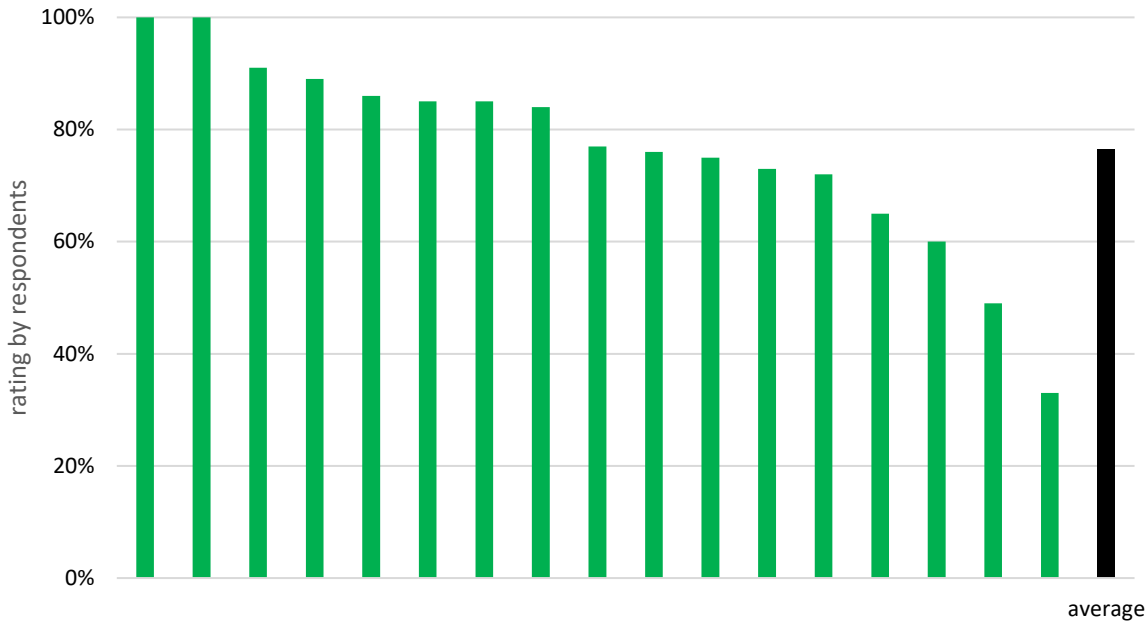

Figure 16: Overall rating of the workshop (rated out of 100)

Q6. Which session(s) was the most interesting/ most valuable for you?

Respondents were most engaged by hearing from a pest scout and by the baiting rig demonstrations

Including the pest scout as a presenter was to achieve two things:

- Engage the pest scouts by giving public recognition to the significant role they play in AWM, and
- For growers to hear from a scout that Qfly is seen in table grapes, what the scouts see, in which varieties, and when, because scouts are trusted, and hearing it from a scout may be more believable than hearing it from a government agency or researcher.

The bait rig demonstrations were to allow growers to hear from other growers.

Both sessions were very practical, and this was appreciated.

During each field day, the discussion about chemicals (registered options, and labour and chemical costs) was very brief but rated as valuable by half the respondents. This is possibly because it shifted from the practical. Growers were interested in the work rates calculator but it was not available yet as a live spreadsheet for them to input tier own data.

The discussion about the practical issues of mixing and using bait was engaging to participants who were already baiting, and wanted to share experiences. Growers who were not already baiting were probably less engaged with this topic.

The SPLAT technology was of high interest at the field day and generated a lot of discussion and held audience attention. It is interesting that in the survey responses it had lost importance compared to the more practical or immediately useable information ie it brought in the audience but did not, in hindsight, provide the most valued learning.

Q7. Overall, how would you rate the items in the information package (showbag, email and/or website)?

Respondents regarded the information package as valuable

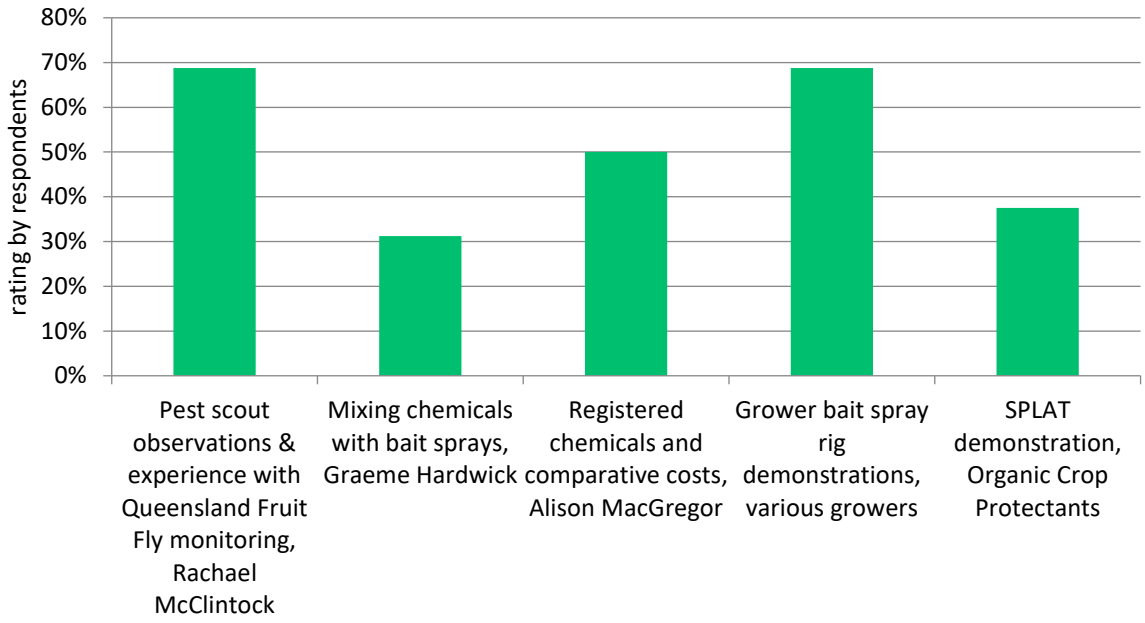

Figure 17: Topics that were of most value to respondents

Table 12: Comments provided regarding Question 6

What was it about (your preferred) session that made it interesting /valuable to you? (optional response to Question 6)	Summary of what attendees valued
Making me more aware on managing the problem and what to look for	Monitoring and control
It was practical rather than the previous one I attended which was overly theoretical The practical experience of the presenters Practical approach. Hearing new and practical information. Hearing growers talk about their experiences.	It was practical
It was good to listen to other grower experiences. Hearing new and practical information. Hearing growers talk about their experiences	Learning from other growers

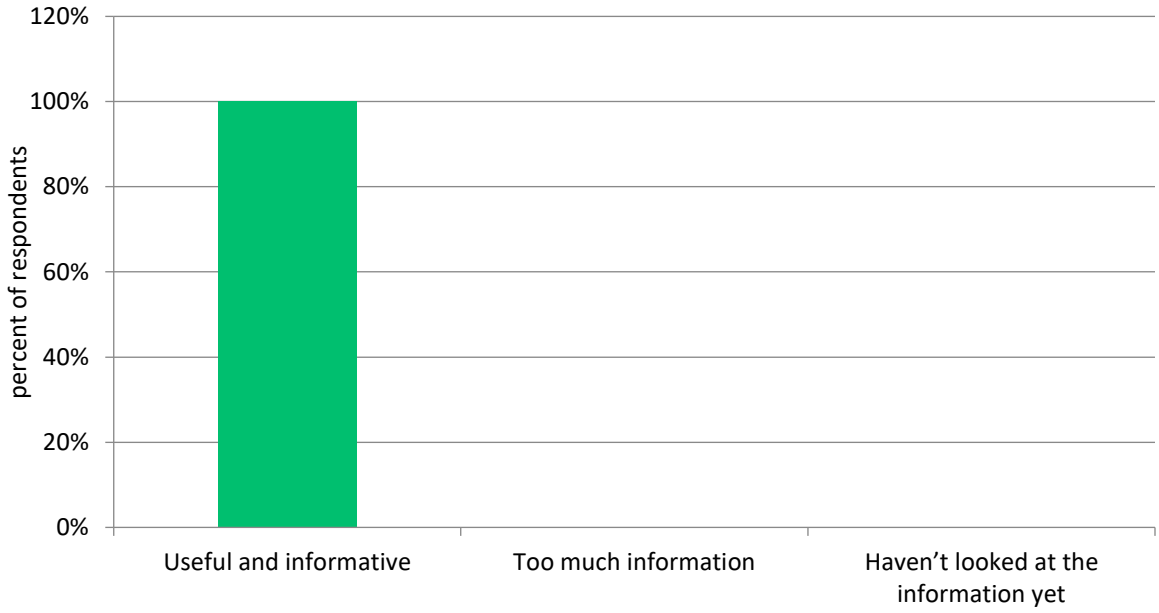

Figure 18: Overall rating of the information package (showbag, email and/or GSPFA website)

Q8. Is there anything you have done, or will do differently on your farm as a result of attending the field day?

Respondents were most likely to (Table 13)

- change their baiting program (change their rig, begin baiting or extend baiting) or
- increase their monitoring (use more traps or extend the time period)

9. What aspects of the field day could be improved?

Respondents suggested (Table 15):

- Creating more opportunity to learn from others practical experiences, including Queensland examples
- Focusing on other crops (it was too specific to table grapes).
- Holding information sessions in Spring (October)
- Providing more detail for growers to take the next step – where to buy machinery

Q10. What other information would you like to know about managing for Queensland Fruit Fly?

Survey answers to this question all suggest that everyone is hopeful of simple solutions to solve a difficult problem: new chemicals, sterile flies, a recipe for best management, system of public notifications (Table 14).

Of these suggestions, there is scope to develop up a recipe to help first timers manage trapping and baiting, and also to assist growers to register for PIC codes so they receive the DPI notifications.

Table 13: What will respondents do differently as a result of attending the field day?

Q8. Is there anything you have done, or will do differently on your farm as a result of attending the field day?	Summary of changes:

Update my rig Adapt a rig to bait spray Will begin bait spraying Use more monitoring traps and extend baiting program after crop has been harvested	Changes to baiting
Monitor for fruit fly all year round, as we have neighbours that grow citrus and their have a lot of fruit on the ground!!! More monitoring on the farm More traps Use more monitoring traps and extend baiting program after crop has been harvested	Changes to monitoring
Maintaining awareness and spraying as required I will be following up all effective methods of control.	General control
We are located on the SA border, so we were seeing what is needed when we have to start bait spraying I cant do anything personally on a farm, but I have new ideas and more ideas about how to talk to growers about baiting. The feedback from growers was useful.	Feeling better prepared
I didn't really get the information I needed at the field day, the trapping options are too expensive as are most other options , still looking for cheaper traps and organic spray options	Still seeking better information
No - the workshop confirmed we are doing everything right.	Reaffirmed existing activities

Table 14: Other information growers would like to receive

Q10. What other information would you like to know about managing for Queensland Fruit Fly?	
If chemical companies are working on new chemicals to help manage the problem	Chemicals
Trapping and baiting used in other regions for fruit flies that work best	Recipe for best management
More about sterile flies	Sterile Flies
Sending out text messages to growers (perhaps referring to notifications about Qfly detections).	Notifications
Will we ever be rid of fruit fly in the Sunraysia? I'm lazy. (*I want*) someone to do it for me. None at this time.	Other

Table 15: What aspects of the field day could be improved?

Q9. What aspects of the field day could be improved?	Summary of suggestions:
By discussing how other people manage fruit fly both here and Queensland to help implement new and possibly better strategies	Wanting more opportunity to learn from others practical experiences

Have small growers groups information days	
The good presenters didn't engage the audience. The negativity of a few influenced the whole event and stopped constructive discussion.	This comment came from Woorinen, where stonefruit growers were unhappy about water and labour costs.
It would have been good to have a speaker on citrus rather than table grapes. Tailored to crops	Too specific to table grapes.
Run the field days or workshops at a better time of year. This all needs to be repeated in spring when Qfly start the next season and before growers get super busy. Maybe in October. Timing in season	Better timing
It should be held again, so that more people are encouraged to attend and maybe we could see more people fight this pest!!	Increase attendance
Business names and phone numbers where we can buy appropriate machinery.	Need more information to take the next step and start baiting (where to go next).
Three respondents answered "None" to this question about improvements.	No improvements