

# Maintaining access to EU markets for Australian canola

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## Glossary

ABS	Australian Bureau of Statistics
AOF	Australian Oilseeds Federation
AEGIC	Australian Export Grains Innovation Centre
AusLCI	Australian Life Cycle Inventory Database Initiative
BCR	Benefit-cost ratio
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CBA	Cost-benefit assessment
DBFZ	Deutsches Biomasseforschungszentrum
DFAT	Department of Foreign Affairs and Trade
DG Energy	Directorate-General for Energy
EU	European Union
GHG	Greenhouse gases
GM	Genetically modified
GmbH	Gesellschaft mit beschränkter Haftung; a suffix used to denote private limited company in Germany
LCA	Lifecycle assessment
LCI	Life Cycle Inventory
Non-GM	Non-genetically modified
NPV	Net present value
RED	Renewable Energy Directive
TBL	Triple bottom line

## 1. Executive Summary

HEADING	Maintaining access to European Union (EU) markets for Australian canola
<p><b>THE CHALLENGE</b></p> <p>For more information see <a href="#">Background-Section 3</a>.</p>	<p>The EU biodiesel market is the biggest niche for Australia’s non-genetically modified canola with &gt;1.7 million tonnes/year (&gt;70%) of canola exports. The market also offers a premium of \$20–\$60 per tonne (2015–16 values), representing an additional income in millions of dollars every year for the industry.</p> <p>The European Commission’s Renewable Energy Directive revised the mandated target of greenhouse gas (GHG) savings for biofuels entering the EU transportation fuel market from the threshold value of 35% to 50% (60% for newly constructed processing plants) starting in January 2018. This new savings target applied to the Australian canola exports to the EU biodiesel market commencing with the crop planted in the autumn of 2017. The revised directive stems from the EU’s efforts towards achieving a target of 20% final energy consumption from renewable sources by 2020 (European Commission 2009).</p> <p>Failing to demonstrate adherence to the revised directive with a timely life cycle assessment (LCA) analysis would have meant the loss of access to EU markets (in the event of non-approval) or the loss of at least one season of exports stemming from market supply chain effects. This would in turn have led to market disruption and undesirable outcomes for Australian grain traders, such as having to compete with other countries in other markets and putting at risk a premium or desirable base price for Australia’s non-genetically modified canola.</p>
<p><b>THE RESPONSE</b></p> <p>For more information see <a href="#">Background-Section 3</a>.</p>	<p>The EU required an independent science organisation within each exporting country to prepare a report on the GHG emissions associated with the on-farm production of biofuel feedstock. The Australian Oilseeds Federation (AOF) and the Australian Export Grains Innovation Centre (AEGIC) sought CSIRO’s expertise in late 2015 to address this issue. CSIRO<sup>1</sup> (with project sub-contractors Lifecycles and Meo Carbon) undertook a full LCA and issued Australia’s <i>Country Report</i>, which demonstrated that the GHG emissions associated with the production of Australian canola were low enough for grain traders to purchase Australian canola with the confidence that it would meet the new target.</p> <p>Australian trade officials in Brussels liaised with the Directorate-General for Energy to have the report implemented before its official approval to protect the 2017 canola exports to the EU biodiesel market.</p>

<sup>1</sup> Further references to CSIRO anywhere in this report include the subcontractors LifeCycles and Meo Carbon Solutions.

<b>THE IMPACT</b> For more information see <a href="#">Evaluating the impacts-Section 6</a> .	<b>Impact type:</b> For the summary of impacts as per CSIRO’s triple bottom line (TBL) benefit classification see <a href="#">Impacts in Section 4</a>		
	Continued access to the EU biodiesel market has been of significant benefit to the Australian canola industry. To highlight this, since October 2017 over 4.4 million tonnes of canola have been shipped to the EU, with a total value of over \$2.5 billion dollars.  The cost-benefit analysis (CBA) suggests a benefit-cost ratio (BCR) (including deadweight cost) of:  <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Base case (Best)<sup>2</sup>: 3.6</td> <td style="width: 50%; border-left: 1px solid black;">Base case (Worst)<sup>3</sup>: 18.5</td> </tr> </table>	Base case (Best) <sup>2</sup> : 3.6	Base case (Worst) <sup>3</sup> : 18.5
	Base case (Best) <sup>2</sup> : 3.6	Base case (Worst) <sup>3</sup> : 18.5	
	Net present value (NPV) assessment (\$ millions, in \$ FY 2018/2019):  <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Base case (Best)<sup>2</sup>: 80.38</td> <td style="width: 50%; border-left: 1px solid black;">Base case (Worst)<sup>3</sup>: 11.99</td> </tr> </table>	Base case (Best) <sup>2</sup> : 80.38	Base case (Worst) <sup>3</sup> : 11.99
Base case (Best) <sup>2</sup> : 80.38	Base case (Worst) <sup>3</sup> : 11.99		
<b>Business Unit(s)</b>	CSIRO Agriculture & Food		
<b>Prospective future impacts</b> For more information see <a href="#">Flow-on benefits of program-Section 8</a>	Future assessments for broad-acre grains; prospective business opportunities for CSIRO; and advanced scientific developments to better meet future sectorial needs (e.g. tools to benchmark environmental performance). Note: Some of these developments are in progress, but confidential at this stage.		
<b>Underpinning background research</b>	It was possible to respond to this challenge in a timely and successful way because of the prior investment by CSIRO in building life cycle inventory to support this type of environmental impact assessment for agriculture, and the collaborative work relationship developed with Lifecycles through this work.		
<b>Sources to corroborate Impact</b>	Australian Oilseeds Federation, Australian Export Grains Innovation Centre, Department of Foreign Affairs and Trade, Lifecycles, Meo Carbon		
<b>Further information</b>	Research Case-Study: Dr Sandra Eady  Impact Evaluation: Dr Tom Keenan		

<sup>2</sup> LCA work successfully conducted by an organisation other than CSIRO.

<sup>3</sup> LCA work, if conducted by an organisation other than CSIRO and unsuccessful.

## 2. Purpose of the case study

The EU biodiesel market is the biggest niche for Australia's non-genetically modified (non-GM) canola with >1.7 million tonnes/year (>70%) of exports and offers a premium of \$20–\$60 per tonne (2015–16 values), representing an additional income in millions of dollars every year for the sector<sup>4</sup>. The European Commission's (EC) Renewable Energy Directive (RED) revised the mandated target of greenhouse gas (GHG) savings for biofuels entering the EU transportation fuel market from the threshold value of 35% to 50% (60% for newly constructed processing plants) starting in January 2018. This new GHG savings target applied to Australian exports entering the EU biodiesel market commencing with the canola crop planted in 2017.

CSIRO was commissioned to undertake a peer-reviewed Life Cycle Assessment (LCA) from cradle-to-farm-gate in collaboration with key partners Lifecycles, Meo Carbon, Australian Oilseeds Federation (AOF) and Australian Export Grains Innovation Centre (AEGIC). The intent of the work was to demonstrate compliance of the canola GHG emissions with the revised RED and timely acceptance of the report to protect continued Australian exports to the EU biodiesel market.

The purpose of this case study is to assess CSIRO's attribution in protecting Australian canola access to the EU biodiesel market. The study discusses the economic, environmental and social benefits arising from this work at the macro (government and the public), meso (CSIRO and similar organisations) and micro levels (farmers and researchers). The analysis provides an estimate of the benefit-cost ratio (BCR), net present value (NPV) and the direct, indirect and potential future benefits of this work. The case study also discusses the key limitations of this work.

This report can be read as a stand-alone or alongside other CSIRO Agriculture & Food evaluations to substantiate the impact and value of CSIRO's research from the resources invested in these projects. The information is provided for accountability, communication, continuous improvement and future application purposes. The intended audience includes Australian governments (including federal, state and local governments), AOF, AEGIC, DFAT, farmers, CSIRO, universities and the general public.

## 3. Background

Australia has accessed the EU market for the majority of its canola exports, e.g. in 2015–16, 57% of canola production and 91% of Australia's canola exports of circa 1,917 kt (worth approximately A\$850 million) went to the EU, largely for biofuels (see [Appendix A](#)). The EU market for biodiesel is highly valued, because it is the biggest market and also offers a premium of \$20–\$60 per tonne (\$50–\$60 as per 2015–16 data), representing an additional \$97 million for the sector (*source: AOF and AEGIC*). Australian canola attracts a premium as it is non-GM. The use of genetically modified (GM) canola is not an issue for the biodiesel production market itself, but non-GM varieties provide the flexibility of being channelled into canola meal and edible oil production that are more sensitive to the use of GM crops. These premiums are paid as Australia's non-GM canola offers more options for the European supply chain; the residues can be used for animal feed and surplus for human consumption.

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<sup>4</sup> [https://grdc.com.au/resources-and-publications/groundcover/groundcover-133-march-april-2018/green-canola-secures-\\$1-billion-eu-trade](https://grdc.com.au/resources-and-publications/groundcover/groundcover-133-march-april-2018/green-canola-secures-$1-billion-eu-trade)

For canola to be accepted in the EU market post-January 2018 for use in the production of biodiesel, it needed to meet the requirements of the revised EU-RED, as discussed above. The LCA of GHG emissions from the cultivation of canola oilseeds in Australia comprised:

- a) the timely validation of the environmental credentials of the Australian canola industry against the revised RED
- b) engagement and support of DFAT, AOF, grain traders, the Directorate-General for Energy (DG Ener) and other relevant departments from August 2017 to expedite the assessment process of the Country Report
- c) the timely acceptance of the report to overcome the risk of jeopardising sales contracts for the canola 2017 harvest.

The EU required an independent science organisation within each exporting country to prepare a report on the GHG emissions associated with the on-farm production of biofuel feedstock. AOF and AEGIC sought CSIRO's expertise in late 2015 to address this issue. CSIRO undertook a full LCA demonstrating that the GHG emissions associated with the production of Australian canola were low enough for grain traders to purchase Australian canola with the confidence that it would meet the new target.

With the efforts and support of Australian officials in Brussels, the EC accepted the Country Report for Australian canola in December 2017—the first report to be submitted and accepted. Department of Foreign Affairs and Trade (DFAT) officials in Brussels liaised with DG Ener to have Australia's Country Report implemented before its official approval to protect the 2017 canola exports to the EU biodiesel market.

Using the GHG figures to certify sales contracts, since October 2017 over 4.4 million tonnes of canola have been shipped to the EU, with a total value of over \$2.5 billion. This maintains access to a secure market for Australian canola and also brings in additional income in premiums every year for Australian farmers (See [Appendix A](#)).

Failing demonstration of adherence to the revised directive, or late implementation of the LCA (Country Report) would have meant the loss of access to EU markets (in the event of non-approval) or the loss of at least one season of exports stemming from market supply chain effects (in the event of late implementation). This would in turn have led to market disruption and undesirable outcomes for Australian grain traders, such as having to compete with other countries in other markets and putting at risk a premium or desirable base price for Australia's non-GM canola. The work had other flow-on benefits that include:

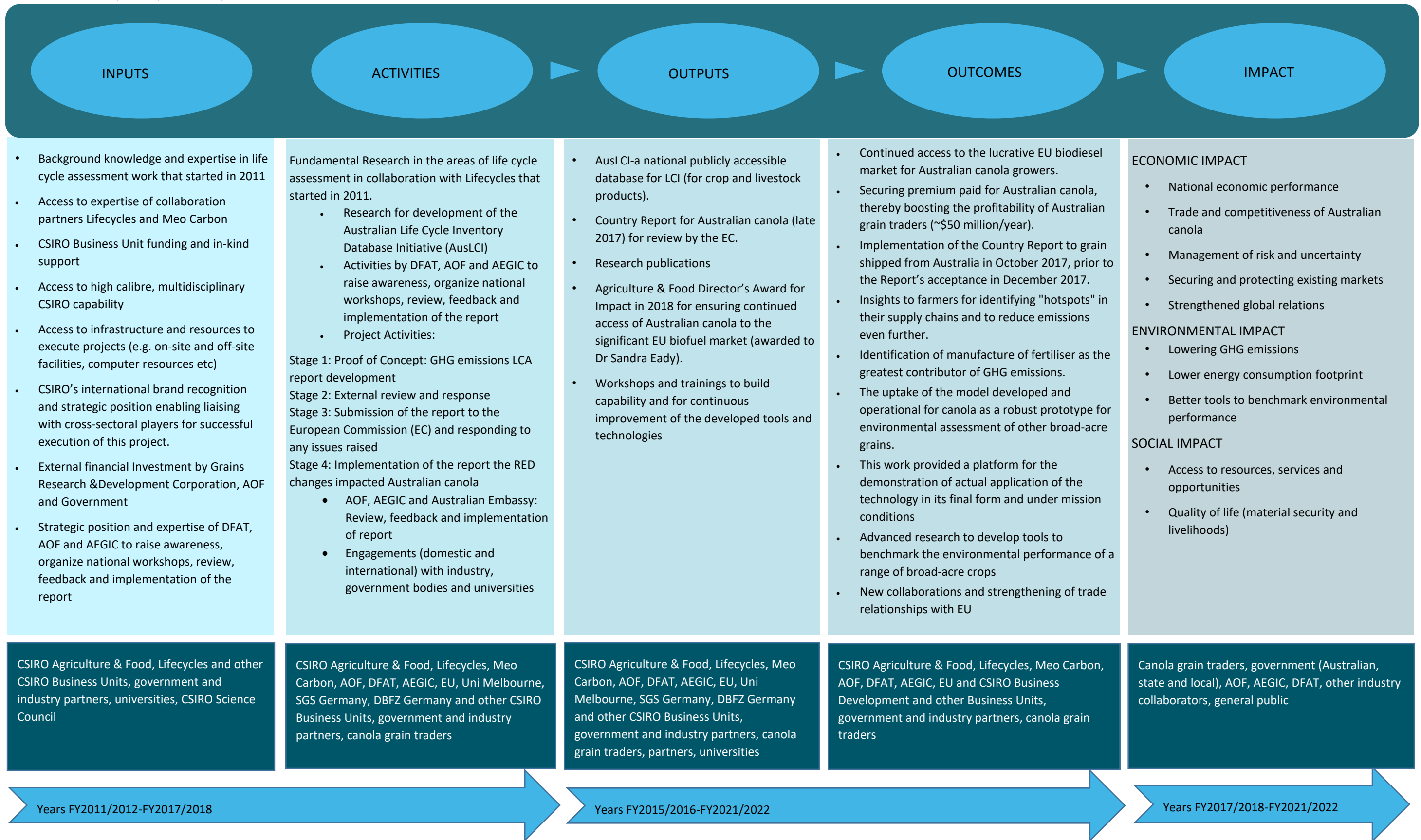
- strengthening relationships with the EU
- global engagement for national benefit
- providing a database for use by various domestic industries
- development of a framework for the life cycle assessment of broad-acre grains
- advanced scientific developments to meet the new demands of this sector
- new business opportunities for CSIRO.

CSIRO was well positioned to deliver the technical components of the required Country Report because of its ability to draw upon multi-disciplinary sources of data, expertise and international brand recognition. In anticipation of sectorial demands for this type of analyses, there had been a



significant prior investment and expertise building into developing agricultural life cycle inventory capability since 2011, led by Dr Sandra Eady in a successful partnership with Tim Grant from Life Cycle Strategies (now known as Lifecycles). Tim has delivered a public national platform, the Australian National Life Cycle Inventory Database (AusLCI) for LCA practitioners to access high-quality inventory for Australian systems. The multi-partner collaborative effort from CSIRO, AOF, AEGIC and the Australian Embassy supported a key market outcome of significant value to Australian agriculture.

## 4. Impact pathway



## Project inputs

### CSIRO

- Background knowledge and expertise in building a life cycle inventory for this type of environmental impact assessment. In anticipation of these requirements, CSIRO spearheaded significant work into developing an agricultural life cycle inventory since 2011, led by Dr Sandra Eady in a successful partnership with Tim Grant (Lifecycles).
- Access to high-calibre, multidisciplinary CSIRO capability
- Access to infrastructure and resources (e.g. LCA database from background work) to execute work
- CSIRO's international brand recognition and strategic position enabled it to obtain information and liaise with cross-sectoral players for the successful execution of this project.

### External Partners: DFAT, AOF and AEGIC

- Funding for the project
- The strategic position of DFAT, AOF and AEGIC helped to raise awareness and organise national workshops on LCA work; and provide feedback and critical support for the approval of Australia's Country Report by the key deadline of 1 January 2018.

### Investments

- a) Program: Cash and in-kind support associated with all the work conducted by CSIRO and partners since the commencement of the LCA work in FY2011/2012. This includes (but is not limited to), the following projects:
- Developing a National Life Cycle
  - AusLCI (investment details covered in Table 3)
  - Canola GHG study (investment details covered in Table 2)
  - Other CSIRO projects

Table 1 provides investment details associated with the program since its inception.

Table 1: Cash and in-kind support for the program

Contributor / type of support	FY2011/2012– FY2014/2015 (pre-Canola GHG work)	FY2015/2016– FY2017/2018 (Canola GHG work)	FY2018/2019– FY2021/2022 (post-Canola GHG work)
CSIRO	-	95,049	92,440
External partners	498,272	859,368	-
<b>Total cash</b>	<b>498,272</b>	<b>954,417</b>	<b>92,440</b>
CSIRO	217,857	649,972	61,934
External partners	271,106	484,461	-
<b>Total in-kind</b>	<b>488,963</b>	<b>1,134,433</b>	<b>61,934</b>

- b) The canola GHG emission LCA project is the main focus of this evaluation. All the costs and in-kind support associated with the project are listed in Table 2.

Table 2: Cash and in-kind support for the Canola LCA project

Contributor / type of support	FY2011/2012– FY2014/2015 (pre-Canola GHG work)	FY2015/2016– FY2017/2018 (Canola GHG work)	FY2018/2019– FY2021/2022 (post-Canola GHG work)
CSIRO	-	-	92,138
External partners	166,169	48,971	-
<b>Total cash</b>	<b>166,169</b>	<b>48,971</b>	<b>92,138</b>
CSIRO	18,867	22,862	61,934
External partners	-	-	-
<b>Total in-kind</b>	<b>18,867</b>	<b>22,862</b>	<b>61,934</b>

- c) The AusLCI project was the first project that started in FY2011/2012 under this program. It led to the development of a national, publicly accessible database for LCI. The project provided the necessary background knowledge and expertise that underpinned the work on canola GHG emission LCA. The costs and in-kind investment associated with this project are covered in Table 3.

Table 3: Cash and in-kind support for the AusLCI project

Contributor / type of support	FY2011/2012– FY2014/2015 (pre-Canola GHG work)	FY2015/2016– FY2017/2018 (Canola GHG work)	FY2018/2019– FY2021/2022 (post-Canola GHG work)
CSIRO	-	2,501	
External partners	202,214	377,286	
<b>Total cash</b>	<b>202,214</b>	<b>379,787</b>	<b>-</b>
CSIRO	108,877	276,489	
External partners	-	-	
<b>Total in-kind</b>	<b>108,877</b>	<b>276,489</b>	<b>-</b>

## Activities

CSIRO spearheaded significant work into developing agricultural Life Cycle Inventory (LCI) since 2011, led by Dr Sandra Eady in a successful partnership with Tim Grant (Lifecycles). The work developed Intellectual Property (IP) that included LCI for broad-acre crops, grass-fed beef and lamb production and wool production totalling 232 inventories covering six impact categories (global warming, energy, land and water use, eutrophication, ecotoxicity and soil function).

The background LCA work that started in 2011 significantly underpinned the canola GHG emissions LCA. However, for the purpose of this evaluation, this section primarily focuses on the activities performed for the successful execution of the canola GHG emissions LCA. For more details on the background work, see [References \(#5\)](#).

The key roles undertaken by the partners in the canola GHG emissions LCA project and its stages are described below.

### CSIRO's role

CSIRO's contributions have helped secure continued access to the EU biodiesel market and demonstrate the quality competitiveness of the Australian canola. CSIRO main role was in producing the report in collaboration with Lifecycles and Meo Carbon<sup>5</sup>, supporting Australian Embassy officials, responding to multiple levels of review feedback, liaising with other partners and coordinating activities for successful implementation of the report.

### Other partners

AOF, AEGIC, DFAT and the Australian Embassy played the key role in liaising with industry, organising funding support, review, feedback and working with DG Ener and relevant EU bodies for timely acceptance and approval of the Country Report. CSIRO's role in different stages of the project is discussed below:

#### *Stage 1: Proof of Concept: GHG emissions LCA*

CSIRO worked with Lifecycles and Meo Carbon, with oversight from AOF, AEGIC and a representative from CBH Group Australia, to conduct complex analysis of the whole of supply chain and farming systems across Australia, with input and feedback from the industry partners to evaluate state-based GHG emissions figures. CSIRO undertook a robust and thorough LCA.

#### *Stage 2: External Review*

The University of Melbourne (Australia), SGS Germany GmbH (Germany) and Deutsches Biomasseforschungszentrum DBFZ (Germany) were engaged to reviewed the Country Report and LCA calculations by CSIRO.

The partnership between CSIRO and Lifecycles, who undertook the model building, was key to integrating feedback efficiently and accurately. The partnership allowed the initial assessment to be done quickly and enabled the industry to judge if their canola was in the 'ball park' of meeting the requirements before investing in a full report.

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<sup>5</sup> Lifecycles and Meo Carbon were sub-contracted to work under the guidance of CSIRO to deliver fully costed and specified inputs and hence they are not discussed separately.

### *Stage 3: Submission of the report to the EC and responding to any issues raised*

CSIRO briefed staff in Brussels to ensure good technical understanding of the content of the report and its compliance with the RED. CSIRO swiftly responded to any information requests by the EU regulators during the review.

### *Stage 4: Implementation of the report before January 2018*

CSIRO provided the necessary support to DFAT who liaised with the Directorate General of Energy (DG ENER, the body administering the RED), and other relevant departments to expedite the assessment process for the timely approval of the Country Report by the EC. This was critical to overcoming the risk of jeopardising the 2017 canola exports to the EU.

CSIRO coordinated with cross-sectoral actors AOF, AEGIC, the Australian embassy in EU, and the reviewers, etc. for the smooth execution of all the above stages.

## Outputs

### Key outputs of the project (for CBA analysis)

The key output of the work is the Country Report for Australian canola (accepted December 2017). CSIRO demonstrated that a tonne of dry-weight Australian canola seed has on average 497 kg of CO<sub>2</sub>-equivalent emissions, with the key exporting states (Western Australia, South Australia and New South Wales) having results close to or below this average. With EU legislation allowing the equivalent of 1,092 kg of CO<sub>2</sub> per tonne of dry grain, a value of 497 kg of CO<sub>2</sub> provided enough leeway for the additional post-farm gate emissions, such as transport, and refining the canola seed into biodiesel, while leaving the final product below the 50%–60% GHG savings target.

The Country Report was rigorously reviewed, deemed thorough and required minimal changes after the EU technical assessment.

### Other Outputs

#### *The Australian Life Cycle Inventory Database Initiative (AusLCI)*

AusLCI<sup>6</sup>, developed in collaboration with Lifecycles, represents a major initiative to provide and maintain a national, publicly accessible database of environmental information on a wide range of Australian products and services, covering a range of life cycle stages. It is an invaluable tool for those involved in environmental assessment and particularly LCA, as it provides consistent guidelines, principles and methodologies for the collection of LCI data, along with protocols for LCA processes for different sectors, thereby saving time and effort of the users to obtain this information and adding efficiency and consistency in the system. These benefits have not been quantified. For more details see [References \(#5\)](#).

Costs: To highlight the magnitude of investment, the overall expenditure on the AusLCI project over the life of the program is AU\$1,213,000 (in FY 2018/2019 \$\$; See Table 3 above). These costs have already been included in program costs of the CBA in [Section 7](#).

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<sup>6</sup> See [auslci.com.au](http://auslci.com.au) for more details

## Publications

- 1) Simmons, AT, Murray A, Brock, PM, Grant, T, Cowie, A, Eady, SJ, Sharma, B (2019). Life cycle inventories for climate change mitigation strategies in the Australian grains sector; drivers of global warming impacts and relationships with other environmental indicators. Accepted Crop and Pasture Science.
- 2) Grant, T, Eady, S, Cruyppenninck, H, Simmons, A (2017) AusLCI methodology for developing Life Cycle Inventory for Australian agriculture. Lifecycle Strategies Pty Ltd, Electronic.
- 3) Eady, SJ, Bessou, C, Sala, S, Grant, T (2016). How do we establish life cycle assessment methods to assess the impact of agricultural production on soil functions? Keynote paper submitted to 10<sup>th</sup> International Conference on Life Cycle Assessment of Food, 19-21 October 2016, Dublin.
- 4) Bricout, J., Grant, T. and Eady, S.J. (2016). Integration of ecosystem service metrics into product-based environmental studies. NRM Science Conference 2016, Adelaide, 13-15 April 2016.
- 5) Eady, S.J., Hercule, J., Grant, T., and Deuter, P. (2015). AusAgLCI – The business case for investment in a national Life Cycle Inventory for horticulture. ISHS Acta Horticulturae 1112: XXIX International Horticultural Congress on Horticulture, 10.17660/ActaHortic.2016.1112.53

For a complete list of publications, see [Appendix D](#).

## Awards

- The Agriculture & Food Director's Award for Impact in 2018 for ensuring continued access of Australian canola to the lucrative EU biofuel market (awarded to Dr Sandra Eady).
- Nomination for the prestigious Sir Ian McLennan Achievement for Industry Award 2018, for recognition for outstanding practical contributions to the industry

## Outcomes

The key beneficiaries of the Country Report include farmers and researchers; CSIRO and similar organisations; the Australian, state and local governments; and the public. The main outcome of this work has been maintaining continued canola export access to the significant EU biodiesel market for Australia post-implementation of the revised RED.

The significant outcomes from this work and testimonials from key partners that highlight CSIRO's contribution are detailed below:

- Since October 2017, over 4.4 million tonnes of canola have been shipped to the EU, with a value of over \$2.5 billion
- Due to the premium paid for Australian canola in the EU market, an additional income (typically \$20–\$60/tonnes) is earned by Australian canola farmers, thereby boosting the profitability of Australian grain traders. This converts to additional millions of dollars for Australian farmers annually, as estimated by AOF and AEGIC.
- The work has led to a deeper understanding of Australia's cropping environment and strengthening of relations with the EU.
- The LCA work has been able to provide farmers with insights to understand 'hotspots' in their supply chains to enable future process improvements; highlight manufacture of fertiliser as the greatest contributor of GHG emissions; and suggest processes to target for further reduction in emissions and lower overall carbon footprint.
- This work provided a platform for the demonstration of the application of the technology in its final form and under mission conditions by key partners.

- The uptake of the model for canola as a robust framework for environmental assessment of other broad-acre grains.

#### **Testimonial - Australian Oilseeds Federation**

*'It is with confidence that I write that it is unlikely that Australia's highly valuable canola trade with Europe will have continued beyond 31 December 2017 without the focus and dedication of Dr Eady in undertaking the required work to produce the Country Report titled: Greenhouse gas emissions from the cultivation of canola oilseed in Australia. It is also worth noting that I am confident that the imprimatur of CSIRO greatly assisted the carriage of the report through both DFAT as well as through the EU review process. Over 8000 Australian canola growers are extremely grateful for the work undertaken by CSIRO, as it has provided assurance for ongoing access to the premium priced EU canola market.'*

**Nick Goddard**

CEO, Australian Oilseeds Federation Inc.

For more details, see [Appendix C](#)

#### **Testimonial - Australian Export Grains Innovation Centre**

*'CSIRO was preferred to conduct this work due to its international brand recognition. The steering committee played a useful oversight and review role and facilitated the generation of the CSIRO report supported by Life Cycle Strategies research services and advisory and review services of Meo Carbon.*

*Noting how long it took the EU Commission to accept the report (known as Australia's Country Report), finalising the research early enabled Australia to be the first country to have its report approved. The roles of Australian Embassy staff (Nicola Hinder) in Brussels were crucial to ensuring passage of the report through the Commission's review process.*

*If the AOF and AEGIC did not initiate the research activity when they did, then, in my view, industry concerns about the export of canola to the EU would eventually have generated industry and government to act; but that action would have delivered a Country Report probably one to two years later than occurred. The uncertainty generated would have adversely affected export sales of Australian canola.'*

**Prof. Ross Kingwell**

Chief Economist, Australian Export Grains Innovation Centre

For more details see [References](#)

#### **Testimonial - Department of Foreign Affairs and Trade**

*'While ensuring the final acceptance of the Country Report by the key deadline of 1 January 2018 was largely the charter of Australian Embassy officials, the ongoing involvement of CSIRO, Canberra based Department of Agriculture and Water Resources officials and the Australian oilseeds industry was of key importance. The Country Report was thorough and rigorously reviewed ensuring there were minimal changes after the EU technical assessment, CSIRO briefed staff in Brussels ensuring a good technical understanding of the content of the report and its compliance with the RED.*

*From an Australian Government perspective this project was an excellent example of Australia's premier science agency supporting a key market outcome of significant value to Australian agriculture.'*

**Nicola Hinder**

Minister-Counsellor (Agriculture), DFAT

For more details see [Appendix C](#)

[Link to Nicola Hinder's Video](#)



## Impacts

Table 4: Summary of project impacts using CSIRO triple bottom line (TBL) benefit classification approach

Type	Category	Indicator	Description
Economic	National economic performance	The positioning of Australian canola as a highly competitive feedstock for the EU biofuel market  Continued canola export access to lucrative EU biodiesel market	The work helped to maintain continued access to the EU biodiesel market, Australia's single largest export destination for canola (>70% overall export) that also pays a premium for our non-GM canola, making it a highly lucrative market.  In the absence of approval, EU buyers would not have purchased canola crop from FY 2017/2018.
	Trade and competitiveness	Australia's Country Report demonstrated compliance with the revised RED and was the first one to be accepted and implemented	The Country Report was the first non-EU State report that demonstrated compliance with the revised RED.  The work has provided a framework for similar future assessments for other grains as the GHG emission requirements become more stringent in the EU and globally
	Management of risk and uncertainty	Implementation of the report to Australian canola exports starting October 2017 (before acceptance of report)	The work demonstrated a great example of a multi-partner collaborative effort to support a key market outcome of significant value to Australian agriculture and economy. The Country Report was timely accepted and approved to protect supply chain effect and its impact on canola from 2017–2018 crop due to rigorous efforts and required integration of cross-sectoral partners.
	Securing and protecting existing markets	Continued canola export access to lucrative EU biodiesel market.	The work has the capacity to maintain and/or increase returns from existing EU market access. It positioned Australian canola as a highly competitive feedstock for the EU biofuel market, as the assessment figures are well below those for emissions from canola produced in Europe.  As the EU member states move to a GHG emissions-intensity target (as opposed to the fixed GHG savings target), demand will strengthen for canola that can be produced with the lowest emissions possible.
Environmental	Lowered GHG emissions and land management	Understanding of 'hot-spots' in supply chains to reduce GHG emissions	The LCA work has been able to provide farmers with insights to identify 'hotspots' in their supply chains that can be targeted to

Type	Category	Indicator	Description
		Identification of fertilisers as the greatest contributor to GHG emissions	<p>improve the process and lower their carbon footprint.</p> <p>Identification of the manufacture of fertiliser as the greatest contributor of GHG emissions and suggest ways to further reduce emissions.</p> <p>Provide a database and framework for the use of a variety of domestic industries.</p>
	Energy generation and consumption		A better understanding of the canola production process to introduce improvements in energy consumption and reduce overall GHG footprint.
Social	Access to resources, services and opportunities	Continued access to the EU biodiesel market for canola exports	<p>Continued access to the lucrative biodiesel market thereby boosting the profitability of Australian grain traders.</p> <p>Access to new or improved knowledge in LCA to enable improved processes for lower GHG emissions for future demands of the sector.</p> <p>Roadmap for higher demand of Australian canola as demand strengthens for feedstock that can be produced with the lowest emissions possible.</p>
	Quality of life (material security and livelihoods)		<p>Maintaining access to available markets for exports, providing advanced knowledge and information to improve current processes and systems.</p> <p>Strengthening relationships for continued benefit and wellbeing of farmers, industry, government and public in Australia.</p>

## 5. Clarifying the impacts

As discussed in the above sections, the Australian Country Report enabled continued access to the highly lucrative EU biodiesel market, which offers the highest exports as well as premiums to Australia's non-GM canola. For the purpose of the cost-benefit analysis (CBA) of this evaluation we claim the following impacts:

- **Impact claimed (for CBA):** The absence of timely approval and implementation of the country report would have meant a reluctance of EU buyers to purchase canola from the FY2017/2018 crop. With the high quality of the report and deft negotiations, Australian trade officials in Brussels were able to have the GHG values applied to the crop harvested in October 2017, prior to the Report's official acceptance. Based upon dialogue with the key parties involved and considering the time sensitive and high-scrutiny nature of this work, **CSIRO and key-partners claim that Australia would have lost a season of exports to EU biodiesel market if CSIRO and partners were not engaged in this work.**
- **Partners to corroborate claimed impact:** AOF, AEGIC, DFAT
- **Other benefits from the work are covered in [Section 8](#).**

### Counterfactual

EU required the canola GHG emission LCA to be conducted by an independent, reputed science organisation. If CSIRO had not conducted this assessment, some other domestic or international organisation would have undertaken it, as discussed below:

- a) A state government organisation could undertake canola LCA work at a state level, but inconsistencies and patchiness associated with performing an assessment for all regions in Australia might prevent aggregation to the national level.
- b) At the international level, there are organisations with the capacity and capability to undertake canola LCA work, but they have:
  - limited expertise in the Australian region
  - limited history in working with Australian governments and canola businesses and are
  - not necessarily party to regional alliances or integrated with the relevant regional organisations.

This could have led to inefficiencies and delayed submission of the report to EU authorities for assessment thereby delaying implementation of the Country Report.

- c) There are private consultants in Australia operating in the grains industry who could have conducted this assessment. However, this would present potential conflicts of interest and thus may not have resulted in EU acceptance.

CSIRO had undertaken prior agricultural GHG research and has been one of the key contributors in the development of [AusLCI](#). This background knowledge, relationship with key players working in this domain and enabling their integration to carry out this work gave CSIRO a competitive advantage in producing a quality report before the key deadline. AOF stated that this task was beyond the scope or capability of the AOF or others in the domestic industry.

### Assessment of CSIRO's attribution

The focus of this CBA is to estimate the broader net benefits from the canola GHG emissions LCA work as a whole, as identified above, and to estimate that part of the net benefits attributable specifically to

CSIRO. The execution of complex analysis in a scientifically sound manner, trans-continental coordination amongst collaboration partners for report review and deft negotiations for timely acceptance and approval of the Country Report, were all important pillars for successful outcomes of this work. Hence, attribution is not solely contingent upon the funding contributions.

For the purpose of this case-study the benefits were assessed over the period FY2017/2018 to FY2021/2022 (the revised EU-RED typically stays active for five years) and divided into two distinct timeframes to reflect the different roles of the collaboration partners for the periods:

- Period 1: Benefits from protecting premiums from canola exports to the EU biodiesel market in the first 12 months post-acceptance of Country Report (FY2017/2018–FY2018/2019)
- Period 2: Benefits from protecting premiums from canola exports to the EU biodiesel market for a subsequent period of case-study analysis i.e. FY2018/2019–FY2021/20226

To estimate the share of the benefits attributable to CSIRO, the authors contacted AOF, AEGIC and DFAT to provide their assessment for two periods. The results are captured in Table 5 below.

Table 5: Responses from key partners on CSIRO’s attribution in Canola LCA work

Organisation	Assessment of CSIRO’s share of benefits
AOF	<ul style="list-style-type: none"> <li>• Due to the complex nature of the work and various interdependencies, AOF did not provide assessment of attribution numbers for CSIRO’s work.</li> <li>• AOF noted that CSIRO was the first choice to conduct this assessment because of:               <ul style="list-style-type: none"> <li>- its international brand image</li> <li>- the noteworthy background work done by Dr Sandra Eady in LCA domain</li> <li>- the availability of rich talent pool</li> <li>- its strategic positioning to liaise with cross-sectoral players for successful and timely completion of the work.</li> </ul> </li> <li>• There were others in the domestic industry who could have conducted this analysis. However, due to the critical importance of the report, and the great scrutiny expected from EU regulators of the results, the assessment had to be timely and beyond reproach. Considering all these factors, AOF also stated that this task was beyond the scope or capability of the AOF or others in the domestic industry.</li> </ul>
AEGIC <sup>7</sup>	<p>Ross Kingwell, AEGIC provided the following estimates of benefits share with the rationale behind the assessment. For more details, see <a href="#">References</a></p> <p>Period 1:</p> <ul style="list-style-type: none"> <li>- CSIRO: <b>30%</b></li> <li>- Other partners (combined): AOF, AEGIC, Australian Embassy: <b>70%</b></li> </ul> <p>Period 2:</p> <ul style="list-style-type: none"> <li>- CSIRO: <b>60%</b></li> <li>- Other partners (combined): AOF, AEGIC and Australian Embassy: <b>40%</b></li> </ul>

<sup>7</sup> AEGIC’s inputs are used for the purpose of the cost-benefit analysis (covered in Section 6)

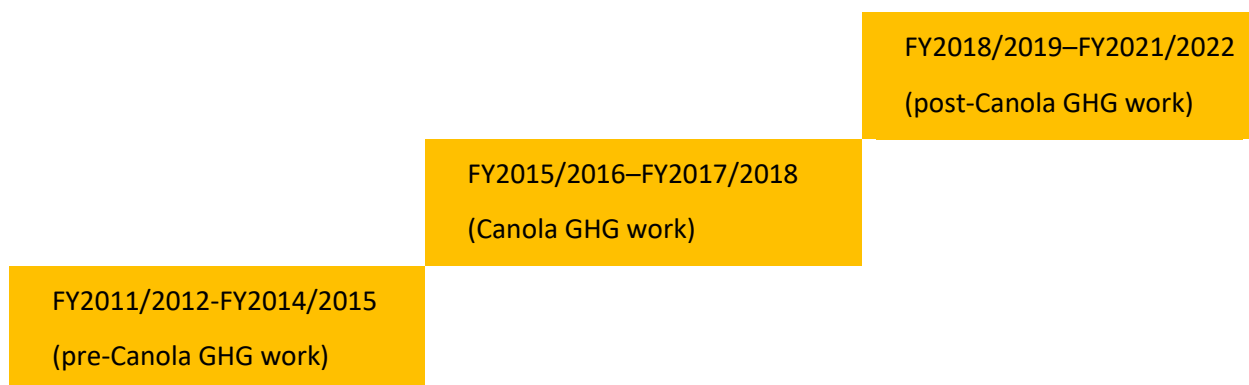
Organisation	Assessment of CSIRO's share of benefits
DFAT	CSIRO was unable to receive response. However, a prior testimonial from DFAT highlights CSIRO's role in this project is available in the <a href="#">Outcomes section</a> .

## 6. Evaluating the impacts

A cost-benefit analysis was conducted for the period FY2011/2012 to FY 2021/2022 that estimates the impacts of the work performed in canola LCA work. Given the global nature of this work, the affected stakeholders are not limited to Australia. CBA estimates the equivalent value of costs and benefits associated with this program. However, the CBA was conducted from an Australian perspective and only measures economic costs and benefits arising from and attributable to CSIRO's interventions in Australia.

As discussed in the above sections, the Country Report for Australian canola GHG enabled continued access to the highly significant EU biodiesel market. For the purpose of the analysis, we claim that:

- **Impact claimed (for CBA):** The absence of timely approval and implementation of the country report would have meant a reluctance of EU buyers to purchase canola from the 2017–2018 crop. The high quality of the report and deft negotiations, Australian trade officials in Brussels were able to have the GHG values applied to the crop harvested in 2017, prior to the Report's official approval. Based upon dialogue with the key parties involved and considering the time sensitivity and high scrutiny of this work, **it is claimed that Australia would have lost a season of exports to EU biodiesel market if CSIRO and partners had not been engaged in this work.**
- **Time period (FY2011/2012 to FY 2021/2022)**



- **Costs:**
  - Program Costs since inception i.e. FY 2011/2012 to FY 2018/2019
  - Dead weight costs of government taxation.

Since the canola LCA is mainly funded by the Australian and state governments, the cost of the funds used for the research program should reflect on the rest of the economy. If it is assumed that CSIRO LCA funding has been obtained through income taxation, there will have been negative effects on the private sector in the form of deadweight loss. It has been argued by a number of authors that research costs should be increased by about 20% to reflect the deadweight loss of income tax-based funding, although many Australian cost-benefit studies omit it. This is reflected in [Table 8: Benefits assessment](#).

- **Benefits:** FY2017/2018 (October 2017) through to FY2021/2022 (December 2022), post-implementation of revised RED. Benefits are accounted for until FY2021/2022 as revised RED typically stay active for 5 years post-implementation.
- **Partners to corroborate claimed impact:** AOF, AEGIC, DFAT
- **Other benefits from the work are covered in [Section 8](#).**

**Note:** The CBA includes all costs associated with the program starting FY2011/2012. However, for benefits estimation, we have only evaluated the canola GHG emissions LCA project to keep the analysis conservative.

### Cost benefit analysis snapshot

<b>Objective:</b> To evaluate the impact of the canola GHG emissions LCA work and benefits generated for Australia
<b>Base-case: Best:</b> LCA work successfully conducted by an organisation other than CSIRO <b>Base-case: Worst:</b> LCA work conducted by an organisation other than CSIRO and unsuccessful
Project impacts for CBA: <a href="#">Section 6</a>
Predicting impacts of the project over the period of assessment for different scenarios: <a href="#">Table 6</a>
Estimating the economic value of the costs and benefits: <a href="#">Table 7</a>
Estimating the BCR for the project: <a href="#">Table 8</a>

### Modelling approach

To estimate the benefits of this work, the following project case was used to model the estimated range of benefits:

Approval and acceptance of Australia’s Country Report for securing continued access to the EU market and premiums for the period from FY2017/2018 (October 2017) through to FY2021/2022 (December 2022).

The focus of this analysis is to estimate the broader net benefit to Australia from the investment in the work, calculate the part of those benefits attributable to CSIRO and understand the payoff from the assessment work with respect to funding invested. It is therefore necessary to tease out CSIRO’s costs and benefits—requiring a disaggregation of the positive externalities back to either CSIRO or to other contributors.

#### *Project assumptions*

- a) Australia would have lost access to the EU biodiesel market (worst case) or a season of exports (best case) if CSIRO and partners had not been engaged in this work.
- b) The revised EU-RED will stay active for at least five years. Hence the assessment of benefits is performed until FY2021/2022.
- c) The premium paid to Australian canola exports by the EU is assumed as \$20/tonne for period FY2017/2018–FY2021/2022. In reality, this value varies from \$20–\$60/tonne based upon complex market supply and demand factors. We have chosen a lower bound value for the assessment to keep this analysis conservative.

- d) Overall Australian canola exports to EU (biodiesel + non-biodiesel market) for FY2019/2020–FY2021/2022 have been assumed to be 1500 kt.
- e) In the case of absence of the approval of the Country Report, Australia would have lost access to the EU biodiesel as well as the non-biodiesel market. This is because Australian canola supply to the non-biodiesel market is very small and the EU have their own non-GM canola production to cater to the domestic non-biodiesel market, thereby making it unviable to continue exports from Australia.
- f) Other scenario-specific assumptions are covered in Table 6 below.
- g) The discount rate for the purpose of the CBA is assumed to be 7%.

Tables 6 and 7 outline the CBA analysis scenarios and approach. The three scenarios that have been assessed include:

**#1** LCA work, if conducted by an organisation other than CSIRO and unsuccessful. This is considered the worst base case as it represents a scenario that would have led to complete loss of access to the EU market for Australian canola.

**#2** LCA work, if conducted by an organisation other than CSIRO. This is considered the best base case as it represents a scenario that would have led to continued access to the EU biodiesel market for Australian canola. This would still have led to the loss of at least one year of exports to the EU market, causing market disruption and uncertainty that would have adversely affected export sales of Australian canola.

**#3** EU revised RED canola LCA work conducted by CSIRO & team. This represents the evaluation case that assesses the incremental benefits resulting from CSIRO’s involvement in this work.

The benefits associated with this work have been assessed for a period of five years as explained above. The author provides the evaluation approach for the assessment of the overall benefits and CSIRO’s attribution against the two baselines in Table 7. Specific assumptions for each case are also covered in Table 6 and 7.

Since the analysis is based on taking credit for the premiums earned from the EU biodiesel market, the incremental benefit of engaging CSIRO (i.e. #3 Evaluation Case) relative to the two base cases is:

- Base Case #1: five years of premiums earned from the EU exports (indicated in Table 7 as  $5(B1+B2) \times (\text{CSIRO's attribution})^8$ )
- Base Case #2: one year of premiums earned from the EU exports (indicated in Table 7 as  $(B1+B2) \times (\text{CSIRO's attribution})$ )

The overall exports to the biodiesel and non-biodiesel markets are denoted as A1 and A2 in Table 7. Although the revised RED only applies to the EU biodiesel market, in the event of non-compliance, Australia would have lost access to canola exports completely. This is because the share of exports utilised in the EU non-biodiesel market is small and it would not have been commercially feasible to export smaller volumes.

Both scenarios #1 and #2 indicate millions of dollars in lost revenue for the Australian canola industry. Non-compliance to revised RED or delay in acceptance of the Country Report would have caused some

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<sup>8</sup> B1: EU Exports premium to biodiesel market/yr  
 B2: EU Exports premium to non-biodiesel market/yr  
 CSIRO’s Attribution: As per AEGIC assessment provided in Table 5

time lag to get new buyers for the 2017 canola harvest (at the least). This would have in-turn led to market disruptions and Australian grain traders competing with other countries (e.g. Canada) in other markets (e.g. China) and having to risk not getting a premium or desirable base price for Australia's non-GM canola. These issues of market disruption and adverse effects on export sales of Australian canola are hard to estimate due to complex market dynamics. To keep the CBA conservative, we have assumed no time lag to find new buyers for the canola 2017 harvest and attaining the same base price as paid by EU for canola exports to other countries for both the baselines. This is a very conservative assumption and hence the stated incremental benefits have been underestimated.



Table 6: Cost benefits analysis: scenarios and assumptions








Period of Analysis: FY2017/2018–FY2021/2022		Assumption: The revised EU-RED will stay active for at least 5 years	
	Scenario	Consequence	Economic Impact (2017–2022)
 Evaluation Case	<b>#3</b> EU revised RED canola LCA work conducted by CSIRO & team* (Evaluation case)	Key benefit attributable to CSIRO & team**: Maintaining access to the EU market, thereby protecting canola export and premiums to crops harvested FY2017/2018–FY2021/2022 <b>Benefits claim:</b> Background knowledge (AusLCI work), relationship with key players working in this domain and strategic positioning to enable their integration gave CSIRO + team the competitive advantage of carrying out the quality assessment, review and timely implementation of the Country Report (2017).	 
 Base Case (Best)	<b>#2</b> LCA work, if conducted by an organisation other than CSIRO (Base case for the purpose of this analysis)	<b>Benefit of work:</b> Maintaining access to the EU biodiesel market, thereby protecting canola export and premium 2018–2022 <b>Assumptions:</b> -Successful completion of analysis and demonstration of Australian canola quality compliance to the revised EU-RED for continued access - Australian able to sell canola to another market (overseas/ domestic) for the year 2017–2018 (before the implementation of the report)	
 Base Case	<b>#1</b> LCA work, if conducted by an organisation other than CSIRO and unsuccessful	<b>Results:</b> <ul style="list-style-type: none"> <li>- Loss of Australian canola exports to the EU biodiesel market (loss of export and premiums to this market)</li> <li>- Loss of Australian canola exports to EU non-biodiesel market</li> <li>- Selling Australian canola in the domestic market/ exporting more canola to other Australian canola importers like China (2017–2022)</li> </ul> <b>Assumptions:</b> We assume the base purchase price (excluding premium) for Australian canola, for other importing countries or domestic market, is the same as the price paid by the EU. This is a very conservative assumption as in a scenario like this Australia would be directly competing with countries like Canada, thereby lowering the base export price.	

Table 7: CBA analysis approach

	Case	Consequence	Economic Impact (FY2017/2018–FY2021/2022)	
	EU Exports to biodiesel market/yr: A1 EU Exports to non-biodiesel market/yr: A2	EU Exports premium to biodiesel market/yr: B1 EU Exports premium to non-biodiesel market/yr: B2	Period of Analysis: 2017–2022 Assumption: The revised EU-RED will stay active for at least 5 years	
Evaluation Case	#3 EU revised RED canola LCA work conducted by CSIRO & team*  (Evaluation case)	Key benefit attributable to CSIRO & team** Maintaining access to the EU market, thereby protecting canola export and premiums to crops harvested <u>FY2017/2018–FY2021/2022</u> <b>Benefit claim:</b> Background knowledge (AusLCI work), relationship with key players working in this domain and strategic positioning to enable their integration gave CSIRO + team the competitive advantage of carrying out the quality assessment, review and timely implementation of the Country Report (2017).	EU Exports	5(A1+A2)
			EU Premium	5(B1+B2)
			Other Country Exports	-
			<b>Total<sub>3</sub></b>	<b>5(A1+A2+B1+B2)</b>
Base Case (Best)	#2 LCA work, if conducted by an organisation other than CSIRO  (Base case for the purpose of this analysis)	<b>Benefit of work:</b> Maintaining access to the EU biodiesel market, thereby protecting canola export and premium <u>FY2017/2018–FY2021/2022</u> <b>Assumptions:</b> -Successful completion of analysis and demonstration of Australian canola quality compliance to the revised EU-RED for continued access - Australia able to sell Canola to another market (overseas/ domestic) for the year FY2017/2018 (before the acceptance of the report)	Other Country Exports (FY2017/2018)	A1+A2
			EU Exports	4(A1+A2)
			EU Premium	4(B1+B2)
			<b>Total<sub>2</sub></b>	<b>5(A1+A2)+4(B1+B2)</b>
Base Case	#1 LCA work, if conducted by an organisation other than CSIRO and unsuccessful	<b>Results:</b> - Loss of Australian canola exports to the EU biodiesel market (loss of export and premiums to this market) - Loss of Australian canola exports to EU non-biodiesel market - Selling Australian canola in the domestic market/ exporting more canola to other Australian canola importers like China (2017–2022) <b>Assumptions:</b> We assume the base purchase price (excluding premium) for Australian canola, for other importing countries or domestic market, is the same as the price paid by EU. This is a very conservative assumption as in a	EU Exports	0
			EU Premium	0
			Other Country Exports	5(A1+A2)



Table 7: CBA analysis approach

Case	Consequence	Economic Impact (FY2017/2018–FY2021/2022)	
	scenario like this Australia would be directly competing with countries like Canada thereby lowering the base export price <b>Note:</b> If the Country Report had not been accepted, there would have been a time lag to get new buyers for the Australian canola. To keep the CBA conservative, we have assumed <u>no lag</u> for the purpose of this analysis.	<b>Total<sub>3</sub></b>	5(A1+A2)
The overall benefit of the canola Country Report work (attributed to the overall team) wrt <b>base case (worst)</b> for <u>FY2017/2018–FY2021/2022</u>		<b>Total<sub>3</sub>- Total<sub>1</sub>=5(B1+B2)</b>	
CSIRO’s overall benefit contribution wrt base case (worst) for <u>FY2017/2018–FY2021/2022</u>		<b>5(B1+B2) X (CSIRO’s attribution)</b>	
The incremental benefit of CSIRO & team conducting this work wrt Base Case (Best) (i.e. some other organisation (domestic/ foreign) conducting it) for <u>FY2017/2018–FY2021/2022</u>		<b>Total<sub>2</sub>- Total<sub>1</sub>=(B1+B2)<sub>FY2017/2018</sub></b>	
CSIRO’s incremental benefit contribution wrt Base Case (Best) (i.e. some other organisation (domestic/ foreign) conducting the work) for <u>FY2017/2018–FY2021/2022</u>		<b>(B1+B2)X(CSIRO’s attribution)</b>	
*CSIRO & team implies CSIRO (incl sub-contractors Life Cycles Strategies, Meo Carbon) with multi-partner that include AOF, AEGIC, DFAT **Supporting evidence includes testimonials from AOF, AEGIC and Australian embassy Note: The seed quality of Australian canola is high. The key contribution of any scientific body conducting this assessment would have been to carry-out quality assessment of complex analysis, its timely completion and implementation to enable the next step of actions based upon the results. Time was of the essence to protect the industry from any losses arising out of these changes.			
Benefits relative to the base case (worst) attributable to CSIRO & team for conducting LCA work for <u>FY2017/2018–FY2021/2022</u>		Incremental benefits attributable to CSIRO & team for conducting LCA work relative to the base case (best) (i.e. some other organisation (domestic/ foreign) conducting it) for <u>FY2017/2018–FY2021/2022</u>	

## 7. Cost benefit analysis results

The following section presents the results of the CBA, comparing the performance of options using the two key metrics:

- BCR: The ratio of the present value (PV) of economic benefits to PV of economic costs over the appraisal period
- NPV: The PV of economic benefits delivered by the canola LCA work less the PV of economic costs incurred;

Both of the above metrics are assessed against the Base Case (worst) and Base Case (best) as defined above in Section 6.

The CBA measures the benefit to Australia through this work. To keep the analysis conservative, this assessment accounts deadweight costs of government taxation.

The results of the CBA are summarised in Table 8 and based on the assumptions applied in the analysis for costs and benefit items using a real discount rate of 7%. The results show net costs and benefits of the 'CSIRO' case (#3) relative to the 'without CSIRO' cases (#1, #2) over the appraisal period, 2011/12/–2021/22 following the methodology discussed in Section 6.

The BCR for CSIRO's engagement in this work with respect to the Base Case (Best) varies from 3.6-4.3 (with or without deadweight). Similarly, the BCR with respect to the Base Case (worst) varies from 18.5–22. NPVs (\$ millions, in \$ FY 2018/2019) for Base Case (Best) and Base Case (worst) are estimated as 11.99 and 80.38 respectively.

Table 8: Benefits assessment

BCR Assessment Approach				
Case	Consequence	Costs	Benefits	Benefit: Cost Ratio
EU Exports to biodiesel market/yr: A1 EU Exports to non-biodiesel market/yr: A2	EU Exports premium to biodiesel market/yr: B1 EU Exports premium to non-biodiesel market/yr: B2	Period: Since inception i.e. FY 2011/2012–FY 2018/2019	Period: FY2017/2018–FY2021/2022 <b>Assumption:</b> The revised EU-RED will stay active for at least 5 years	
Project Case: Benefits assessment from acceptance and implementation of Country Report for Australian Canola GHG for enabling continuous access to the European Union market for the period from October 2017 through to December 2022.				
CSIRO's Program cost for FY 2011/2012–FY 2018/2019 (in \$ FY 2018/2019) Ref: Appendix B		3,847,000		
		With <u>Deadweight costs</u> : 4,616,300		
CSIRO's overall benefit contribution with respect to base case (worst) for FY 2011/2012–FY 2018/2019 (\$ FY 2018/2019) Ref: See Appendix A, Appendix B, Table 5,7 and Project Assumptions			<b>5(B1+B2) X</b> (CSIRO's attribution) = 85,000,000	22 With <u>Deadweight costs</u> : 18.5
	The incremental benefit of CSIRO conducting this work with respect to Base Case (Best) (i.e. some other organisation (domestic/ foreign) conducting it) for <u>FY2017/2018–FY2021/2022</u> (\$ FY 2018/2019)			<b>(B1+B2)<sub>FY2017/2018</sub> X</b> (CSIRO's attribution)= <b>16,610,000</b> 4.3 With <u>Deadweight costs</u> : 3.6
NPV Assessment Approach				
Net present value (\$ millions, in \$ FY 2018/2019) = present value of benefits - present value of costs (CSIRO; incl. dead weight)		Base case (worst)		80.38
		Base Case (Best)		11.99
References: <a href="https://grdc.com.au/resources-and-publications/groundcover/groundcover-133-march-april-2018/green-canola-secures-\$1-billion-eu-trade">https://grdc.com.au/resources-and-publications/groundcover/groundcover-133-march-april-2018/green-canola-secures-\$1-billion-eu-trade</a>				

## 8. Flow-on benefits of program

### Future assessments

- a. The canola GHG emission assessment has helped identify environmental ‘hotspots’ in supply chains and instigate actions to further reduce carbon footprint in the Australian canola production life-cycle.
- b. CSIRO is currently exploring developing a tool for farmers to benchmark the environmental performance of broad-acre crops, thereby propelling technology advancement and innovation to support new sectorial demands.
- c. The LCA model for canola forms a robust framework for environmental assessment of other broad-acre grains. With the increasing awareness, stringent regulations and sustainability demands, these assessments will progressively become important in future. The work provides a database that can be used by several industries in Australia, a framework that can be used for LCA of other grains (e.g. wheat, barley, etc.) and potential business opportunities for CSIRO to conduct similar assessments to address domestic and global needs.

### Global engagement and relationship strengthening

The canola GHG emissions LCA work helped to enhance Australia’s reputation as a provider of quality canola that meets the EU’s GHG reduction targets. Inability to successfully conduct this work would have restricted the trade to Australia’s most significant market for canola export and negatively impacted the Australian canola industry throughout the value chain. Working with the Australian Trade Commission in Brussels, and SGS and DBFZ in Germany, proved significant and created benefits for Australia beyond maintaining our EU canola markets.

The successful completion of the assessment further promoted CSIRO’s reputation and research capability in both domestic and global markets. The uptake of the model for canola as a robust prototype for environmental assessment of other broad-acre grains is expected to generate many new domestic and international RD&I activities to meet growing and new sectorial needs.

This transcontinental work has also helped strengthen the relationship between the Australian oilseeds and grains industry and the Australian Trade Commission in Brussels, while giving relevant international stakeholders a much deeper understanding of the Australian cropping environment. This area had not gathered much attention until the successful completion of this work. The creation of the new insights, collaboration with world-class institutes and linkages would help underpin Australia - EU Free Trade negotiations.

In future, the work has the potential to open new investment, research and innovation opportunities especially with the growing awareness and stringency of GHG emission regulations globally. As EU member states move to a GHG emissions-intensity target (as opposed to the fixed GHG savings target), demand will strengthen for canola that can be produced with the lowest emissions possible.

## 9. Limitations





Australia's Country Report enabled continuing exports to the largest exporter and invaluable EU biodiesel market. This evaluation combines quantitative and qualitative methods to illustrate the nature of the canola GHG emissions LCA's economic, environmental, and social impacts. In cases where the impacts can be assessed in monetary terms, a CBA was used as the primary tool for evaluation. As a methodology for impact assessment, CBA relies on the use of assumptions and judgments made by the authors in conjunction with the research team. This relates primarily to the economic indicators for impact contribution, attribution, and the counterfactual. These limitations should be considered when interpreting the results presented in this case study.

The CBA mainly focussed on the economic benefits from protecting premiums earned from non-GM Australian canola exported to the EU. It is important to note that the key benefit of this work has been maintaining continued access to the EU market. However, due to complex market dynamics, these effects are hard to measure and hence have not been accounted for in this analysis

The premiums earned on exports are highly variable due to dependence upon market dynamics and spectrum of complex interlinked factors. To keep the analysis conservative, lower bound premiums are used to estimate benefits; however, the author has not been able to obtain complete data on premiums earned through Australian canola exports to the EU in the past years. Most of the exported Australian canola is utilised in EU bio-diesel market, which does not require non-GM canola; this would suggest an inherent risk to the premiums earned in the future.

CSIRO's brand value and strategic position underpinned the successful completion of the Country Report. These attributes take time, effort and cost to build, but are difficult to quantify, and the authors have not attempted to do so for this analysis. Similarly, the flow-on benefits described above have not been quantified, as they are largely prospective in nature. It is important to note that the current CBA includes all costs associated with the program starting FY2011/2012. However, for benefits estimation, we have only evaluated the Canola GHG emissions project to keep the analysis conservative. Consequently, this analysis may substantially underestimate the total value that CSIRO's contribution to the Canola GHG emission LCA study delivers.

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Useful Background on Canola Project fro

## Appendix A Canola exports from Australia

Table A: Canola exports from Australia (2014–2018)<sup>9</sup>

Commodity/Product	CANOLA-					Grand Total
	Oil/Seed/Meal					
	Tonnes					
	Cal. Year					
Sum of Qty (Tonnes)	2014	2015	2016	2017	2018	
Destination Country or Continent (simplified)						
EU	1,327,376	1,629,411	1,917,346	2,587,053	1,793,012	9,254,198
Non-EU	1,230,306	1,121,263	264,659	373,640	464,829	3,454,698
<b>TOTAL EXPORTS</b>	<b>2,557,683</b>	<b>2,750,675</b>	<b>2,182,005</b>	<b>2,960,693</b>	<b>2,257,840</b>	<b>12,708,896</b>
			AUD			
	Cal. Year					

<sup>9</sup> Source: Australian Bureau of Statistics (ABS)



Sum of Value (FOB) \$A (from ABS)	2014	2015	2016	2017	2018	Grand Total
Destination Country or Continent (simplified)	2014	2015	2016	2017	2018	
EU	743,716,816	868,559,195	1,116,650,935	1,526,646,946	1,022,880,493	5,278,454,385
Non-EU	721,487,128	654,680,569	164,494,855	225,715,399	273,320,726	2,039,698,677
<b>TOTAL EXPORTS</b>	<b>1,465,203,944</b>	<b>1,523,239,764</b>	<b>1,281,145,790</b>	<b>1,752,362,345</b>	<b>1,296,201,219</b>	<b>7,318,153,062</b>
			\$\$/Tonne (excl premium)			
Sum of Qty (\$\$ per tonnes) Country of Destination (from ABS)	Cal. Year					Grand Total
Destination Country or Continent (simplified)	2014	2015	2016	2017	2018	
EU	560	533	582	590	570	570
Non-EU	586	584	622	604	588	590
<b>TOTAL EXPORTS</b>	<b>573</b>	<b>554</b>	<b>587</b>	<b>592</b>	<b>574</b>	<b>576</b>

## Appendix B Estimation of program costs and benefits



Table B: Canola exports to EU from Australia (realised and projections for benefits assessment)

Commodity/Product	CANOLA-					Grand Total
	Oil/Seed/Meal		Tonnes			
	Cal. Year					
Sum of Qty (tonnes)	FY2017/2018	FY2018/2019	FY2019/2020	FY2020/2021	FY2021/2022	
EU Exports	2,587,053	1,793,012	1,500,000	1500000	1500000	8,880,065
Premiums earned @ \$20/ tonne	51,741,060	35,860,240	30,000,000	30,000,000	30,000,000	177,601,300
Benefits attributable to CSIRO (%)	30%	60%	60%	60%	60%	
Benefits attributable to CSIRO (\$\$)	15,522,318	21,516,144	18,000,000	18,000,000	18,000,000	
Benefits attributable to CSIRO (\$\$FY 2018/2019)	16,608,880	21,516,144	16,822,430	15,721,897	14,693,362	85,362,714

Table C: Canola LCA program costs

Contributor / Type of support	FY2011/2012 (\$ FY 2018/2019)  (pre-Canola GHG work)	FY2012/2013 (\$ FY 2018/2019)  (pre-Canola GHG work)	FY2013/2014 (\$ FY 2018/2019)  (pre-Canola GHG work)	FY2014/2015 (\$ FY 2018/2019)  (pre-Canola GHG work)	FY2015/2016 (\$ FY 2018/2019)  (Canola GHG work)	FY2016/2017 (\$ FY 2018/2019)  (Canola GHG work)	FY2017/2018 (\$ FY 2018/2019)  (Canola GHG work)
<b>Cash</b>							
CSIRO						2,987	98,911
External Partners	112,670	176,286	140,443	275,930	696,202	333,235	0
<b>In-kind</b>							
CSIRO	23,753	88,614	13,664	176,008	414,486	285,874	66,269
External Partners	70,399	0	0	297,898	284,488	288,783	0
<b>Total</b>	<b>206,821</b>	<b>264,900</b>	<b>154,107</b>	<b>749,837</b>	<b>1,395,176</b>	<b>910,878</b>	<b>165,180</b>

## Appendix C Testimonials

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Department of Foreign Affairs and Trade	 Embassy Ltr_Referee_CSIRO Aw

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