Walk through carbon calculators and example of typical mixed wheat sheep operations

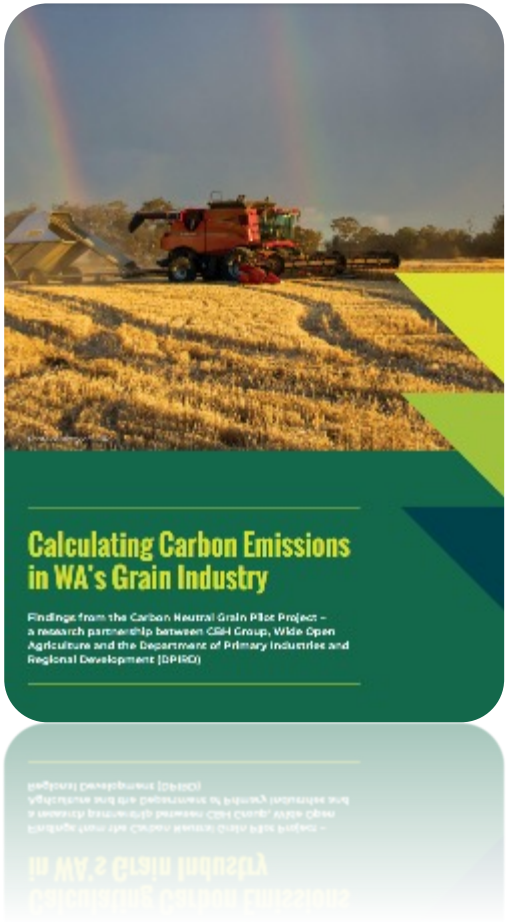
Ben White, B M White & Kondinin Group

Richard Brake, Richard Brake Consulting

Brent Searle, BJW

AAACWA

Perth, April 28, 2023

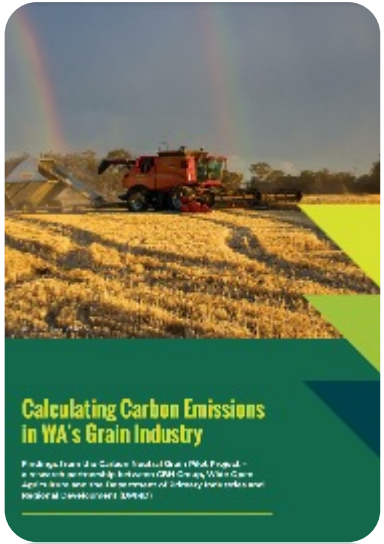


Carbon neutral grain pilot

Personnel and investment

WA Carbon neutral grain pilot project

- Larissa Taylor – Savoir consulting
- Richard Brake - Richard Brake Consulting
- Ben White – BM White research
- CBH, DPIRD, WOA input and investment



CBH GROUP

GOVERNMENT OF WESTERN AUSTRALIA

Department of Primary Industries and Regional Development

Wide Open Agriculture

Project outline

Dataset and demographics

WA Carbon neutral grain pilot project

- 36 farms
  - 8x 2020 (courtesy of Boortmalt)
  - 28x 2021
- Additional reference farms from Viridis (through FarmPrint)
- 2020 & 2021 cropping seasons for Boortmalt data comparison

Project outline

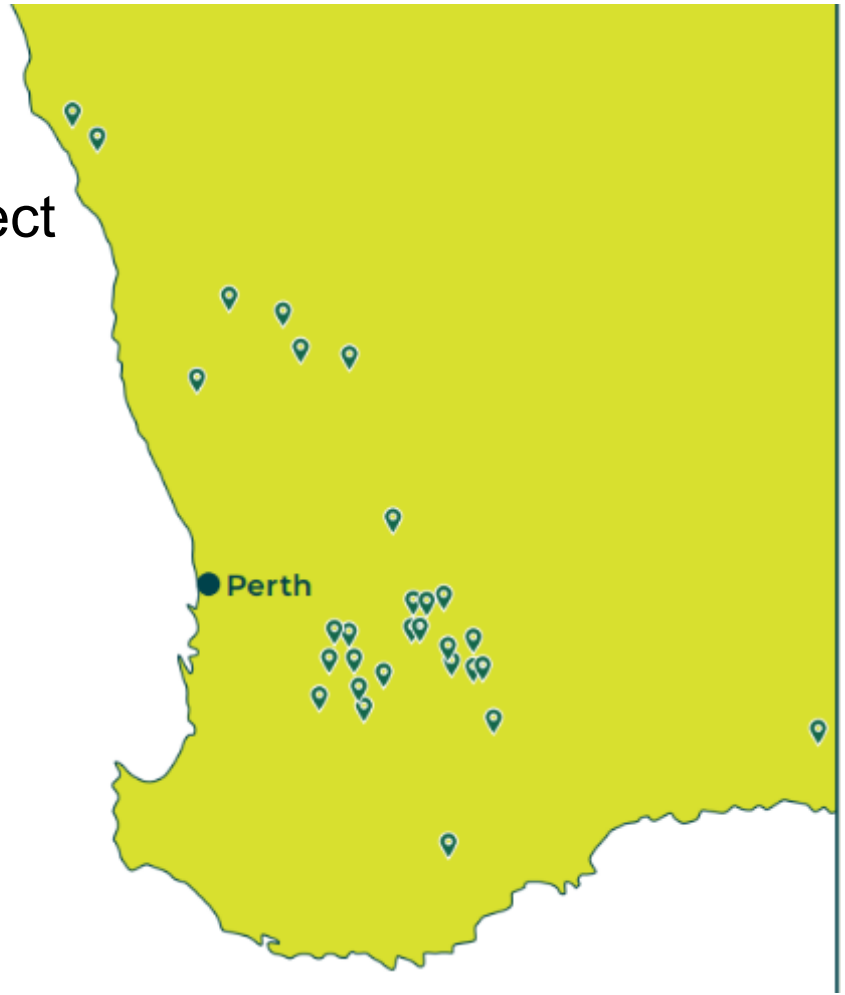
Tools used

WA Carbon neutral grain pilot project

- 3 different tool used

  (identical data applied)

  - PICCC Grains GAF
  - Cool Farm Tools
  - CSIRO FarmPrint*



Department of Primary Industries and Regional Development

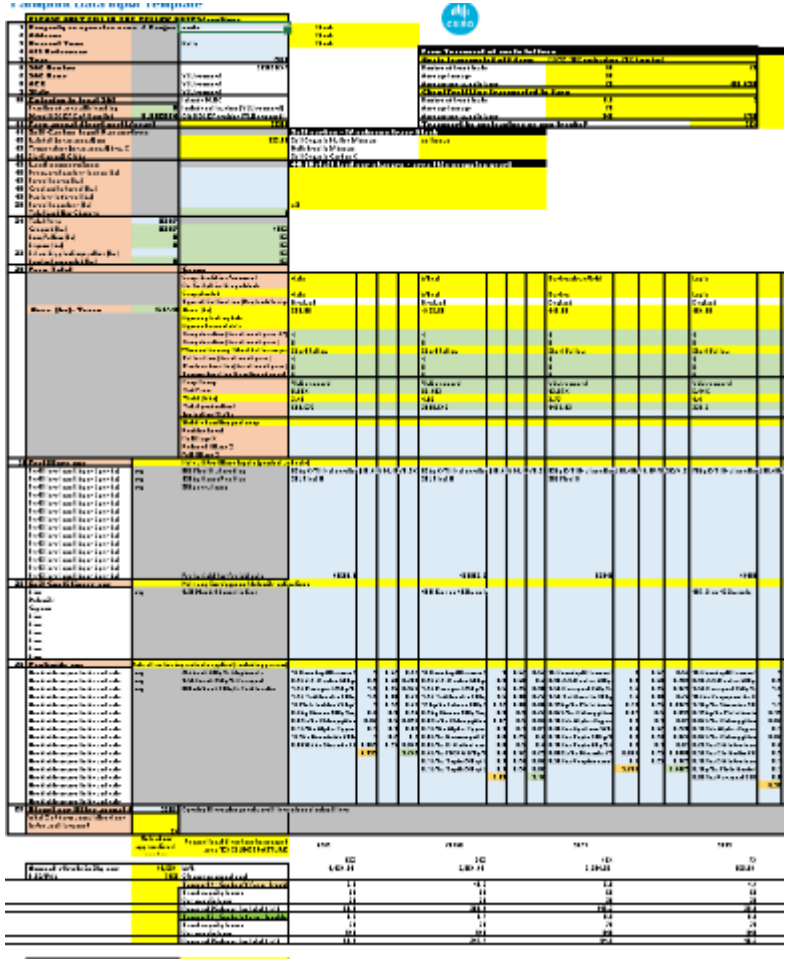
Wide Open Agriculture

Gathering the numbers

Dataset – Carbon Neutral Grain Pilot

Data Collected

- Location & rainfall
- Crop types
- Area
- Variety
- All fertiliser inputs
  - Type & rate
  - Composition
  - Application method
- Lime inputs
- Burning
- Chemical inputs
  - Actives & w/w
- In/Out transport
- Tillage practices
- Yields
- Fuel use
- Electricity use
- Soil C (if known)
- On-farm plantings



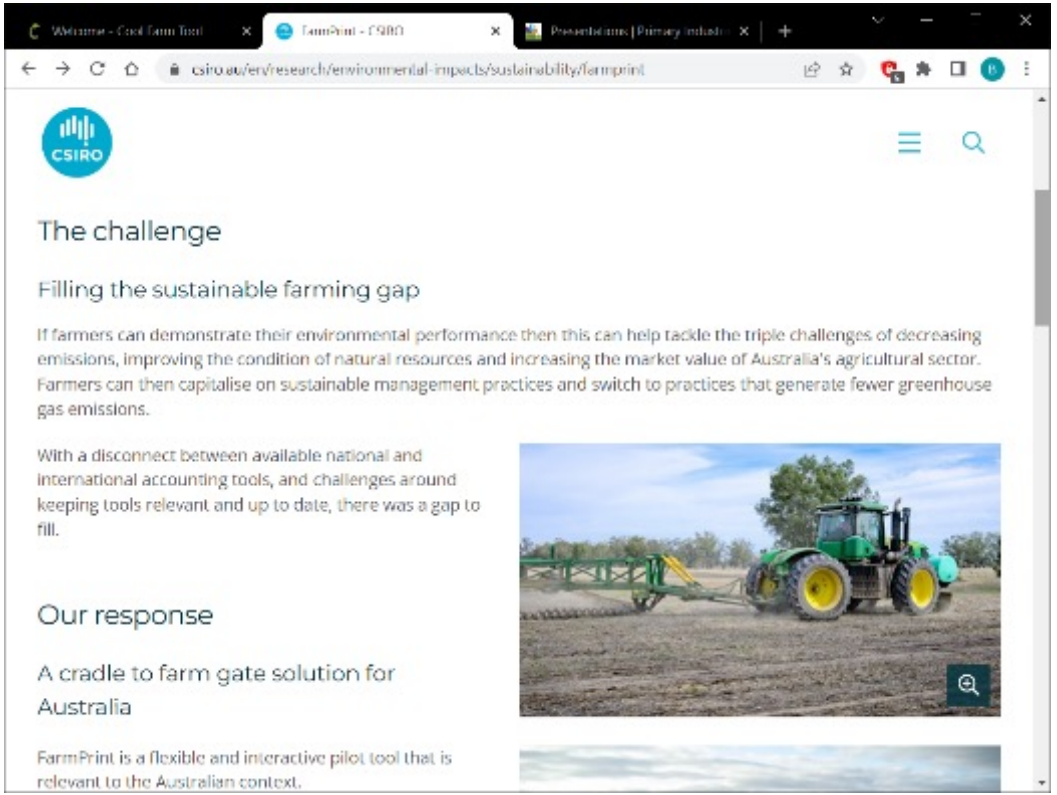
CBH Group

Department of Primary Industries and Regional Development

Wide Open Agriculture

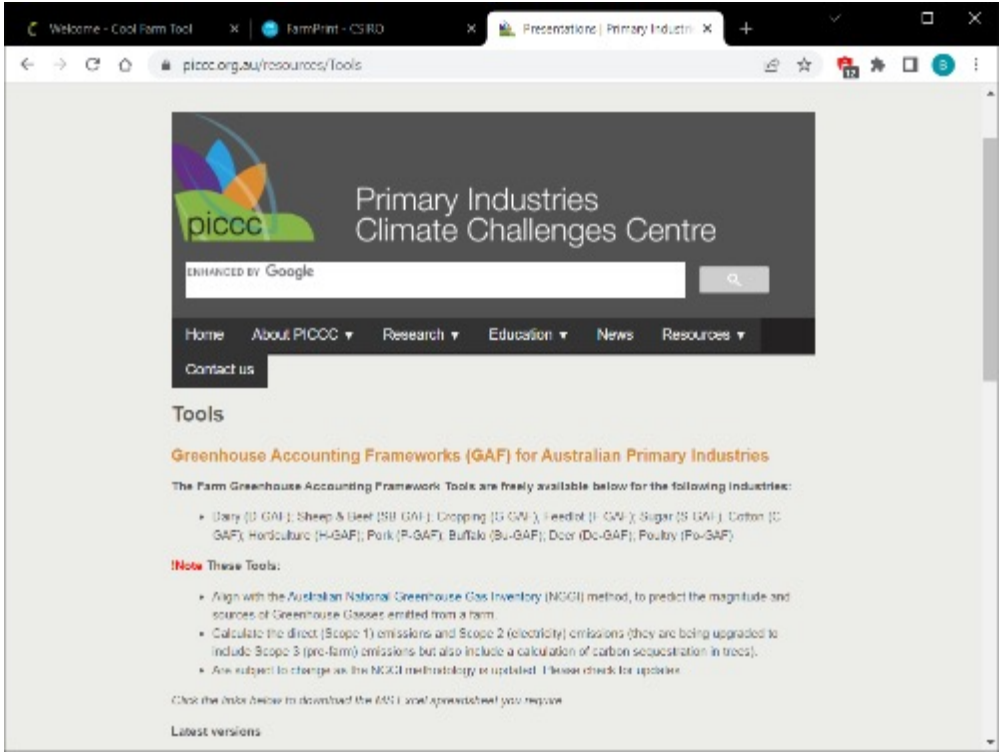
Project outline

Tools used : CSIRO FarmPrint



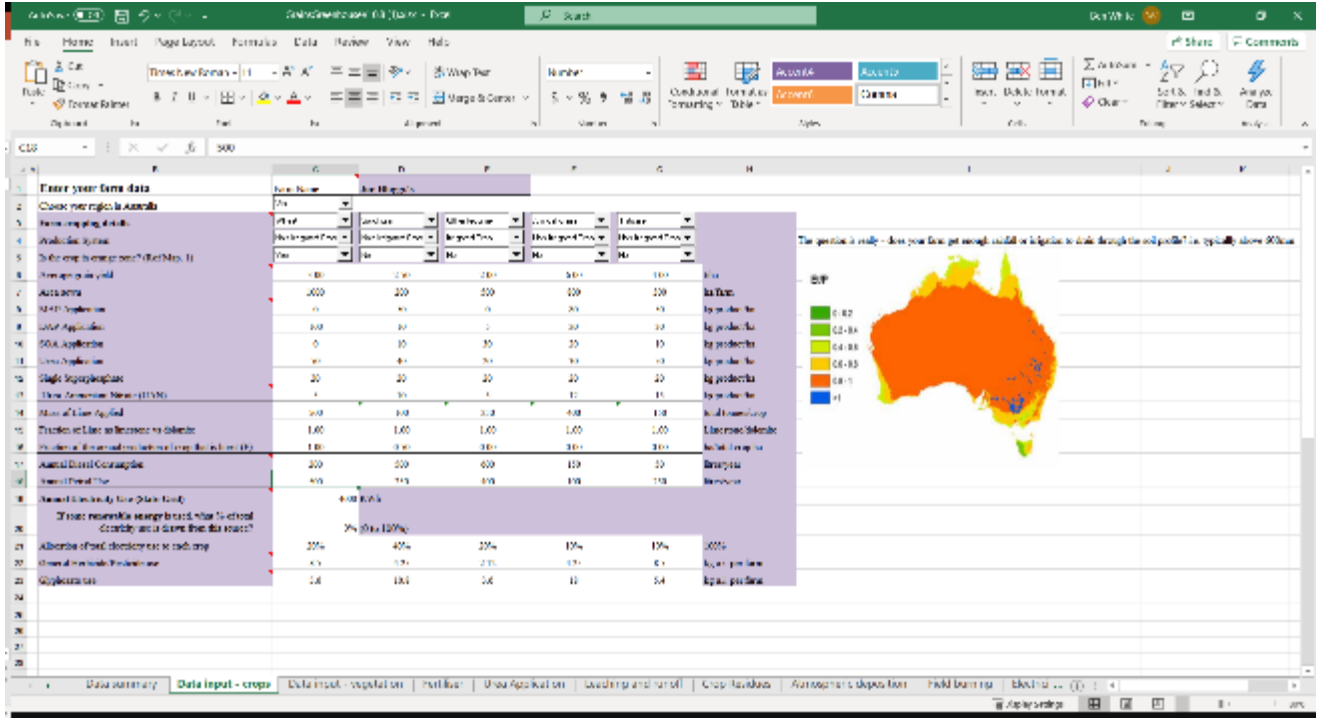
Project outline

Tools used : PICCC Grains GAF



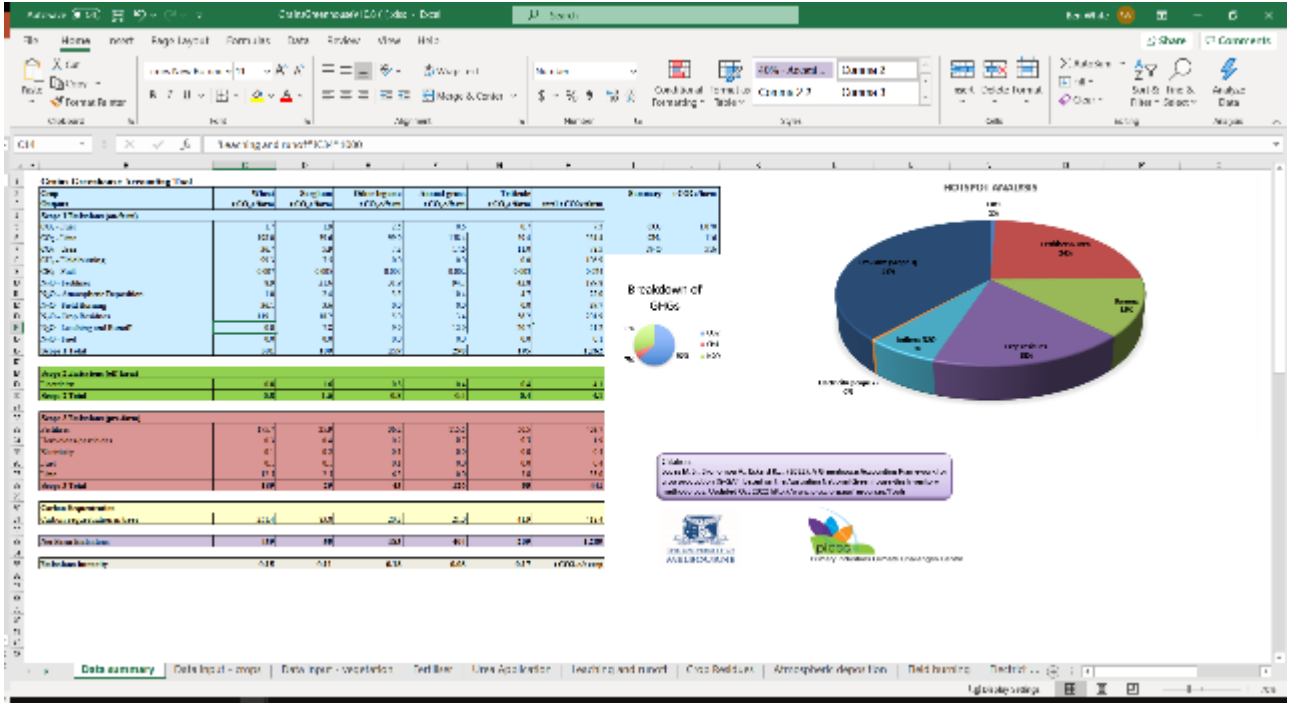
Project outline

Tools used : PICCC Grains GAF



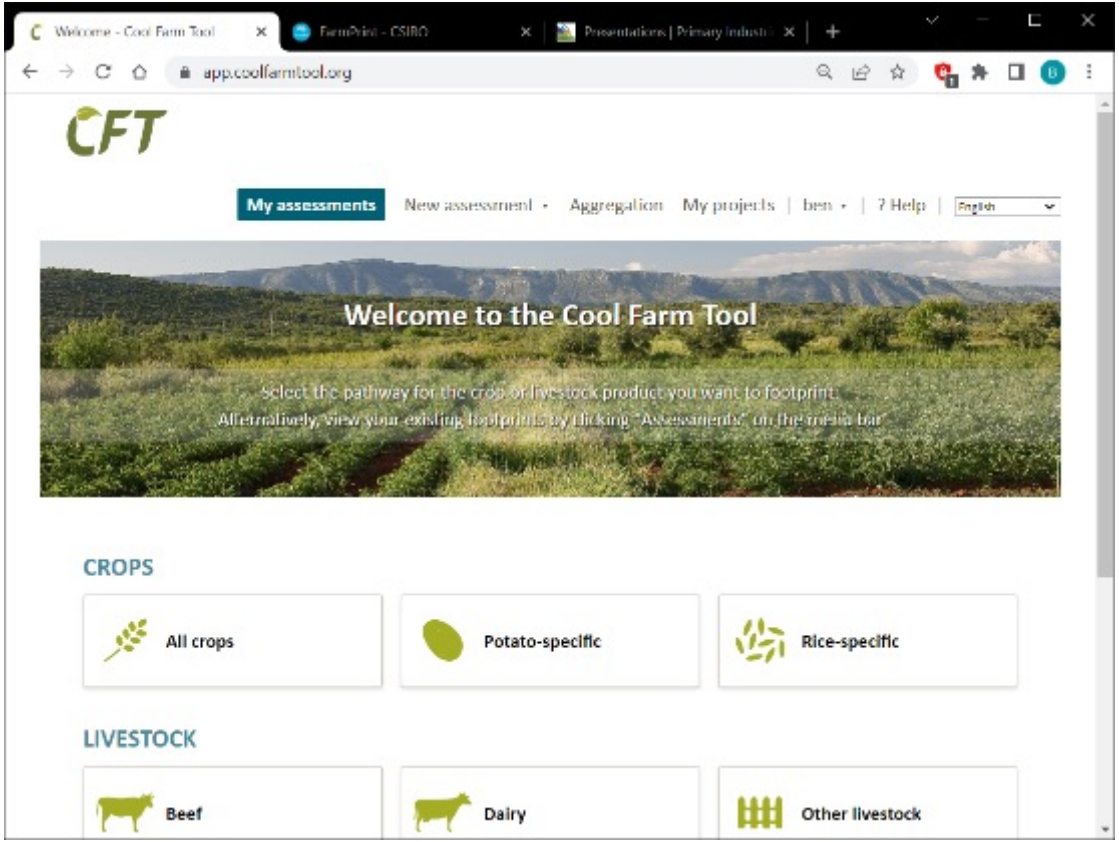
Project outline

Tools used : PICCC Grains GAF



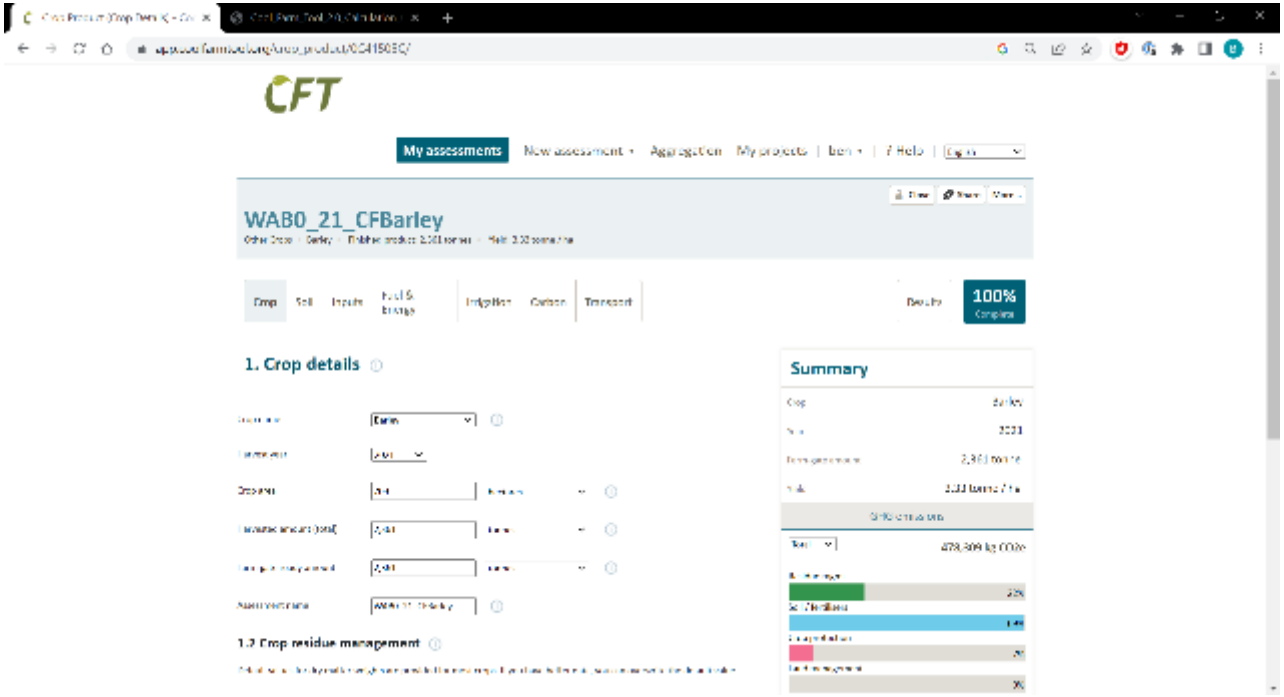
Project outline

Tools used : Cool Farm Tool



Project outline

Tools used : Cool Farm Tool



Assumptions applied: All calculators 1/2

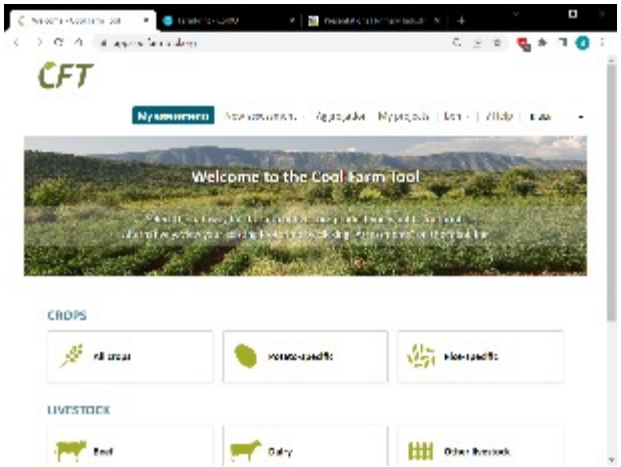
- Fuel and energy apportioned by fractional area of crop to total crop
- Label rates of chemicals used where product or tradename known but rates unknown
  - (Ref – Manufacturer published label)
- Soil carbon and land use changes not included
  - Simply looking at emission sources associated with the production of grain
- Hay production included to balance fuel inputs relative to area

CBH Group
Department of Primary Industries and Regional Development
Wide Open Agriculture

Assumptions applied: All calculators 2/2

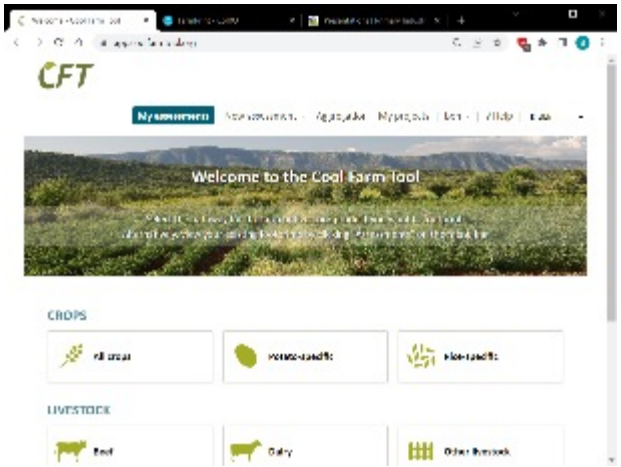
- Livestock enterprises and pasture paddocks excluded
  - (requires separate analysis)
- UAN & Flexi-N assumed SG=1.32, N=32% and Urea=35% from SDS
- Compound fertiliser breakdown reference manufacturer NPKS analysis
- Minimum tillage = tined seeder only,
- Zero till = disc seeder only
- Assumed power cost @$0.35/kW.h where only cost is known

Specific assumptions applied: Cool Farm Tools 1/2



- Crop residue % defaults used
- Soil type: Assumed dry & default SOC values used unless provided
- Fertiliser sources assumed as Oceania unless known
- Lime rates adjusted to match default CaCO3 (55%)
- Legacy practice changes excluded (20yr)
  - Can be significant (eg conventional>min till 18y ago = reduced GHG)
- Default UAN & Flexi-N assumed rates L/ha x SG=1.32

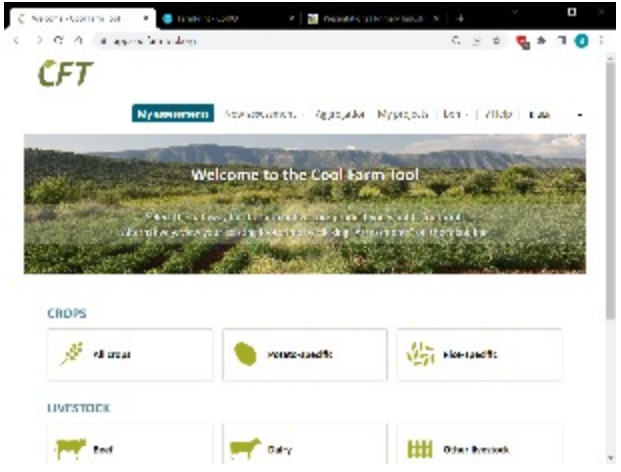
Specific assumptions applied: Cool Farm Tools 2/2

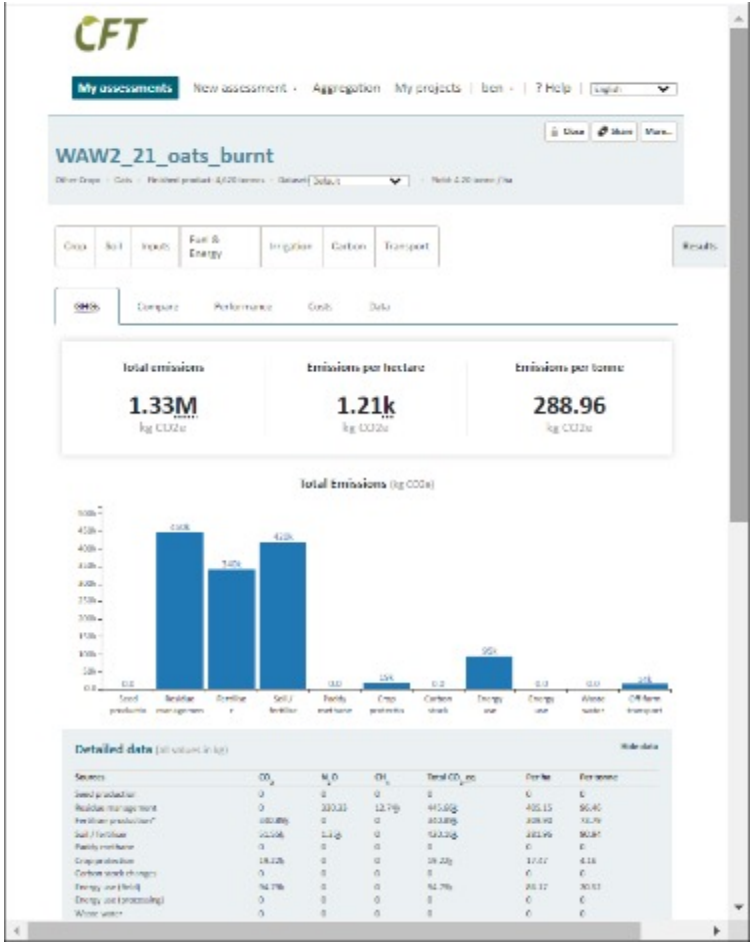


- Fertiliser entered as kg/ha, Lime as t/ha – Some entry variances
  - Significant differences observed – has some significant implications
  - Applies to urea (other fertilisers not tested) also – requires correction
- Crop protection broken down and entered as pure aggregated active constituent (w/w%), post-em and herbicide
  - Maximised entry efficiency with minor impact by selecting herbicide only (<0.1% total variation)
- Lupins/Lentils/Peas/Beans/Vetch =“Other Legume” – no category
- Transport incoming + outgoing goods = distance x tonnage
- Partial burn not provisioned, so excluded or separated on larger paddocks
- Gypsum & dolomite not provisioned, so excluded
- Farm gate ready amount – excludes seed

Output: Cool Farm Tools

COOL FARM TOOL

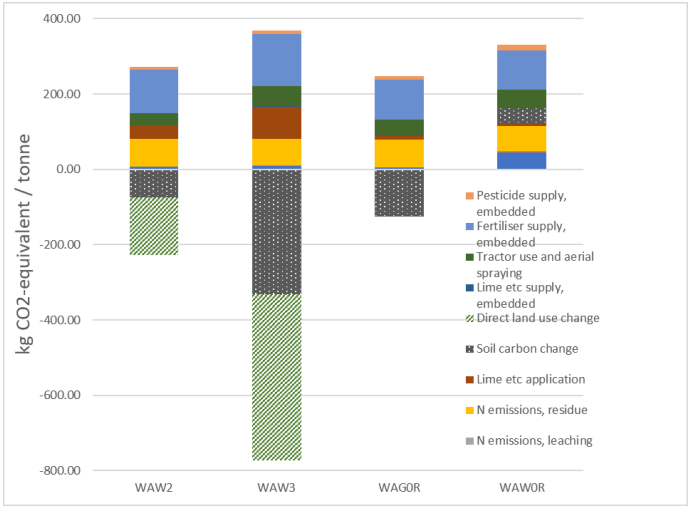




Department of Primary Industries and Regional Development

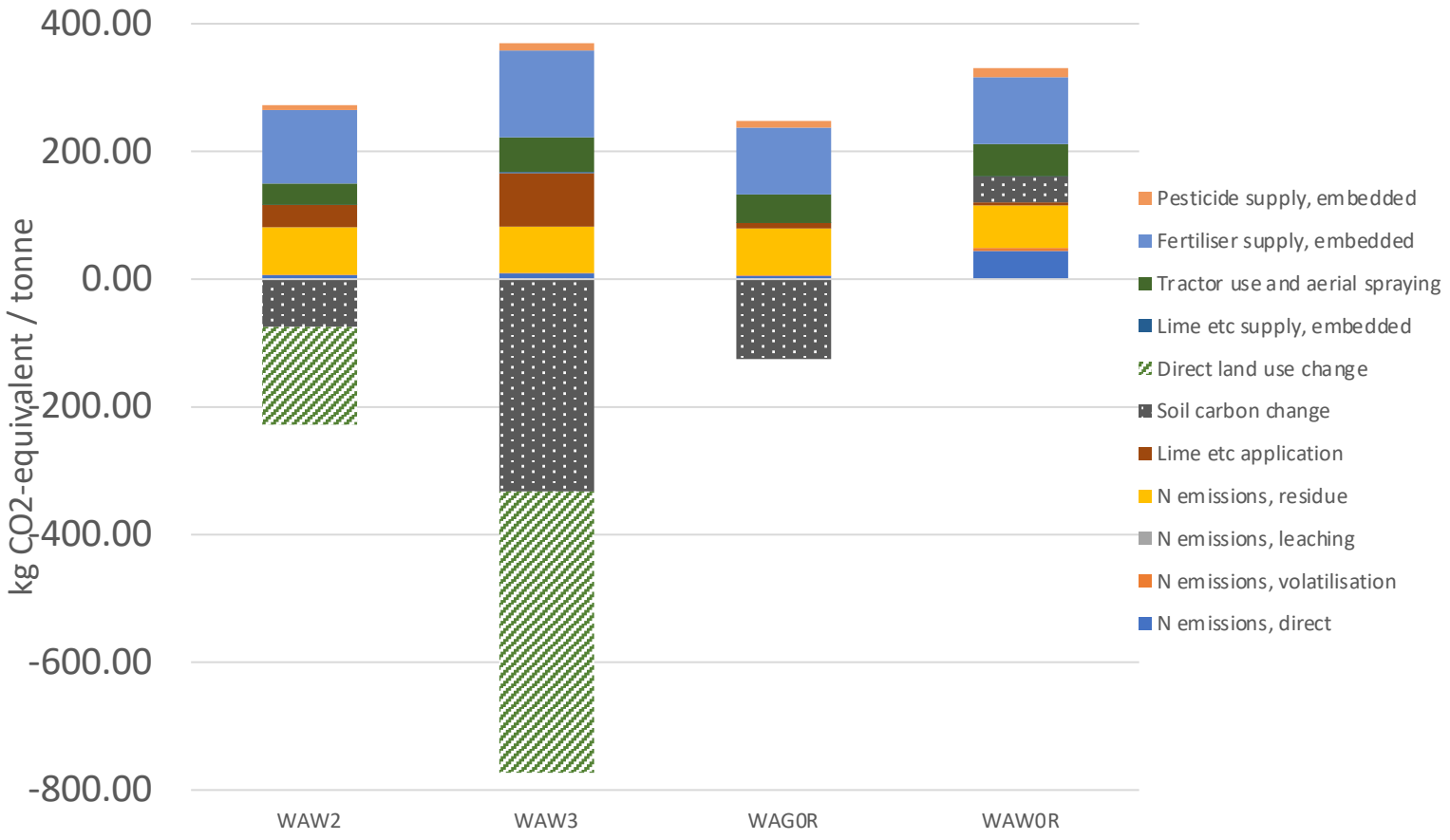
Wide Open Agriculture

Assumptions applied: FarmPrint

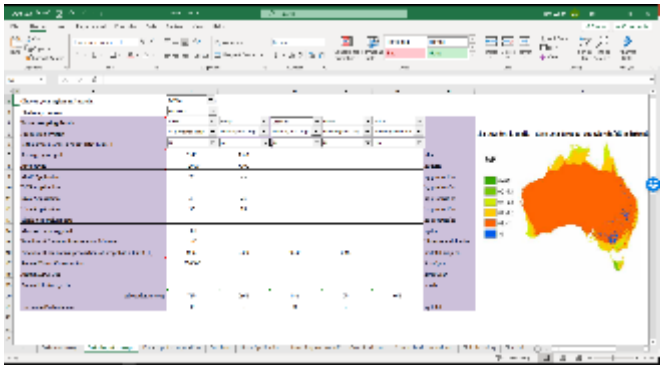


- Datasets re-formatted and provided to CSIRO team in very specific template
- Pesticides - Broken down to pure kg of active pesticide fractions (Ref – manufacturers label info)
- Fertilisers – Broken down into pure kg of key ingredients (Ref - SDS and specs to calculate fraction)
- All other assumptions and back-end handled by CSIRO
- Soil carbon and land use changes were calculated and provided but excluded from emission source analysis
- **Time limited analysis resulted in 4 farms**
- Data received including: **Climate**, Abiotic depletion, Acidification, Eutrophication, Water Scarcity, Land Use, EcoTox, PM-smog

Output: FarmPrint

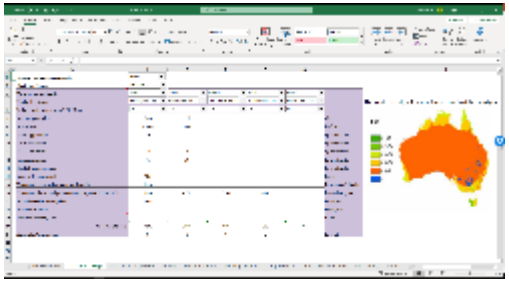


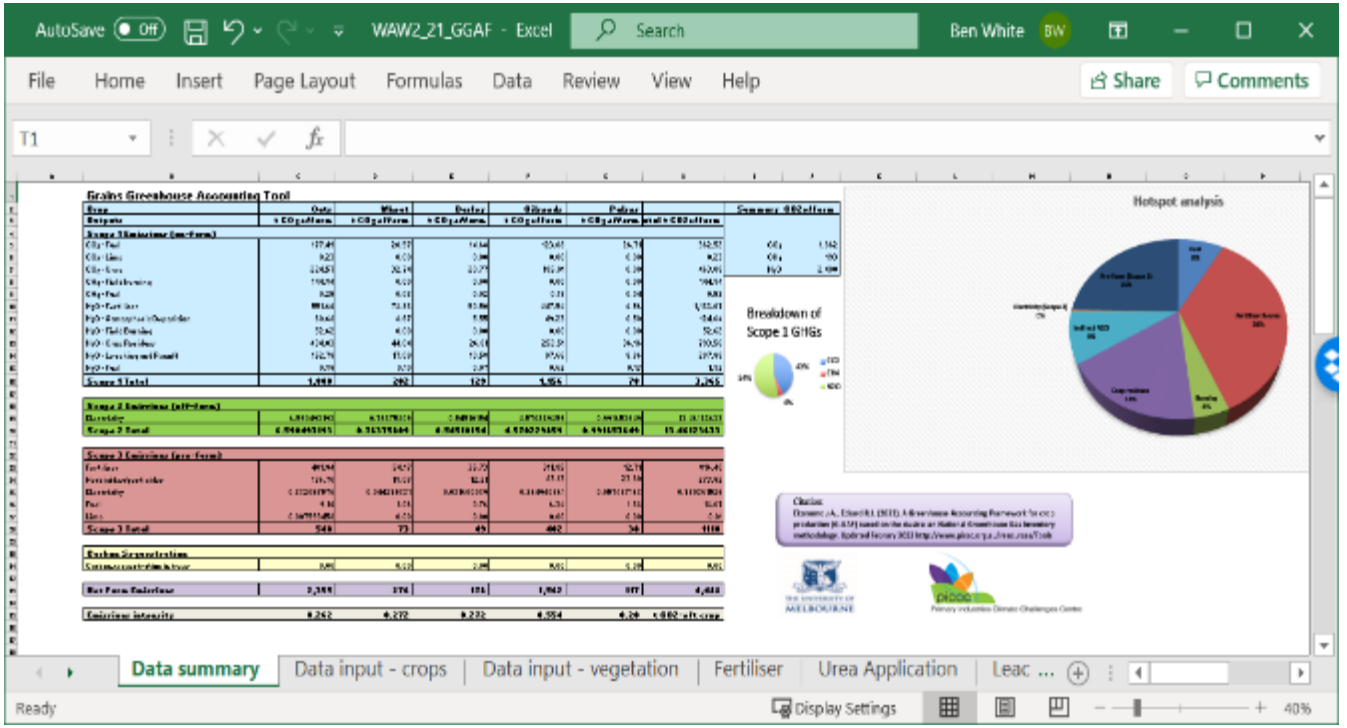
Assumptions applied: G-GAF (PICCC)



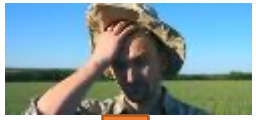
- v10.4 used
- Pesticides broken down into total volume of chemical (off the shelf) – including multi-actives
- Compound blend fertilisers broken down into weight of MAP/DAP/SOA/Urea/Single Super
  - (Ref SDS and NPKS analysis from manufacturer website)
- Fuel and energy apportioned by fractional area of crop to total crop
- Hay production included to balance fuel inputs relative to area
- UAN & Flexi-N assumed SG=1.32, N=32% with Urea=35% from SDS
- Lime tonnage entered as applied in kg/ha (0% dolomite)
- No provision for gypsum - excluded

Output: G-GAF (PICCC)





Process of entry and reporting



Crops	
Crop identifier/comm	Crop 1
Av. Soil pH in this paddock	5.27
Crop planted	Oats
Area (ha)	2140.00
Approx planting date	25-Apr-21
Approx harvest date	01-Dec-21
When not in crop: Short fallow or pasture?	Short Fallow
%of Farm	47.76%
Yield (t/ha)	4.2
Total production t	8988
Stubble handling post crop	100% no tillage.
Residue burnt	1100ha burnt
Note all fertiliser inputs (product and rate)	
80L Flexi N at seeding	70 K-TILL EXTRA
130kg MacroPro Max	120 UREA
50kg urea topu	
Note any lime/gypsum/dolomite aplications	
1.2t Blanket Lancelin lime	1250 tonnes total lime applied 1250000
ctive ingredients applied (including pre-em)	
2L/ha of 580g/L Glyphosate	1L GLYPH
1.5L/ha of 250g/L Paraquat	1.6L TREFLAN 480 ($5.5/L)
800ml/ha of 480g/L Trifluralin	440GMS DIURON ($8/KG)
	150ML ALPHA CYPER ($7/L)
	350 ml PARAGON ($32/L)
	200 ML TILT
	700 ML OPERA

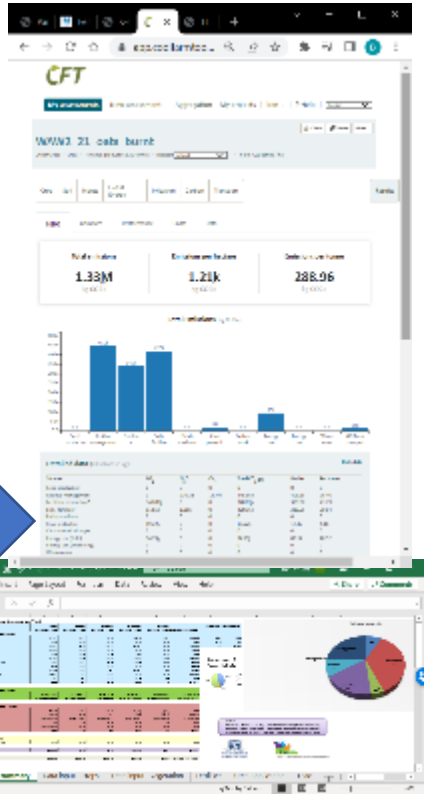
x1-3

x10

Data refinement, preparation, apportion, adaptation, clarification & entry

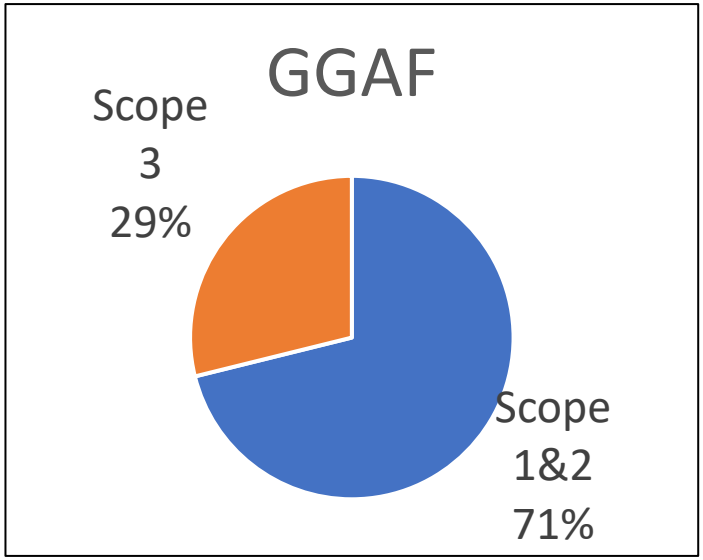
x 5 crops (av)

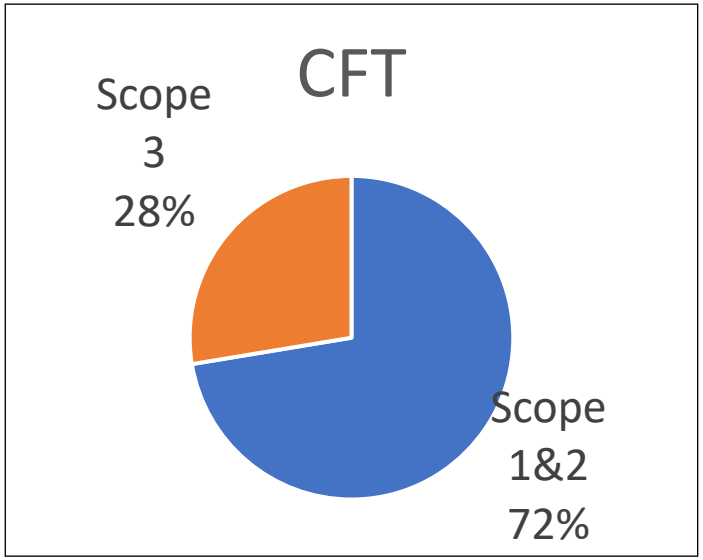
Report



Results

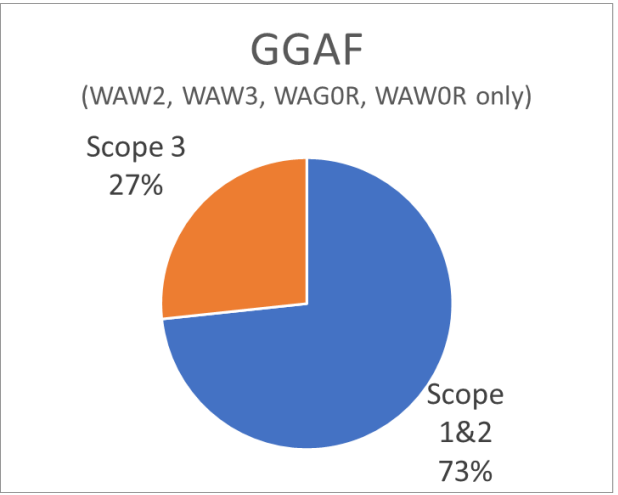
GGAF vs CFT – full dataset

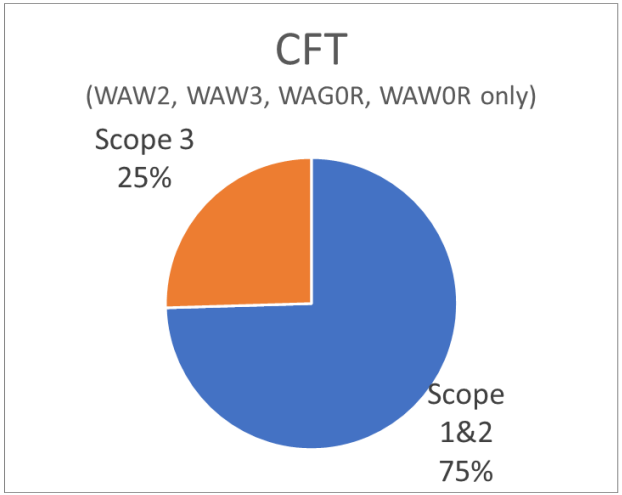


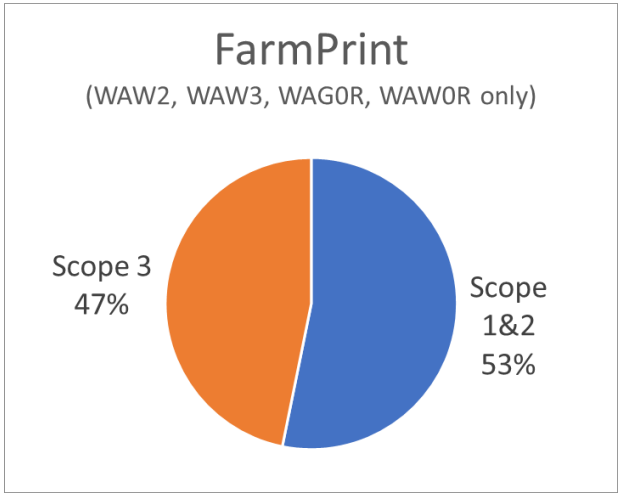


Results

Datasets common to FarmPrint only





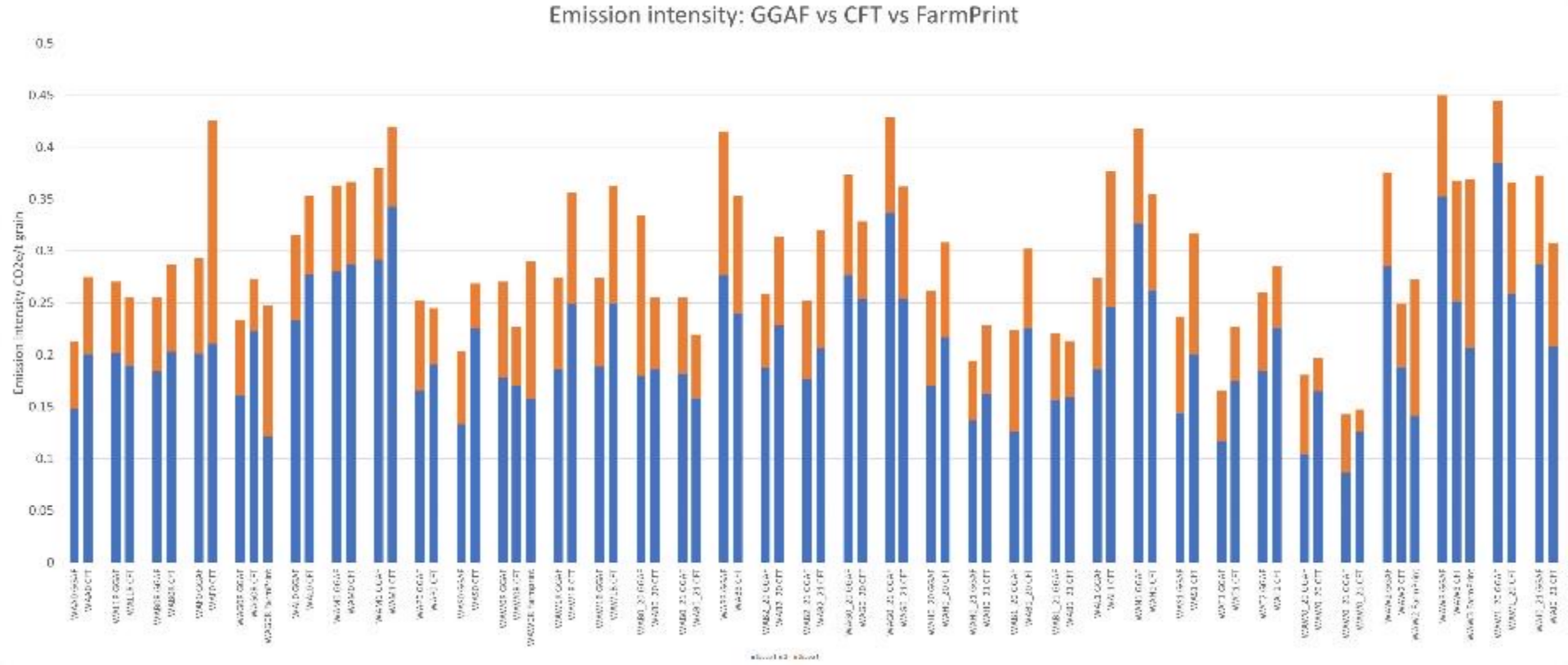


CBH GROUP

Department of Primary Industries and Regional Development

Wide Open Agriculture

Results – emission intensity - all grains by grower

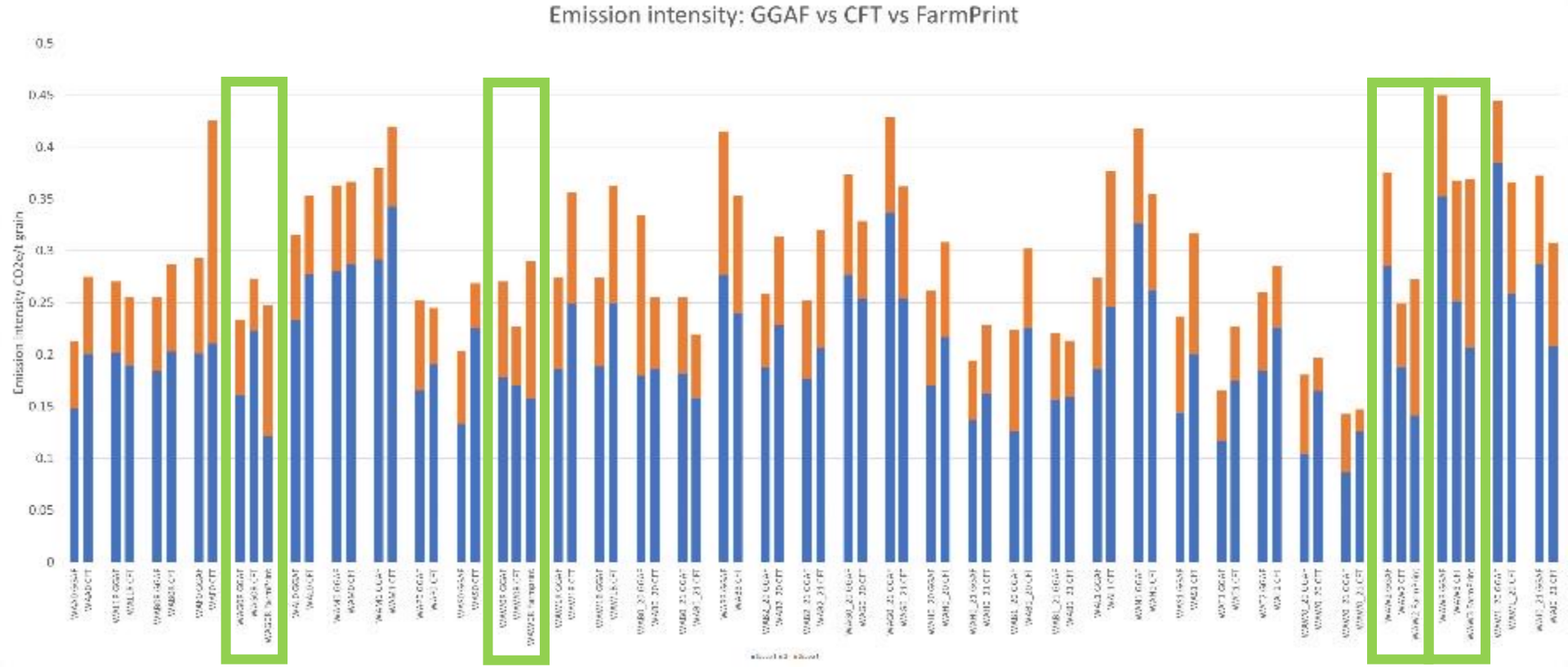


CBH GROUP

Department of Primary Industries and Regional Development

Wide Open Agriculture

Results – emission intensity - all grains by grower



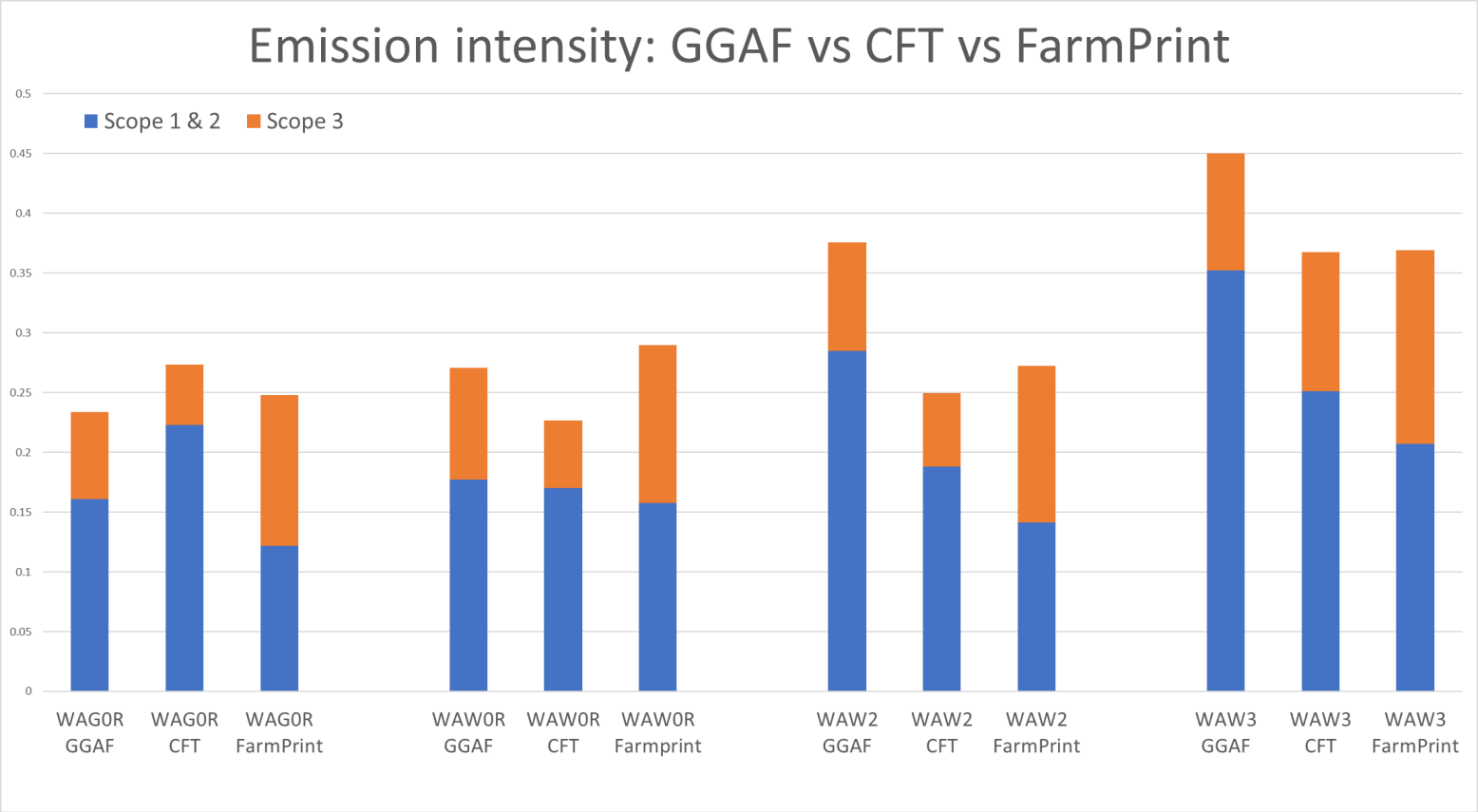
CBH Group

Department of Primary Industries and Regional Development

Government of Western Australia

Wide Open Agriculture

Results -

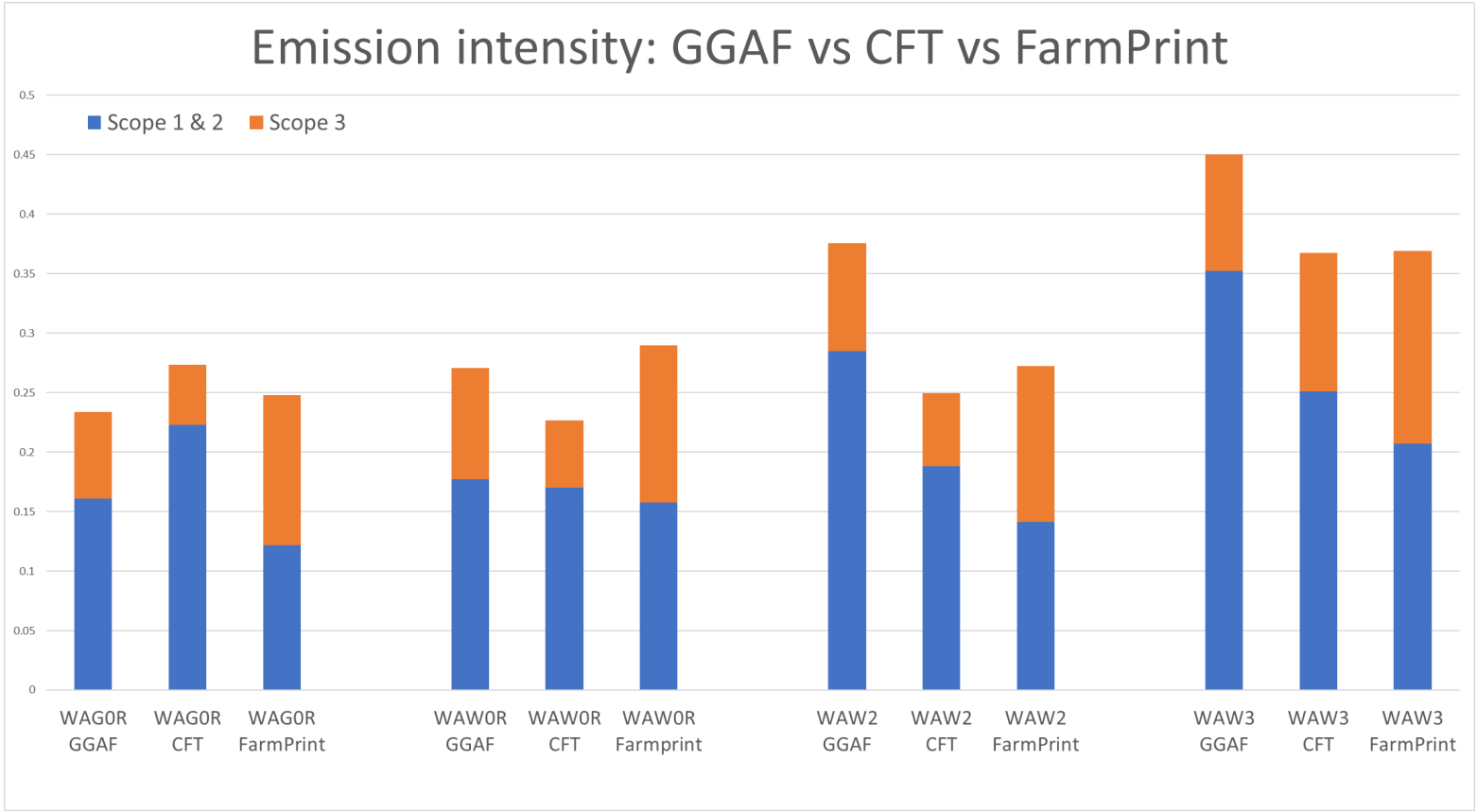


CBH GROUP

Department of Primary Industries and Regional Development

Wide Open Agriculture

Results – Datasets through FarmPrint

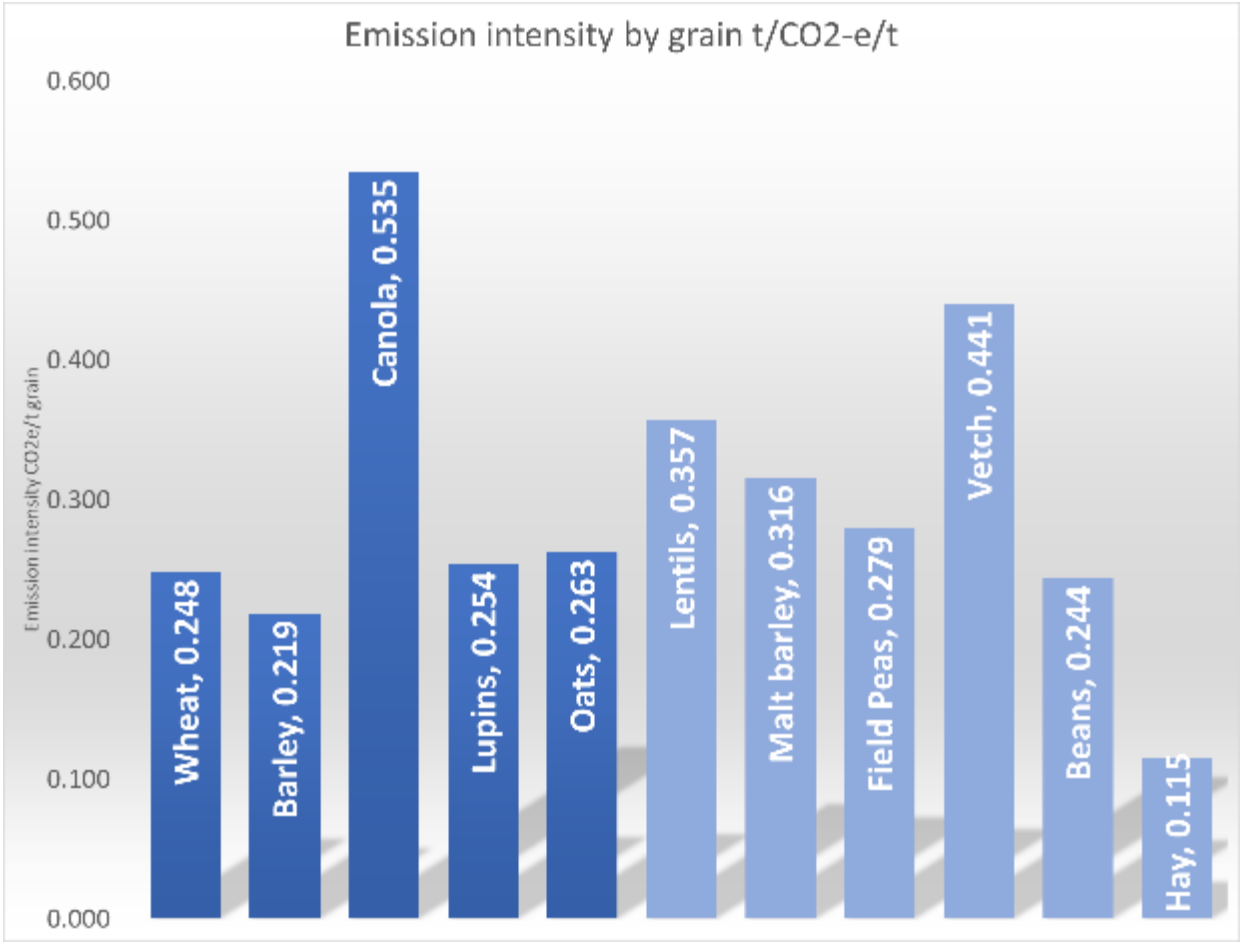


CBH GROUP

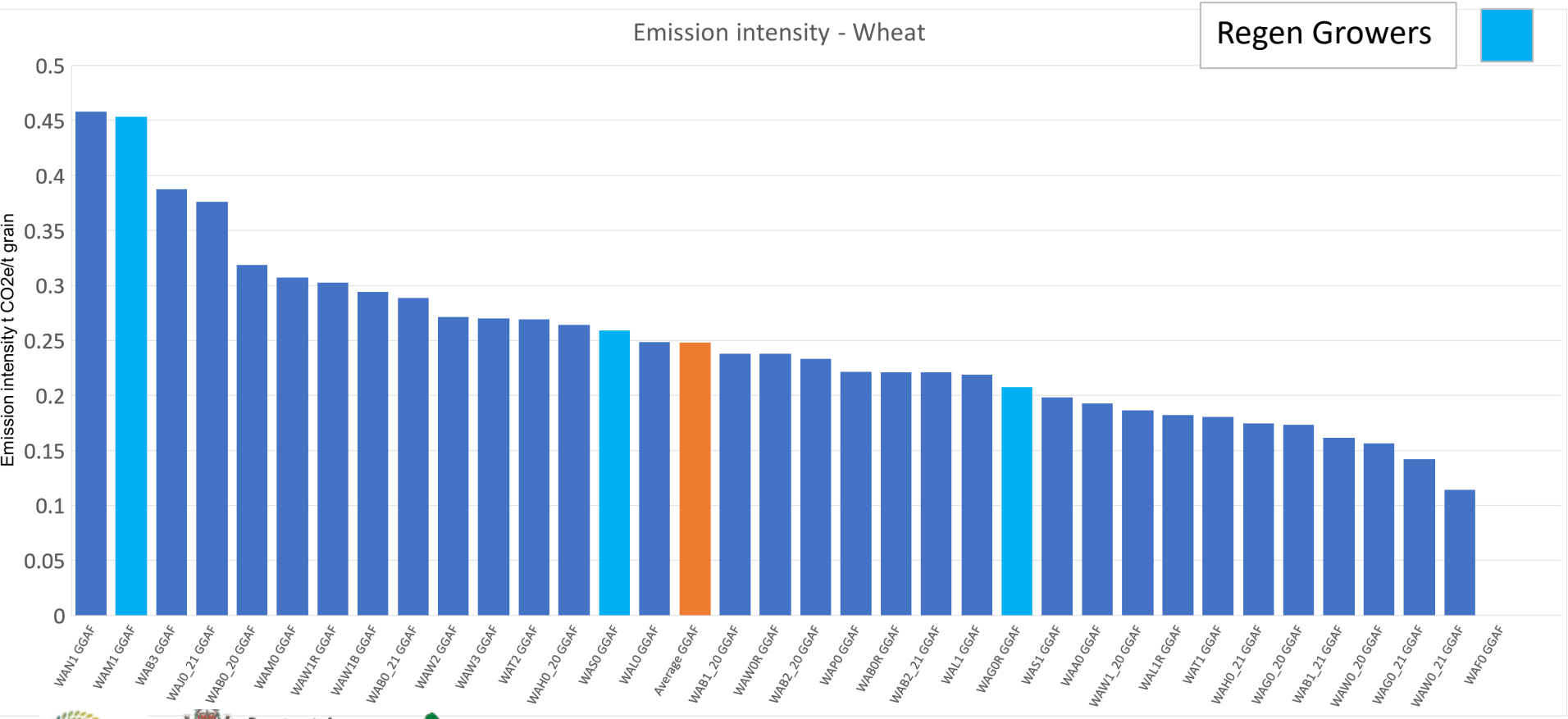
Department of Primary Industries and Regional Development

Wide Open Agriculture

Results emission intensity by grain type



Results

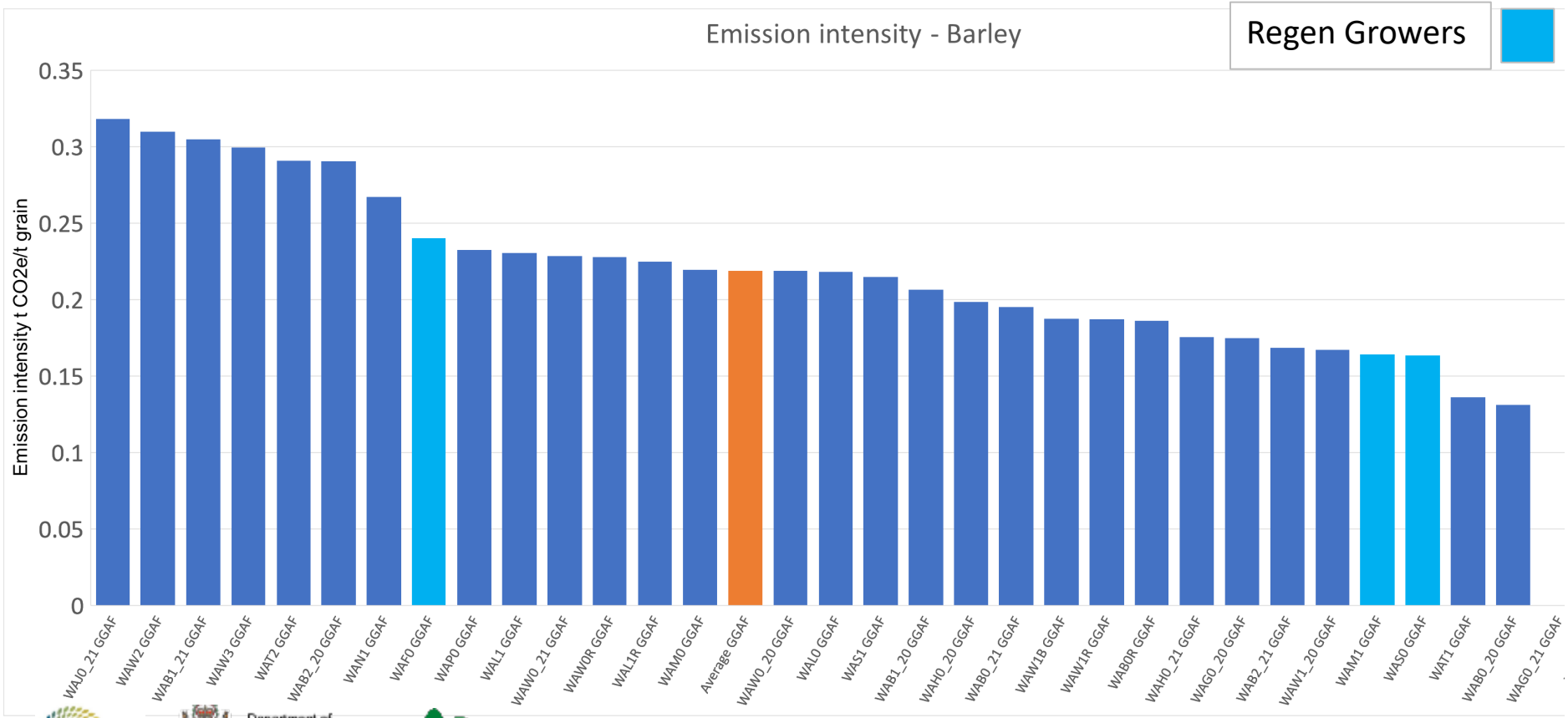


CBH GROUP

Department of Primary Industries and Regional Development

Wide Open Agriculture

Results

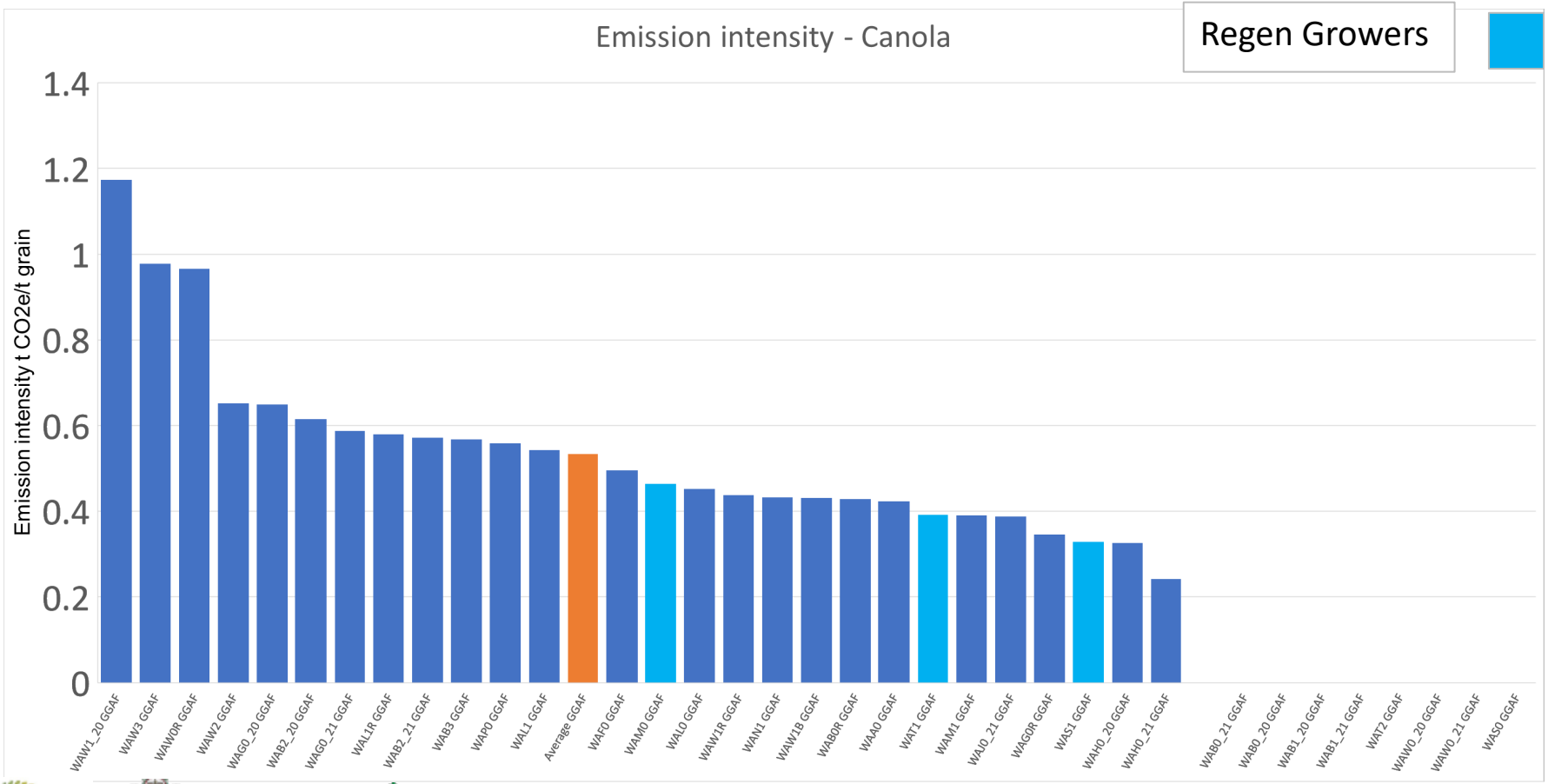


CBH GROUP

Department of Primary Industries and Regional Development

Wide Open Agriculture

Results

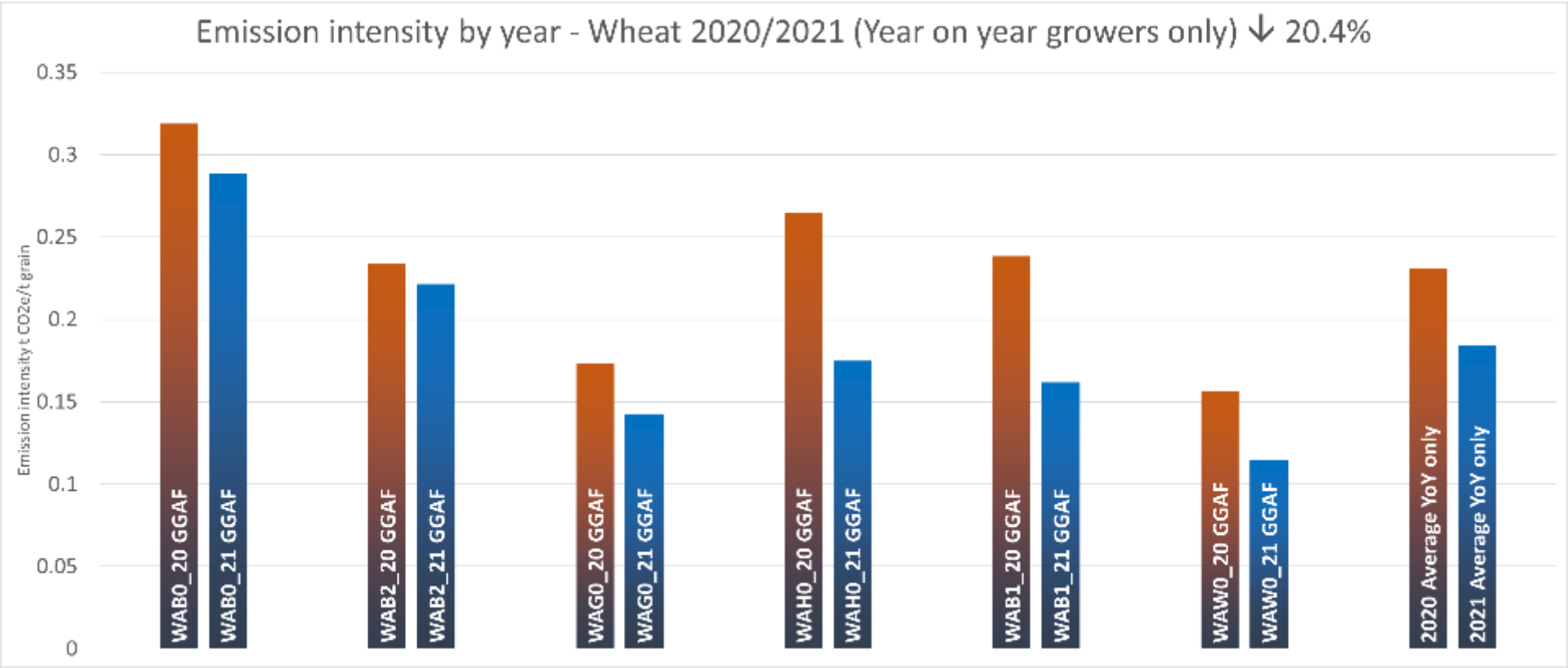


CBH Group

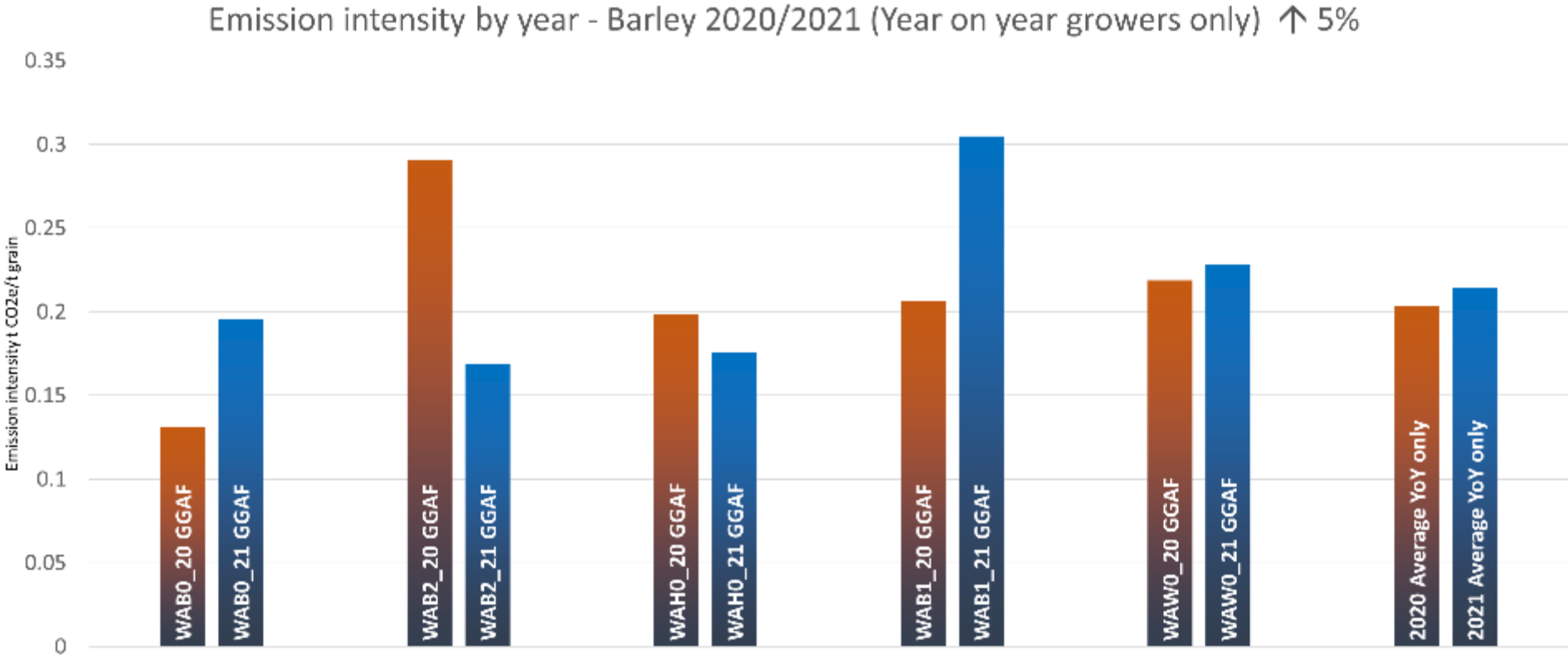
Department of Primary Industries and Regional Development

Wide Open Agriculture

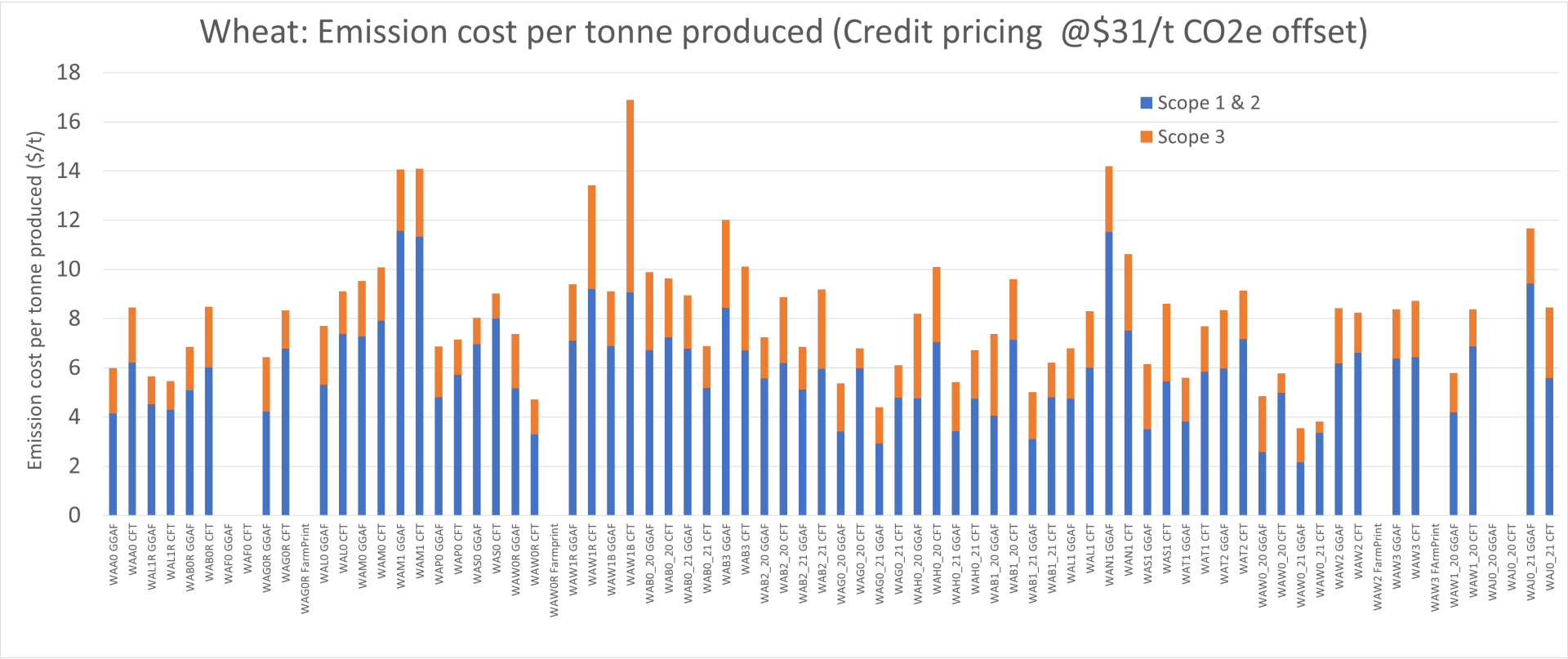
Reduce emissions? Just add water?



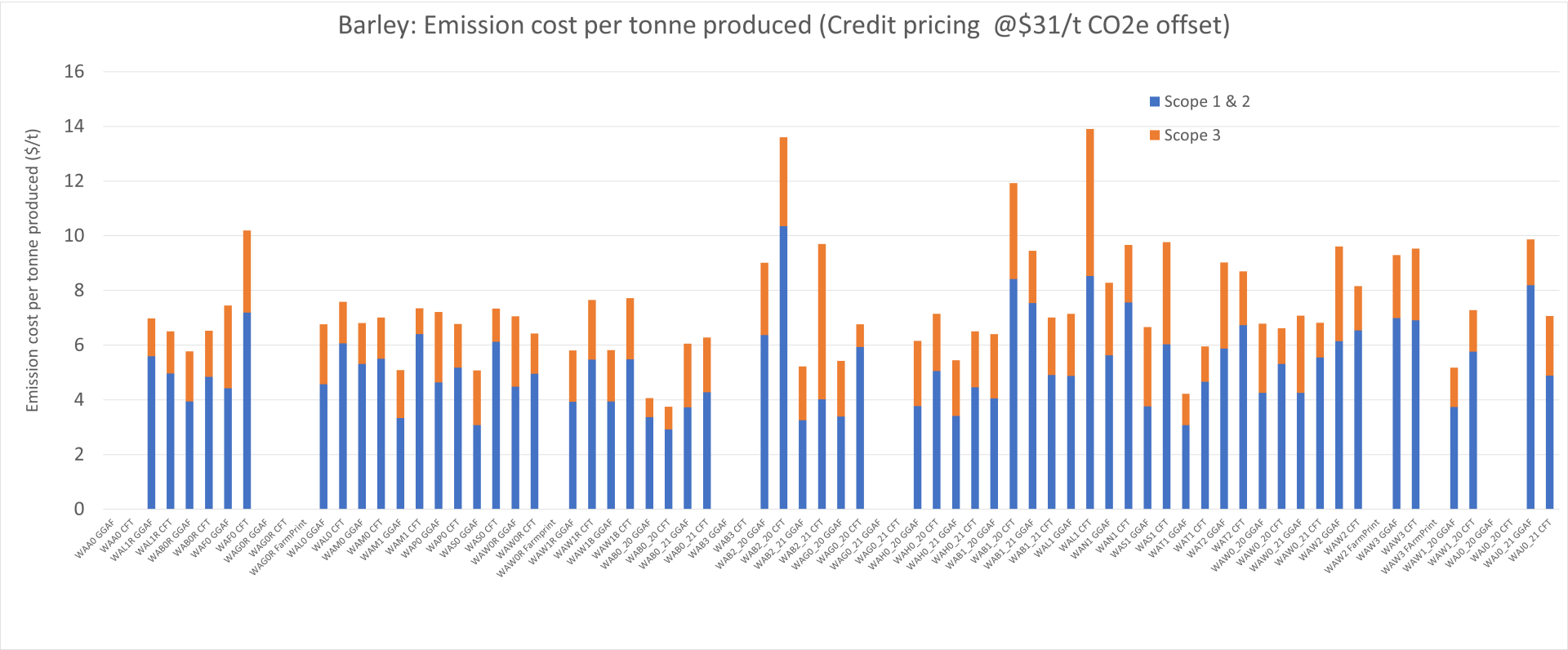
Reduce emissions? Just add water?



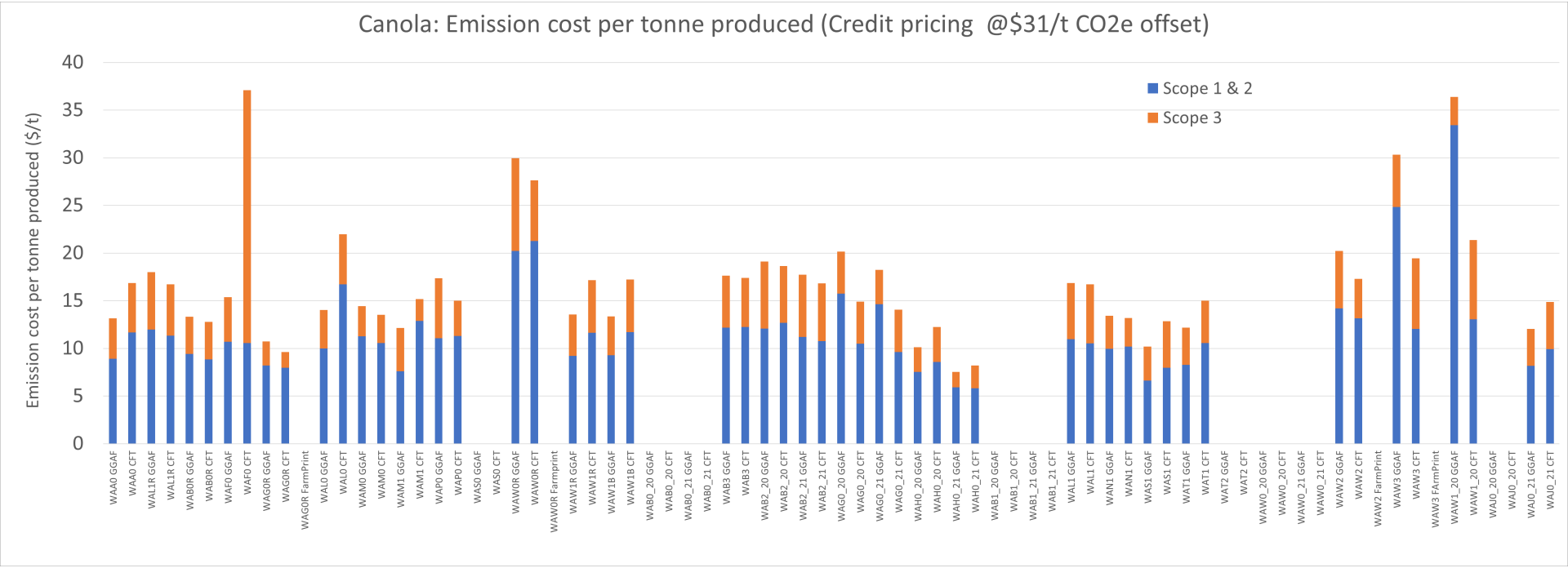
Results


Wheat: Emission cost per tonne produced (Credit pricing @$31/t CO2e offset)
Emission cost per tonne produced ($/t)
0
2
4
6
8
10
12
14
16
18
Scope 1 & 2
Scope 3
WAA0 GGAF
WAA0 CFT
WAL1R GGAF
WAL1R CFT
WAB0R GGAF
WAB0R CFT
WAF0 GGAF
WAF0 CFT
WAG0R GGAF
WAG0R CFT
WAG0R FarmPrint
WAL0 GGAF
WAL0 CFT
WAM0 GGAF
WAM0 CFT
WAM1 GGAF
WAM1 CFT
WAP0 GGAF
WAP0 CFT
WAS0 GGAF
WAS0 CFT
WAW0R GGAF
WAW0R CFT
WAW0R Farmprint
WAW1R GGAF
WAW1R CFT
WAW1B GGAF
WAW1B CFT
WAB0_20 GGAF
WAB0_20 CFT
WAB0_21 GGAF
WAB0_21 CFT
WAB3 GGAF
WAB3 CFT
WAB2_20 GGAF
WAB2_20 CFT
WAB2_21 GGAF
WAB2_21 CFT
WAG0_20 GGAF
WAG0_20 CFT
WAG0_21 GGAF
WAG0_21 CFT
WAH0_20 GGAF
WAH0_20 CFT
WAH0_21 GGAF
WAH0_21 CFT
WAB1_20 GGAF
WAB1_20 CFT
WAB1_21 GGAF
WAB1_21 CFT
WAL1 GGAF
WAL1 CFT
WAN1 GGAF
WAN1 CFT
WAS1 GGAF
WAS1 CFT
WAT1 GGAF
WAT1 CFT
WAT2 GGAF
WAT2 CFT
WAW0_20 GGAF
WAW0_20 CFT
WAW0_21 GGAF
WAW0_21 CFT
WAW2 GGAF
WAW2 CFT
WAW2 FarmPrint
WAW3 GGAF
WAW3 CFT
WAW3 FArmPrint
WAW1_20 GGAF
WAW1_20 CFT
WAJ0_20 GGAF
WAJ0_20 CFT
WAJ0_21 GGAF
WAJ0_21 CFT

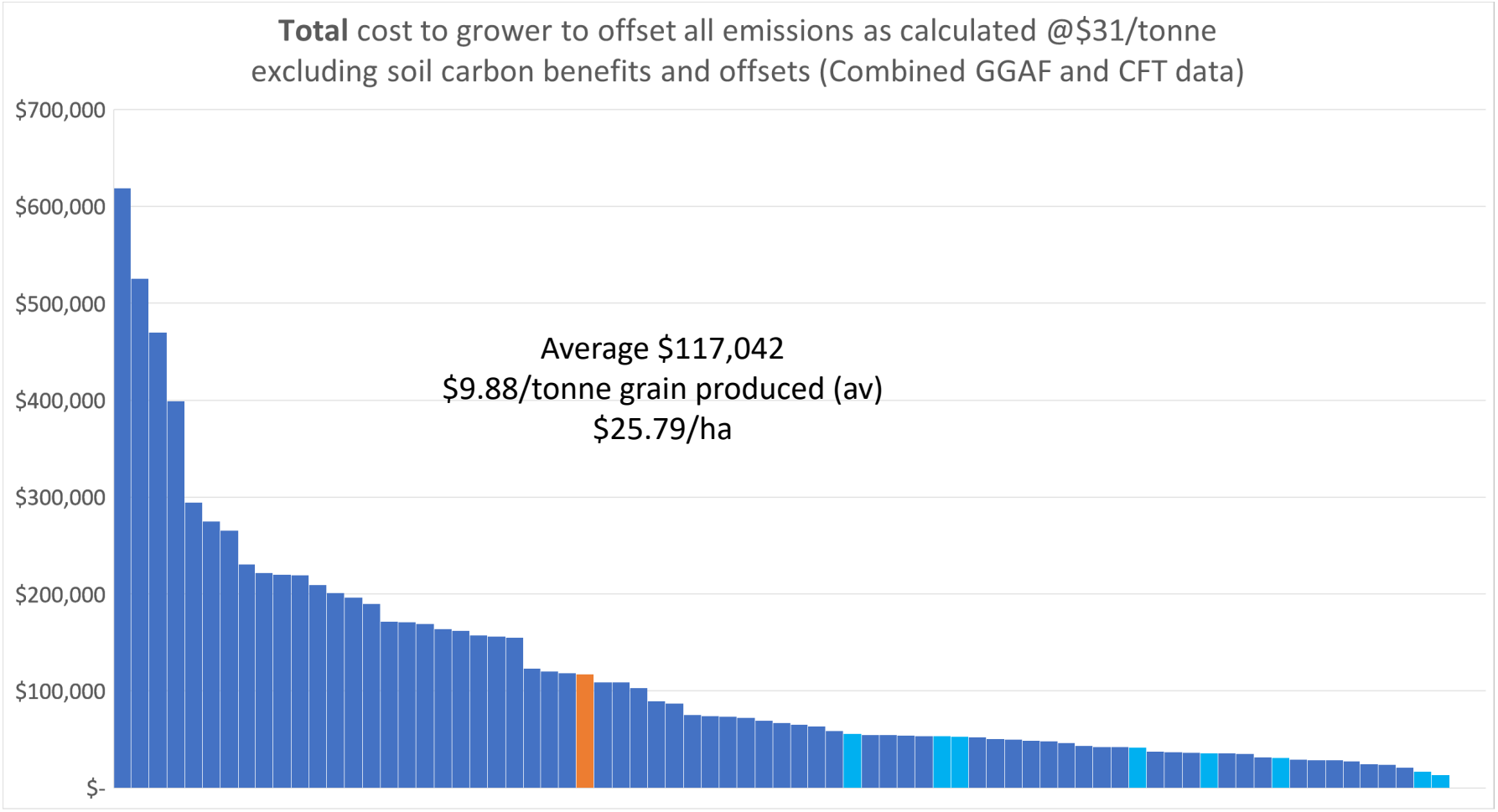
Results


Barley: Emission cost per tonne produced (Credit pricing @$31/t CO2e offset)
Emission cost per tonne produced ($/t)
16
14
12
10
8
6
4
2
0
Scope 1 & 2
Scope 3
WAA0 GGAF
WAA0 CFT
WAL1R GGAF
WAL1R CFT
WAB0R GGAF
WAB0R CFT
WAF0 GGAF
WAF0 CFT
WAG0R GGAF
WAG0R CFT
WAG0R FarmPrint
WAL0 GGAF
WAL0 CFT
WAM0 GGAF
WAM0 CFT
WAM1 GGAF
WAM1 CFT
WAP0 GGAF
WAP0 CFT
WAS0 GGAF
WAS0 CFT
WAW0R GGAF
WAW0R CFT
WAW0R FarmPrint
WAW1R GGAF
WAW1R CFT
WAW1B GGAF
WAW1B CFT
WAB0_20 GGAF
WAB0_20 CFT
WAB0_21 GGAF
WAB0_21 CFT
WAB3 GGAF
WAB3 CFT
WAB2_20 GGAF
WAB2_20 CFT
WAB2_21 GGAF
WAB2_21 CFT
WAG0_20 GGAF
WAG0_20 CFT
WAG0_21 GGAF
WAG0_21 CFT
WAH0_20 GGAF
WAH0_20 CFT
WAH0_21 GGAF
WAH0_21 CFT
WAB1_20 GGAF
WAB1_20 CFT
WAB1_21 GGAF
WAB1_21 CFT
WAL1 GGAF
WAL1 CFT
WAN1 GGAF
WAN1 CFT
WAS1 GGAF
WAS1 CFT
WAT1 GGAF
WAT1 CFT
WAT2 GGAF
WAT2 CFT
WAW0_20 GGAF
WAW0_20 CFT
WAW0_21 GGAF
WAW0_21 CFT
WAW2 GGAF
WAW2 CFT
WAW2 FarmPrint
WAW3 GGAF
WAW3 CFT
WAW3 FarmPrint
WAW1_20 GGAF
WAW1_20 CFT
WAJ0_20 GGAF
WAJ0_20 CFT
WAJ0_21 GGAF
WAJ0_21 CFT

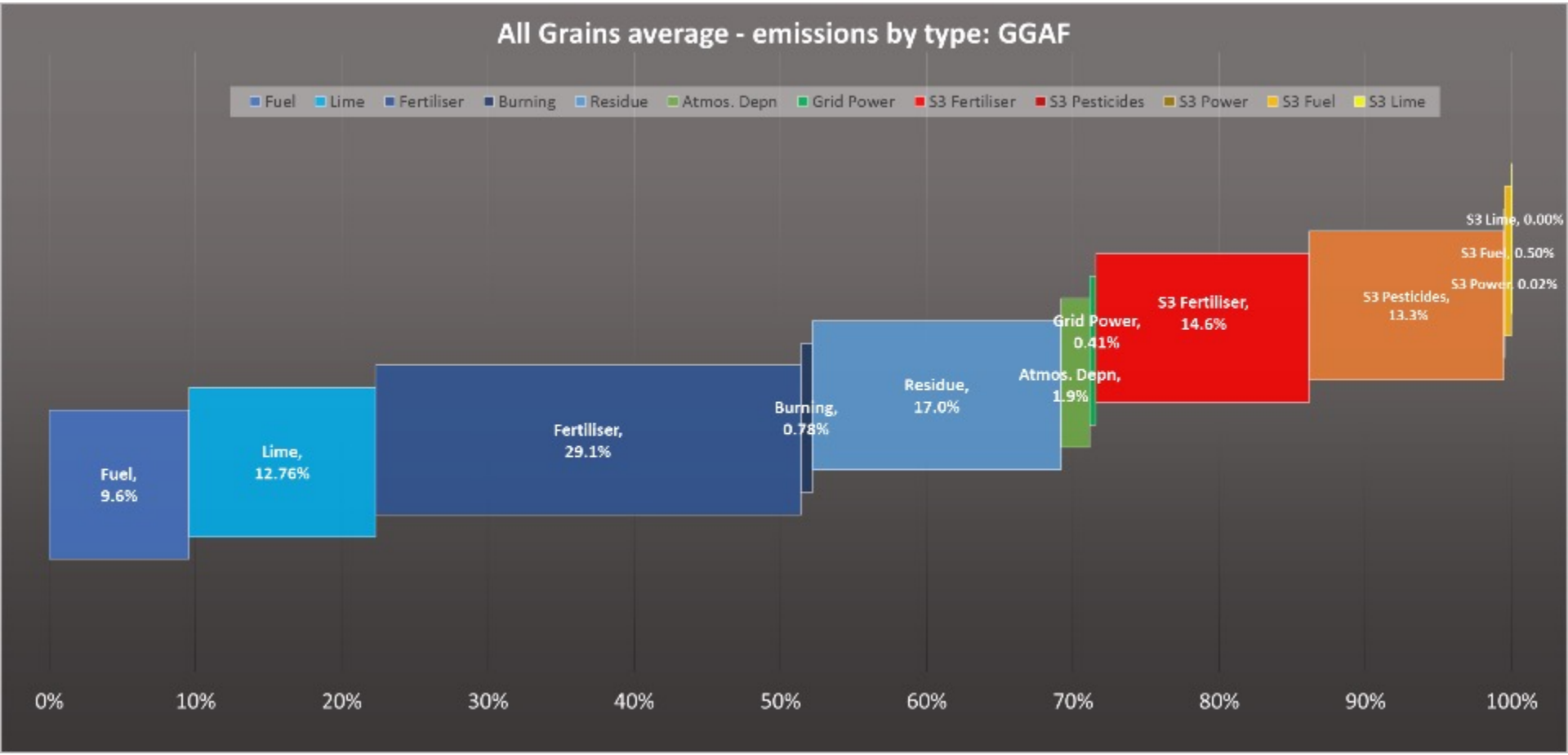
Results


Canola: Emission cost per tonne produced (Credit pricing @$31/t CO2e offset)
Emission cost per tonne produced ($/t)
0
5
10
15
20
25
30
35
40
Scope 1 & 2
Scope 3
WAA0 GGAF
WAA0 CFT
WAL1R GGAF
WAL1R CFT
WAB0R GGAF
WAB0R CFT
WAF0 GGAF
WAF0 CFT
WAG0R GGAF
WAG0R CFT
WAG0R FarmPrint
WAL0 GGAF
WAL0 CFT
WAM0 GGAF
WAM0 CFT
WAM1 GGAF
WAM1 CFT
WAP0 GGAF
WAP0 CFT
WAS0 GGAF
WAS0 CFT
WAW0R GGAF
WAW0R CFT
WAW0R Farmprint
WAW1R GGAF
WAW1R CFT
WAW1B GGAF
WAW1B CFT
WABO_20 GGAF
WABO_20 CFT
WABO_21 GGAF
WABO_21 CFT
WAB3 GGAF
WAB3 CFT
WAB2_20 GGAF
WAB2_20 CFT
WAB2_21 GGAF
WAB2_21 CFT
WAG0_20 GGAF
WAG0_20 CFT
WAG0_21 GGAF
WAG0_21 CFT
WAH0_20 GGAF
WAH0_20 CFT
WAH0_21 GGAF
WAH0_21 CFT
WAB1_20 GGAF
WAB1_20 CFT
WAB1_21 GGAF
WAB1_21 CFT
WAL1 GGAF
WAL1 CFT
WAN1 GGAF
WAN1 CFT
WAS1 GGAF
WAS1 CFT
WAT1 GGAF
WAT1 CFT
WAT2 GGAF
WAT2 CFT
WAW0_20 GGAF
WAW0_20 CFT
WAW0_21 GGAF
WAW0_21 CFT
WAW2 GGAF
WAW2 CFT
WAW2 FarmPrint
WAW3 GGAF
WAW3 CFT
WAW3 FArmPrint
WAW1_20 GGAF
WAW1_20 CFT
WAJ0_20 GGAF
WAJ0_20 CFT
WAJ0_21 GGAF
WAJ0_21 CFT

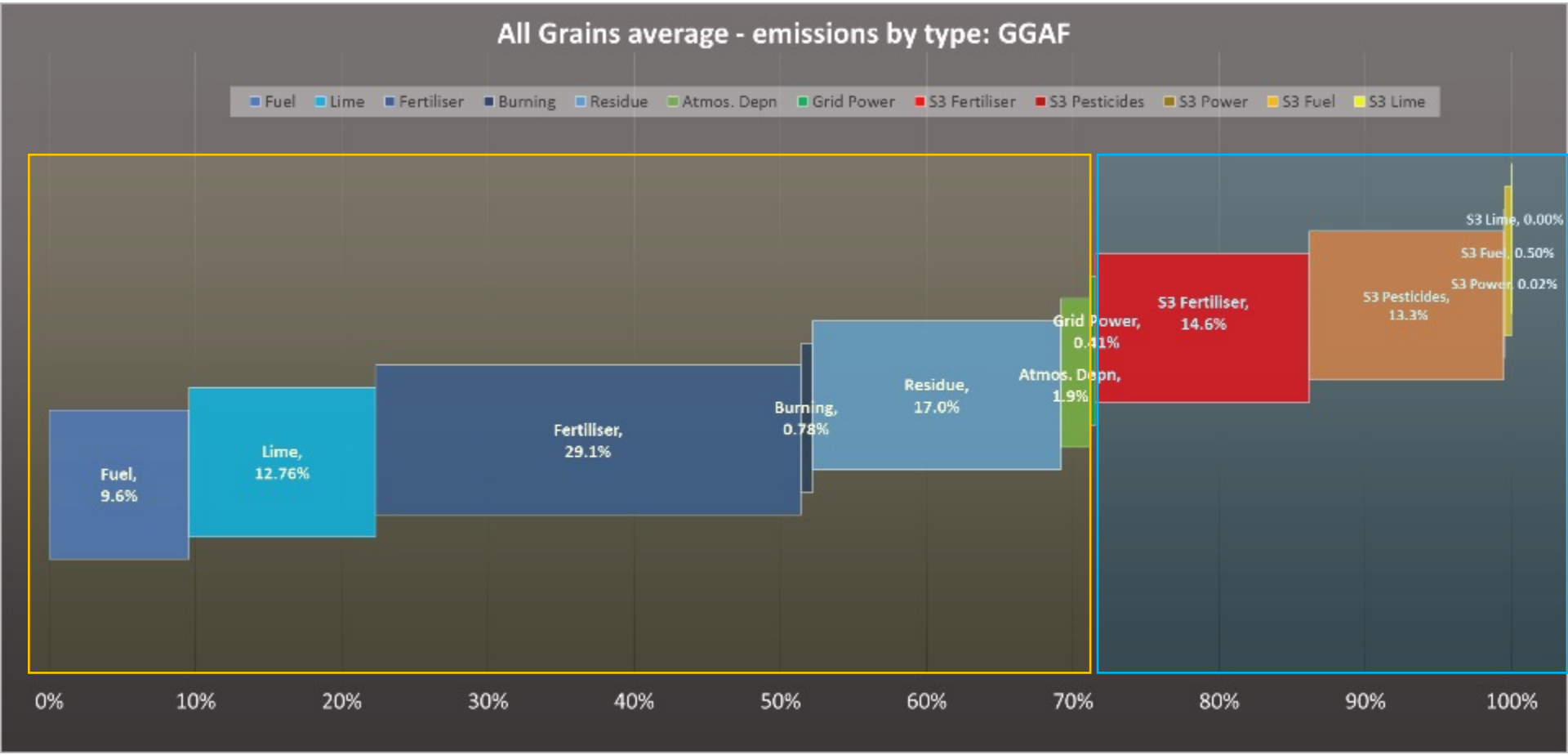
Results


Total cost to grower to offset all emissions as calculated @$31/tonne
excluding soil carbon benefits and offsets (Combined GGAF and CFT data)
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$-
Average $117,042
$9.88/tonne grain produced (av)
$25.79/ha

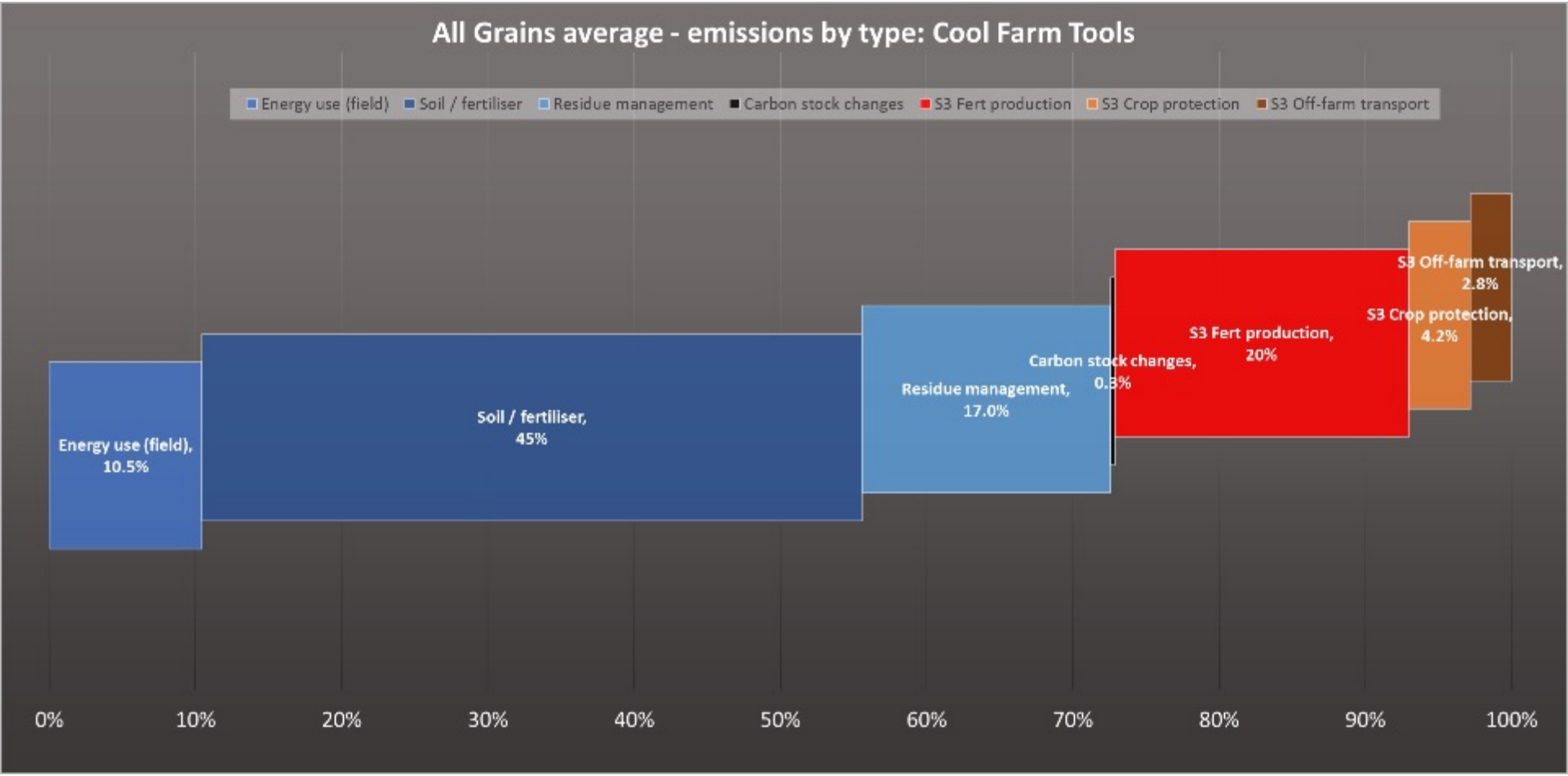
Results


All Grains average - emissions by type: GGAF
Fuel
Lime
Fertiliser
Burning
Residue
Atmos. Depn
Grid Power
S3 Fertiliser
S3 Pesticides
S3 Power
S3 Fuel
S3 Lime
Fuel, 9.6%
Lime, 12.76%
Fertiliser, 29.1%
Burning, 0.78%
Residue, 17.0%
Atmos. Depn, 1.9%
Grid Power, 0.41%
S3 Fertiliser, 14.6%
S3 Pesticides, 13.3%
S3 Power, 0.02%
S3 Fuel, 0.50%
S3 Lime, 0.00%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

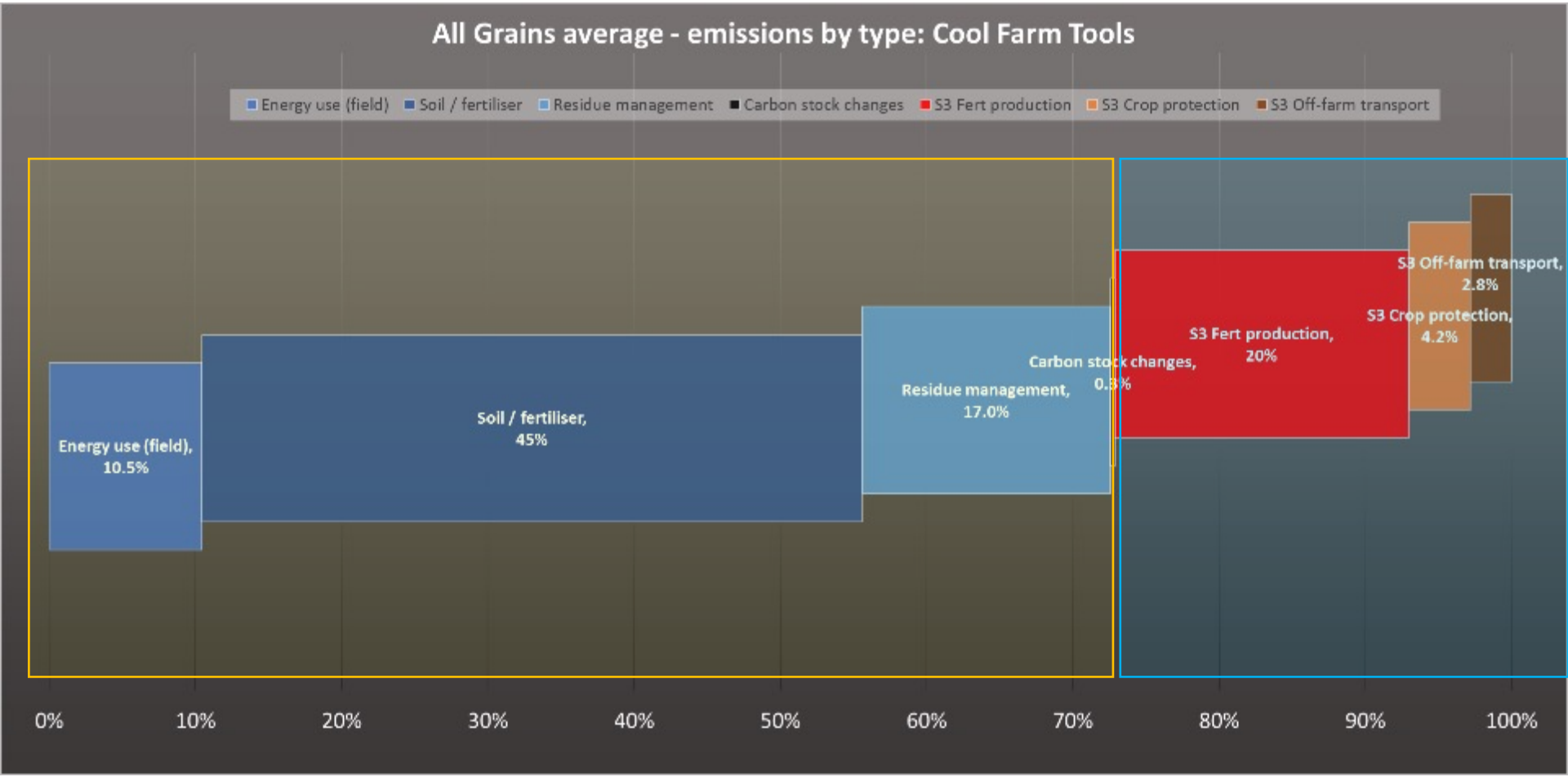
Results


All Grains average - emissions by type: GGAF
Fuel
Lime
Fertiliser
Burning
Residue
Atmos. Depn
Grid Power
S3 Fertiliser
S3 Pesticides
S3 Power
S3 Fuel
S3 Lime
Fuel, 9.6%
Lime, 12.76%
Fertiliser, 29.1%
Burning, 0.78%
Residue, 17.0%
Atmos. Depn, 1.9%
Grid Power, 0.41%
S3 Fertiliser, 14.6%
S3 Pesticides, 13.3%
S3 Power, 0.02%
S3 Fuel, 0.50%
S3 Lime, 0.00%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

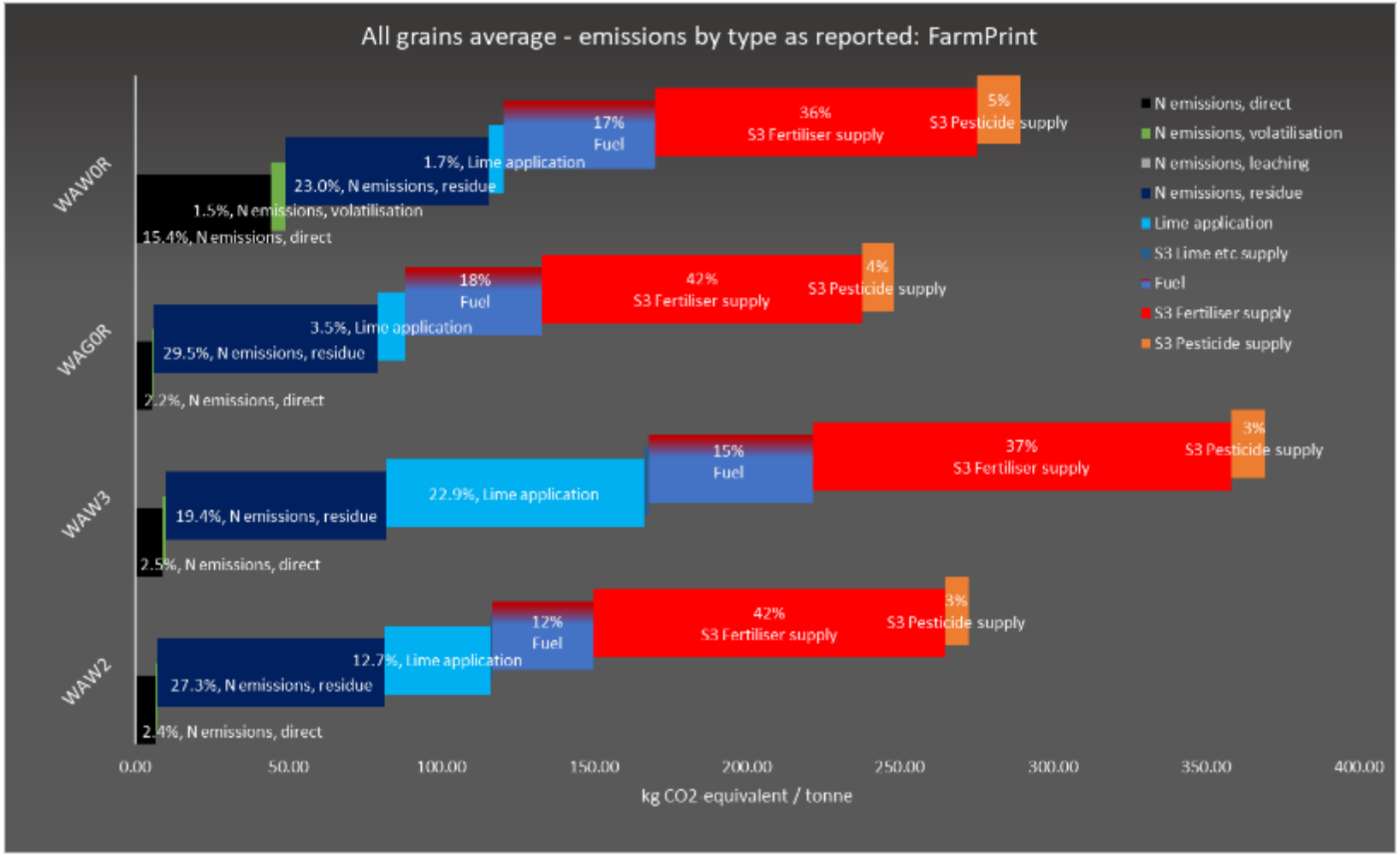
Results


All Grains average - emissions by type: Cool Farm Tools
Energy use (field)
Soil / fertiliser
Residue management
Carbon stock changes
S3 Fert production
S3 Crop protection
S3 Off-farm transport
Energy use (field), 10.5%
Soil / fertiliser, 45%
Residue management, 17.0%
Carbon stock changes, 0.3%
S3 Fert production, 20%
S3 Crop protection, 4.2%
S3 Off-farm transport, 2.8%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

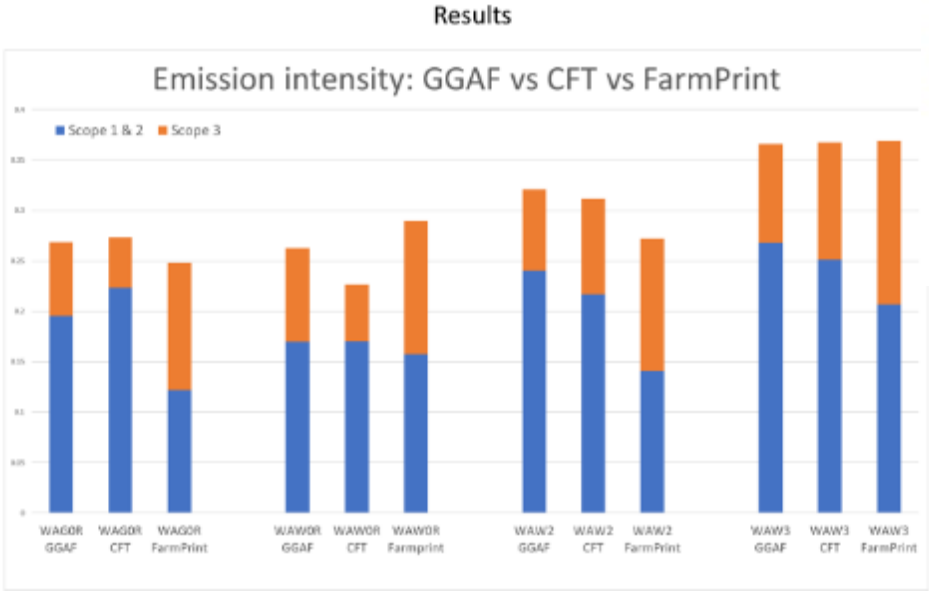
Results

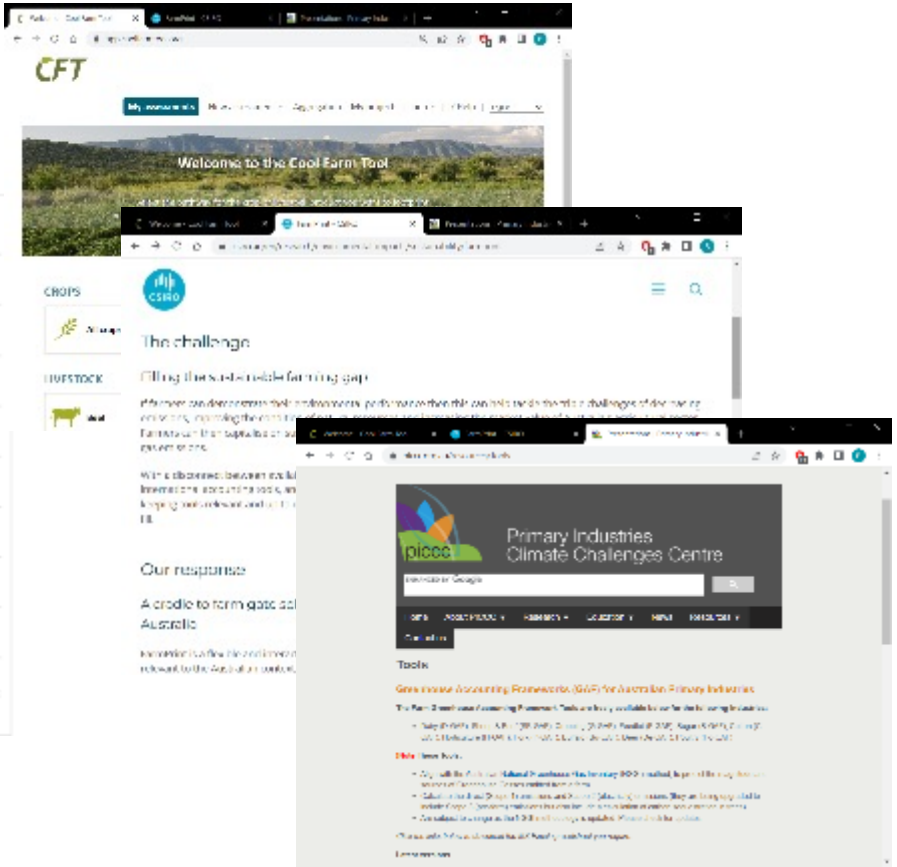

All Grains average - emissions by type: Cool Farm Tools
Energy use (field)
Soil / fertiliser
Residue management
Carbon stock changes
S3 Fert production
S3 Crop protection
S3 Off-farm transport
Energy use (field), 10.5%
Soil / fertiliser, 45%
Residue management, 17.0%
Carbon stock changes, 0.3%
S3 Fert production, 20%
S3 Crop protection, 4.2%
S3 Off-farm transport, 2.8%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

Results

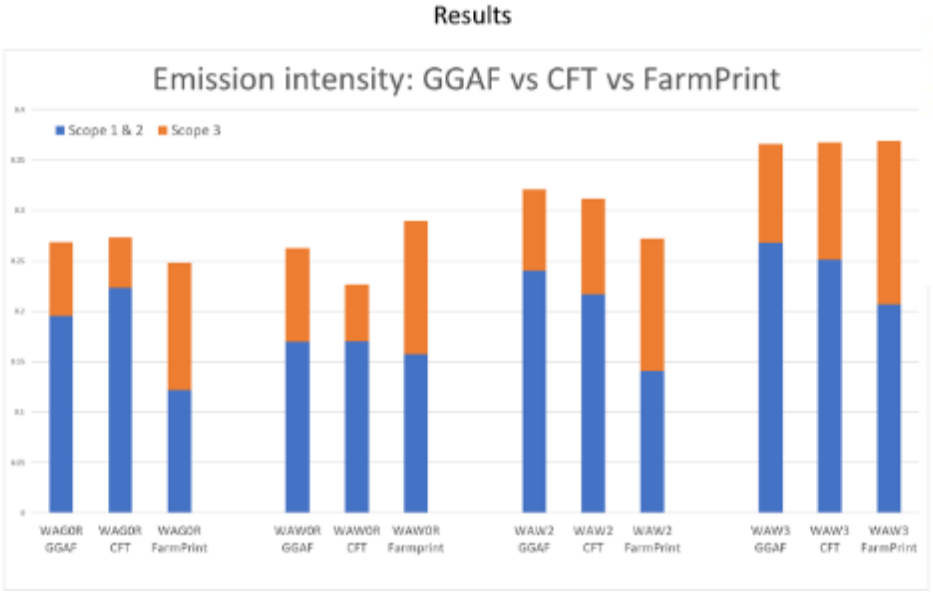

All grains average - emissions by type as reported: FarmPrint
WAWOR
WAGOR
WAW3
WAW2
1.5%, N emissions, volatilisation
15.4%, N emissions, direct
23.0%, N emissions, residue
1.7%, Lime application
17% Fuel
36% S3 Fertiliser supply
5% S3 Pesticide supply
2.2%, N emissions, direct
29.5%, N emissions, residue
3.5%, Lime application
18% Fuel
42% S3 Fertiliser supply
4% S3 Pesticide supply
2.5%, N emissions, direct
19.4%, N emissions, residue
22.9%, Lime application
15% Fuel
37% S3 Fertiliser supply
3% S3 Pesticide supply
2.4%, N emissions, direct
27.3%, N emissions, residue
12.7%, Lime application
12% Fuel
42% S3 Fertiliser supply
3% S3 Pesticide supply
N emissions, direct
N emissions, volatilisation
N emissions, leaching
N emissions, residue
Lime application
S3 Lime etc supply
Fuel
S3 Fertiliser supply
S3 Pesticide supply
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
kg CO2 equivalent / tonne

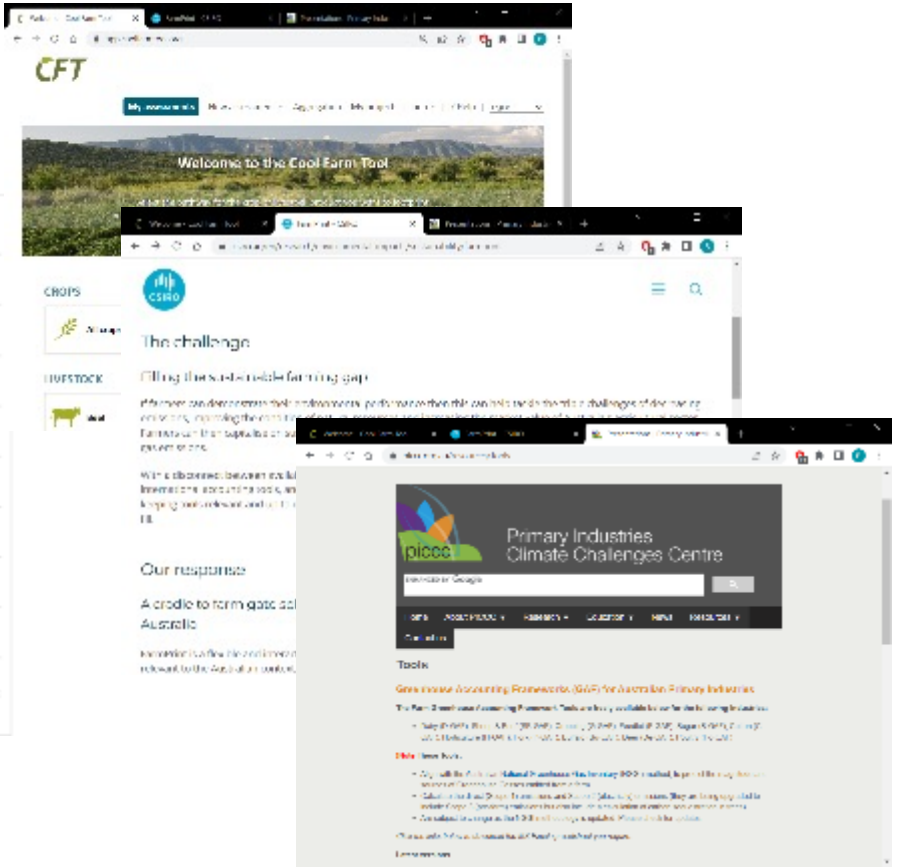
So which calculator is best?



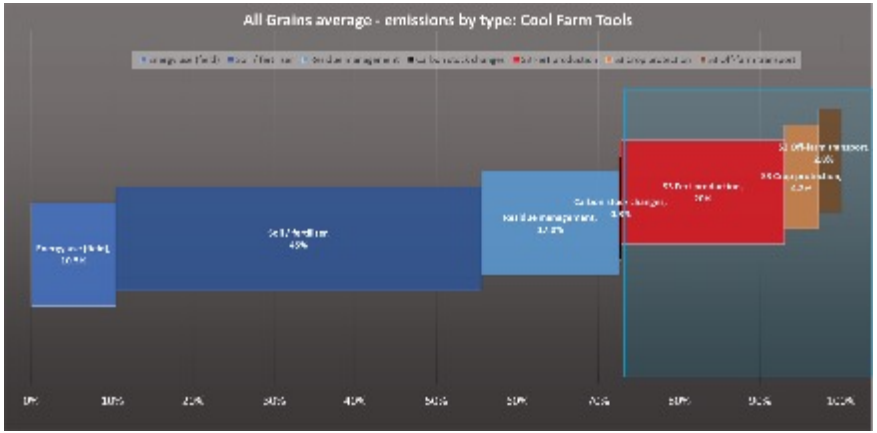


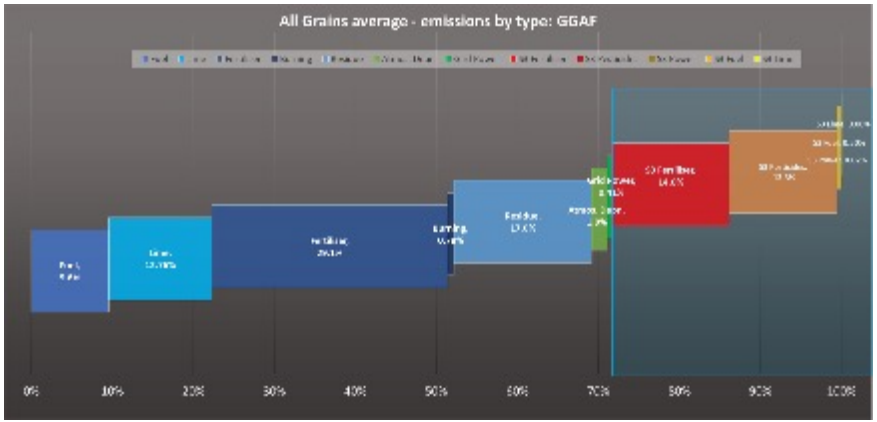
…and which calculator is accurate?



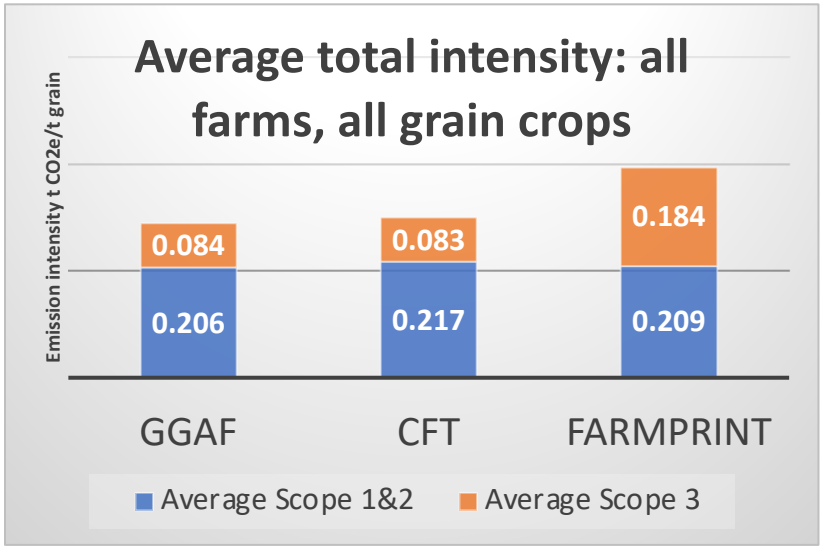


Who does the responsibility for scope 3 reside?



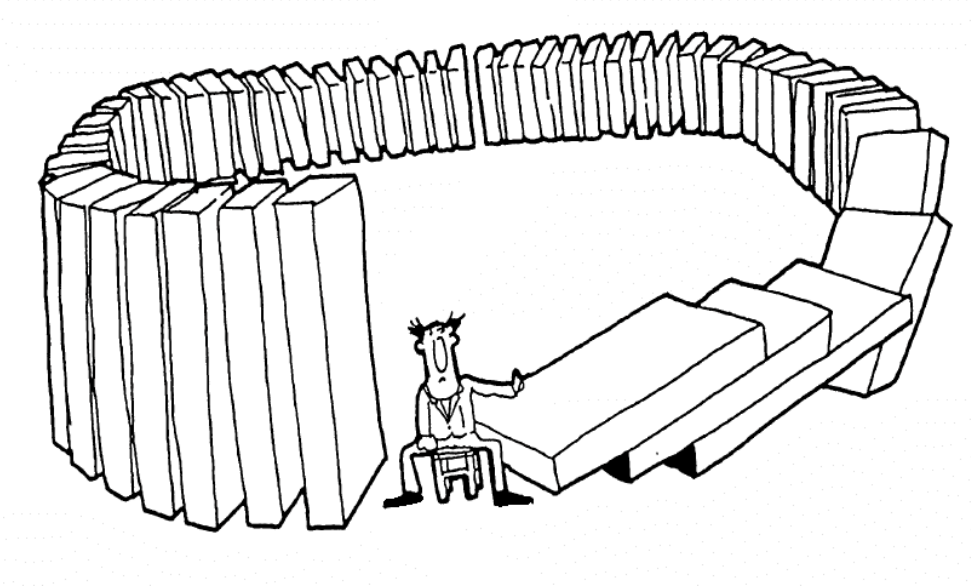


- Circa 25-30%
- “Work” with suppliers to reduce the embedded emissions in their products



Unintended consequences

- Minimising GHG's using the calculators may suggest poor practices.
- For example:
  - No lime?
  - Remove all residues?
  - Poor fertiliser strategies – short/long term
- Cherry-picking calculators



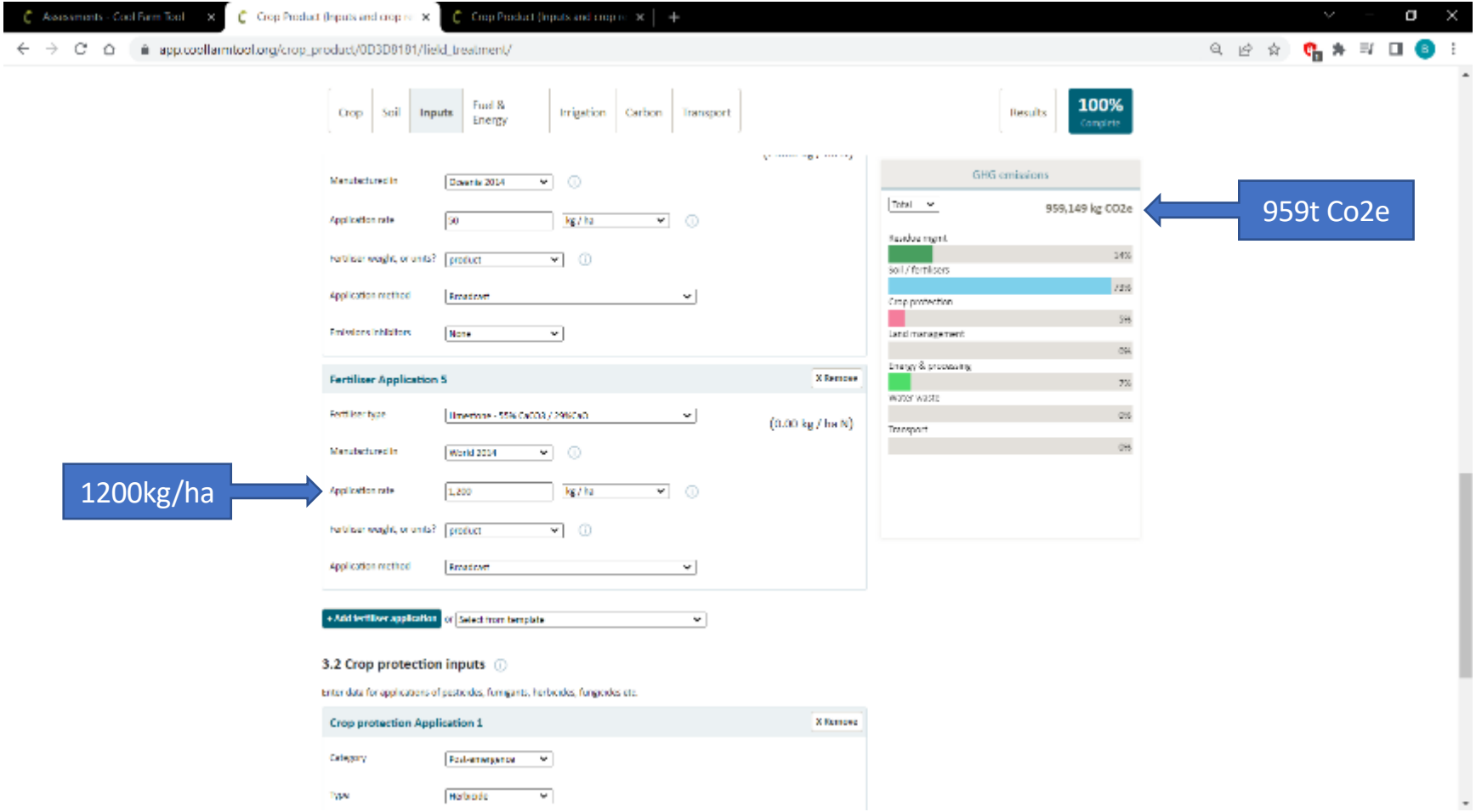
What could be improved? 1/2

- Continuous evolution encouraged
  - But detailed version control notes for users
  - Changes to calculators can deliver large variations in outputs – this may have consequences for growers / buyers / consumers
- Soil carbon changes – confidence required
- Integration of mixed operations – sheep are an important part of WA grain production systems
- Need to be simple but also functional, relevant and fit for purpose – may need to be tailored for grains specifically

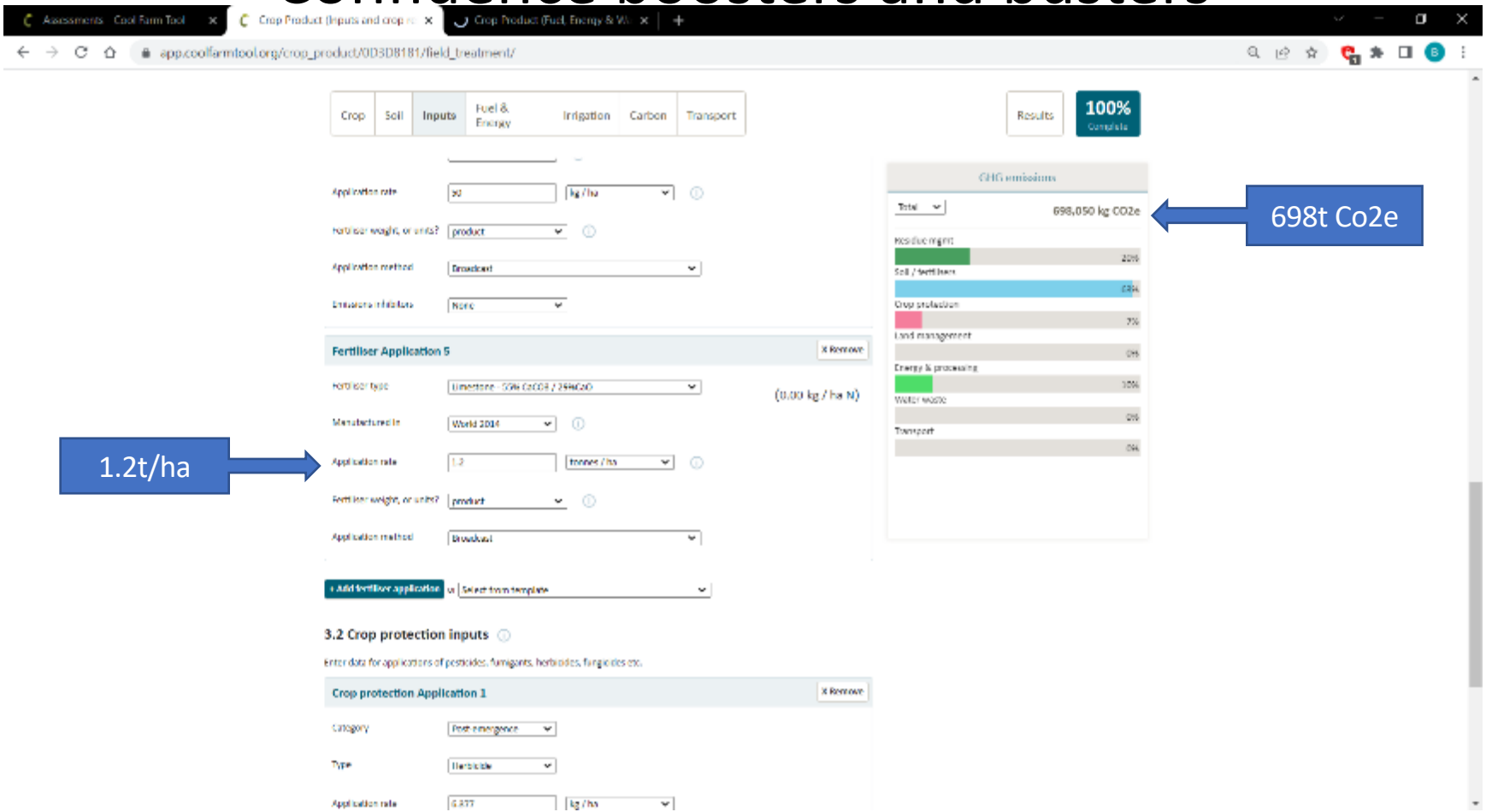
What could be improved? 2/2

- Further reduce data prompt ambiguities
- Bang for buck! Pesticide inputs – drop-down list - actives + rates
  - Or… standard assumptions for pesticides pending crop type and location?
  - Reduce significant time for data entry
- Fertiliser inputs - Broken down by trade name and composition
  - Manufacturers only supply a range of ingredient contents on SDS
- Lime inputs – Integrated products
  - By pit and/or CaCO3 / NV content include Morrel lime?
- Consider grain aeration in Scope 2
  - circa 1.2kWh/t/month for aeration
  - drying pending moisture content

Confidence boosters and busters



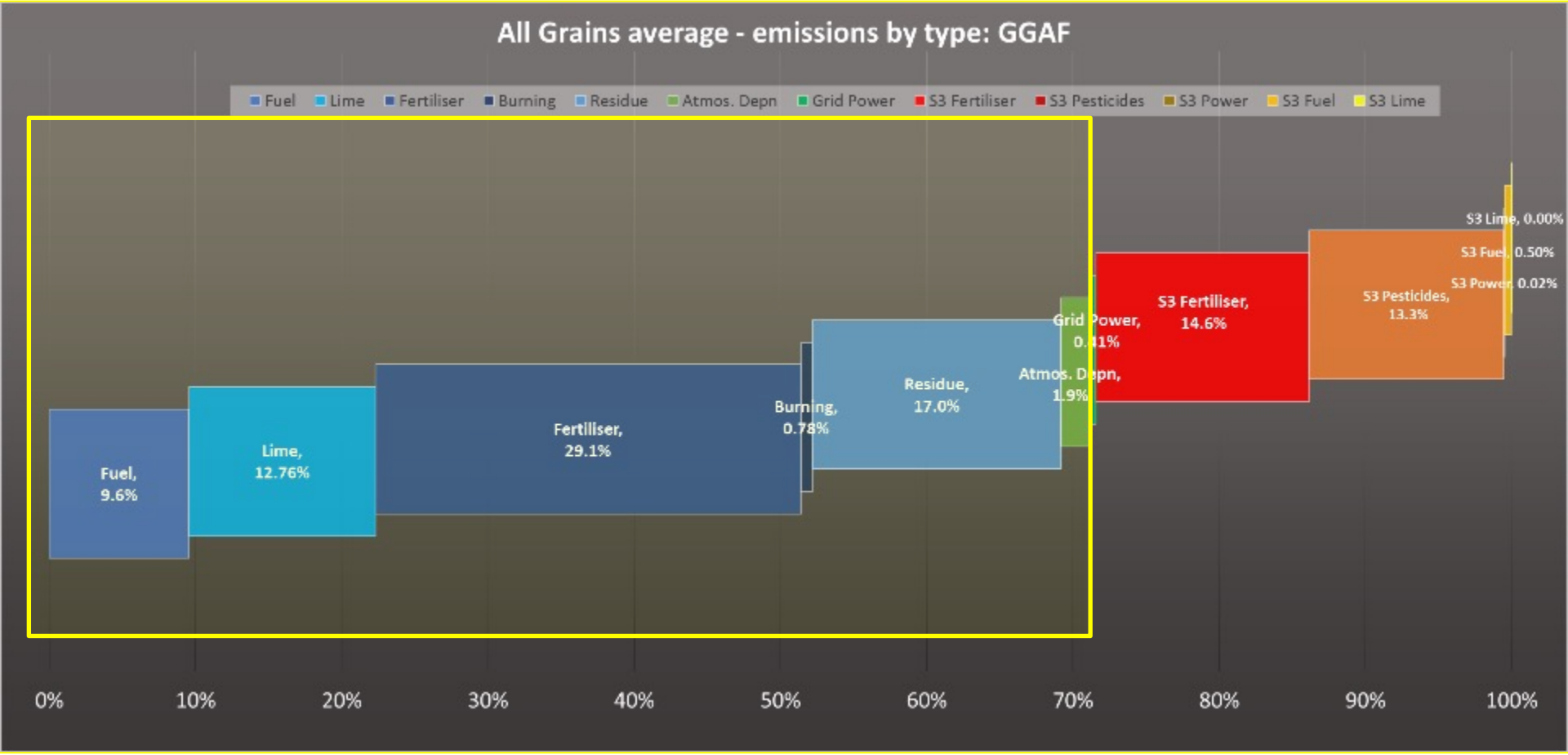
Confidence boosters and busters



Challenges

- Data integration starting to happen
  - Via platforms and/or consultants?
  - Uniform data protocol?
  - Additional data required?
- Engaging growers will be a challenge until more simple/automated and any financial gains more obvious.
  - But baseline knowledge important
- Integrity of data
  - Unskilled operators input it: GIGO

Opportunities - reducing emissions on farm

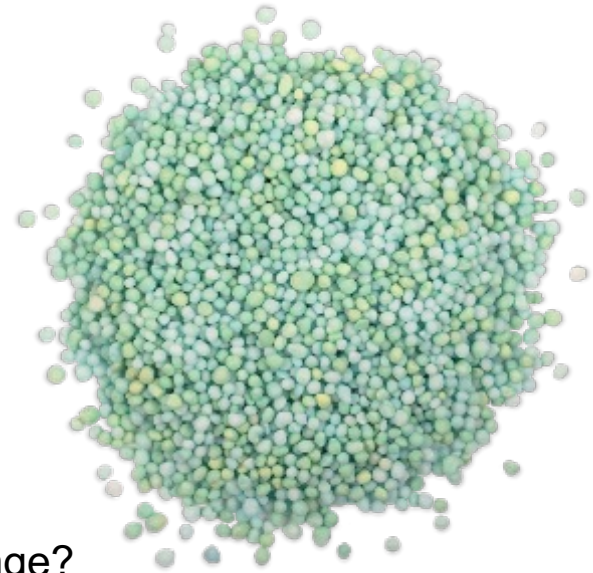


Reducing emissions

Discussion – points from GRU23 Perth

Opportunities/Challenges

- Carbon literacy and learning – learn the terminology and participate in the conversation
- Establish baseline – Most of the data needed has already been collected!
- Calculator tweaking and refinement – industry input needed
- Optimised rotations
- Efficiency of inputs
  - Precision spraying GoB and GoG
  - VRT/section control/placement
- Scope 3 responsibility? – supplier pressure?
- Optimised liming
- Machinery efficiency
- Urease inhibitors in fertilisers
  - $60/t extra cost can be recouped in yield (CSBP 2022)
- Questions around additionality – what is considered a change?

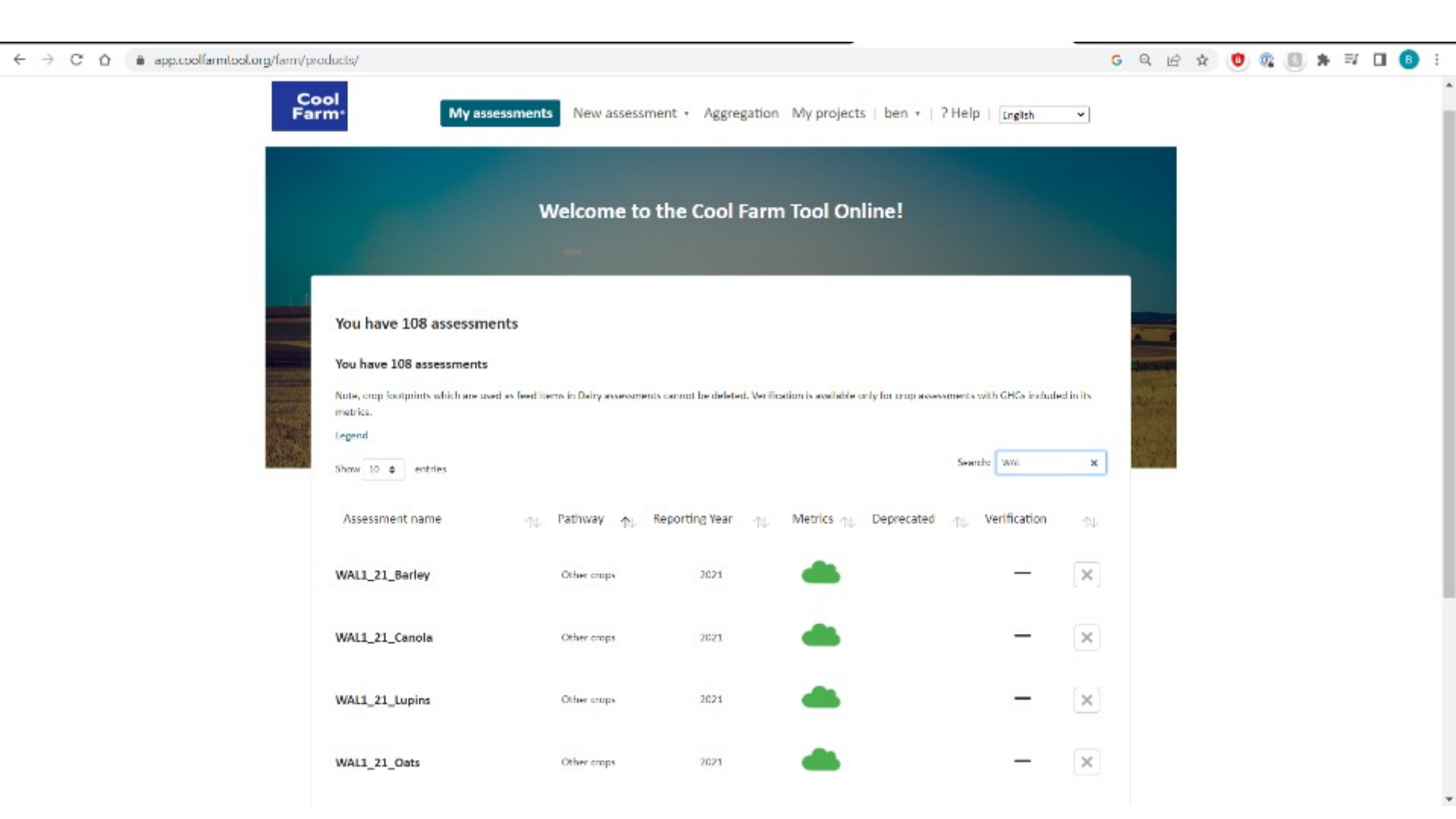


Cropping - Impact of existing and new technologies* (Mandy Curnow DPIRD 2023)

Practice/technology	Potential impact	Likely impact by 2035
Precision placement/variable rate/coated application of N fertilisers	20%	10%
Legume crop rotation	10%	5%
Green urea	20%	10%
Fuel efficient machines	15%	7%
Electrification of transport and machinery	10%	1%
Reduce application and usage herbicide/pesticide to automation	10%	8%
* These aren't additive!		

Livestock - Impact of existing and new* (Mandy Curnow DPIRD 2023)

Practice/technology	Potential impact	Likely impact by 2035
Asparagopsis	40%	10%
Bovaer	40%	15%
Essential oil based	20%	4%
Leucaena (sterile), Desmanthos	15%	1%
Genetics (cattle)	10%	1%
Genetics (sheep)	10%	5%
Anti methane pastures	30%	5%
* These aren't additive!		


app.coolfarmtool.org/farm/products/
Cool Farm
My assessments
New assessment
Aggregation
My projects
ben
? Help
English
Welcome to the Cool Farm Tool Online!
You have 108 assessments
You have 108 assessments
Note, crop footprints which are used as feed items in Dairy assessments cannot be deleted. Verification is available only for crop assessments with GHGs included in its metrics.
Legend
Show 10 entries
Search: WAL
Assessment name
Pathway
Reporting Year
Metrics
Deprecated
Verification
WAL1_21_Barley
Other crops
2021
WAL1_21_Canola
Other crops
2021
WAL1_21_Lupins
Other crops
2021
WAL1_21_Oats
Other crops
2021

WAL1_21_Barley

Other Crops • Barley • Finished product: 5,303 tonnes • Yield: 3.30 tonne / ha

1. Crop details

Crop name: Barley

Harvest year: 2021

Crop area: 1,607 hectares

Harvested amount (total): 5,303 tonnes

Farm-gate ready amount: 5,303 tonnes

Assessment name: WAL1_21_Barley

1.2 Crop residue management

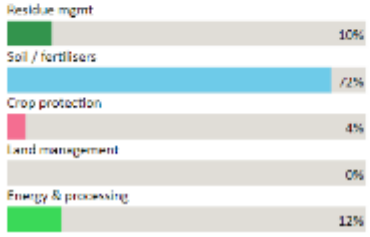
Default values for dry matter weights are provided for most crops. If you have better data, you can overwrite the default value. Residue amount must be entered as "Dry Weight"

Summary

Crop	Barley
Year	2021
Farm-gate amount	5,303 tonne
Yield	3.30 tonne / ha

GHG emissions

Total: 1,213,488 kg CO2e



Crop Product (Soil Characteristics

app.coolfarmtool.org/crop_product/2F078FDA/growing_area/

Cool Farm

My assessments | New assessment | Aggregation | My projects | ben | ? Help | English

Close | Share | More...

WAL1_21_Barley

Other Crops • Barley • Finished product: 5,303 tonnes • Yield: 3.30 tonne / ha

Crop | Soil | Inputs | Fuel & Energy | Irrigation | Carbon | Transport

Results | 100% Complete

2. Soil characteristics

Specify the soil characteristics of the field in your assessment.

Nb. CFT is currently only suitable for assessments on mineral soils with a Soil Organic Carbon content of less than 12%.

Soil texture: sandy (coarse)

Soil moisture average: Dry

Soil organic matter %: Custom value

Soil organic matter custom: 1.900

Measured years ago: 0

Soil organic carbon: --

Soil drainage: good

Soil pH: 5.5 < pH <= 7.3

Summary

Crop	Barley
Year	2021
Farm-gate amount	5,303 tonne
Yield	3.30 tonne / ha

GHG emissions

total

Results can't be calculated as data entry is currently incomplete or incorrect. Click on the 'Save & continue' button to understand where the error is taking place.

Fertiliser Application 1

X Remove

Fertiliser type: Monoammonium phosphate - 11% N / 52% P2O5

(5.61 kg / ha N)

Manufactured in: Oceania 2014

Application rate: 51 kg / ha

Fertiliser weight, or units?: product

Application method: Incorporate

Date of application: dd/mm/yyyy

Emissions inhibitors: None

Fertiliser Application 2

X Remove

Fertiliser type: Urea ammonium nitrate solution - 32% N

(54.40 kg / ha N)

Manufactured in: Oceania 2014

Application rate: 170 kg / ha

Fertiliser weight, or units?: product

Application method: Apply in solution

Date of application: dd/mm/yyyy

Emissions inhibitors: None

GHG emissions

Total

1,213,488 kg CO2e

Fertiliser weight, or units? product

Application method Incorporate

Date of application dd/mm/yyyy

+ Add fertiliser application or Select from template

3.2 Crop protection inputs

Enter data for applications of pesticides, fumigants, herbicides, fungicides etc.

Crop protection Application 1 X Remove

Category Post-emergence

Type Herbicide

Application rate 3.6 kg / ha

Active ingredient % 100 %

+ Add crop protection application

User notes

Aggregated actives:
2.25L Glyphosate 450g/L
3L Paraquat 250g/L
2L Iriflurolin 480g/L
0.7L 500g/L Diflufenican + 250g/L MCPA
30g of /50g/L Iriseulfuron
1.2/L 400g/L Bixlozone Overwatch

GHG emissions

Total 1,213,488 kg CO2e

Residue mgmt 10%
Soil / fertilisers 79%
Crop protection 4%
Land management 0%
Energy & processing 12%
Water waste 0%
Transport 1%

Enter data for electricity and fuels used for crop production and on-farm processing.
If you enter all of your 'in field' energy in 4.1, then you should skip section 4.2 to prevent double counting.

Energy usage 1

X Remove

Energy source: diesel (average biofue

Energy used: 46,407 litre

Category: Field

Label: Diesel (proportional by ar | Clear label

+ Duplicate

Energy usage 2

X Remove

Energy source: electricity (grid)

Energy used: 3,437 kWh

Category: Field

Label: Proportional (by area) ele | Clear label

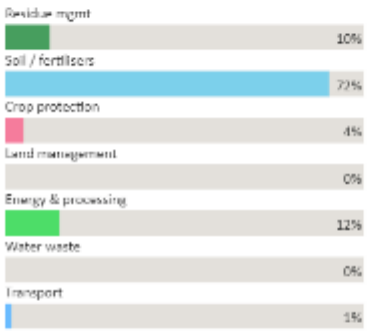
+ Duplicate

+ Add energy usage

4.2 Field operations energy use

GHG emissions

Total: 1,213,488 kg CO2e



6. Carbon changes & sequestration

Section 6.1 calculates the in crop carbon changes and section 6.2 calculates the out-of-crop carbon changes

6.1 In Crop carbon changes

Tick the relevant boxes below if you have made changes to land use, tillage, or carbon inputs in your assessment area during the last 20 years.

☐ Has any part of the field management practice changed between tillage, land use or inputs in the last 20 years?

6.2 Out of crop biomass changes

Add annual changes for the biomass of trees growing within or immediately adjacent to the field assessment area.

+ Add a tree species

User notes

Add comments about this section

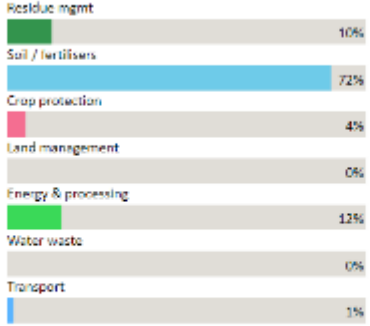
Back | Save as | Save & continue

Summary

Crop	Barley
Year	2021
Farm-gate amount	5,303 tonne
Yield	3.30 tonne / ha

GHG emissions

Total — 1,213,488 kg CO2e



Included. It is good practice to also include outbound transportation of finished crop and co-products from your farm to the processing or storage site.

7.1. Transport

For each transportation mode, calculate or estimate the weight of goods and distances transported. You may have to allocate bulk or shared transport, in which case add User notes on how this was done.

Transport entry 1

X Remove

Mode	road HGV (average heavy goods vehicle)	
Weight	50	tonnes
Distance	1,633	kilometres
Label	Contractor cartage to CBI	Clear label

+ Duplicate

Transport entry 2

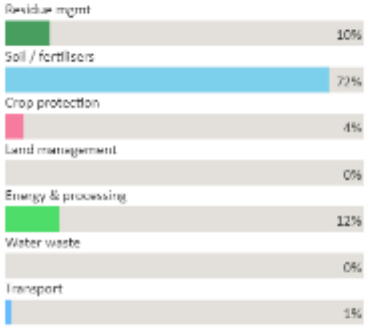
X Remove

Mode	road HGV (average heavy goods vehicle)	
Weight	55	tonnes
Distance	1,553.4	kilometres
Label	Fert/Chem haulage by co	Clear label

+ Duplicate

GHG emissions

Total — 1,213,488 kg CO2e

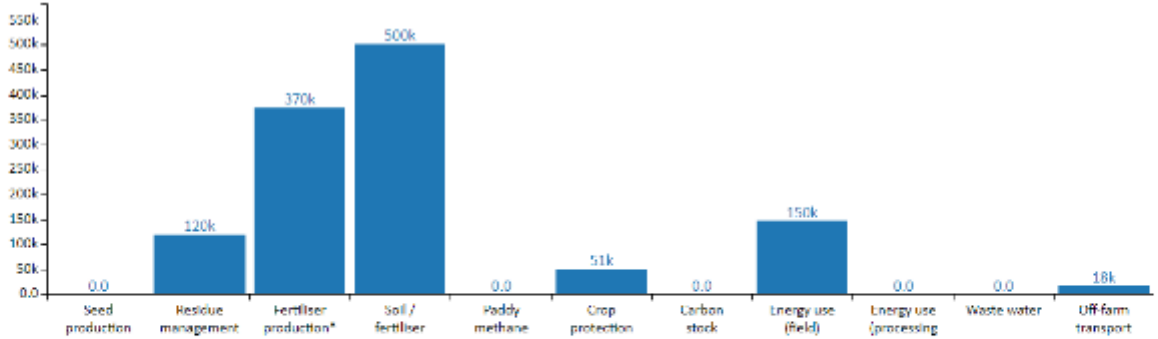


Crop | Soil | Inputs | Fuel & Energy | Irrigation | Carbon | Transport

Results | 100% Complete

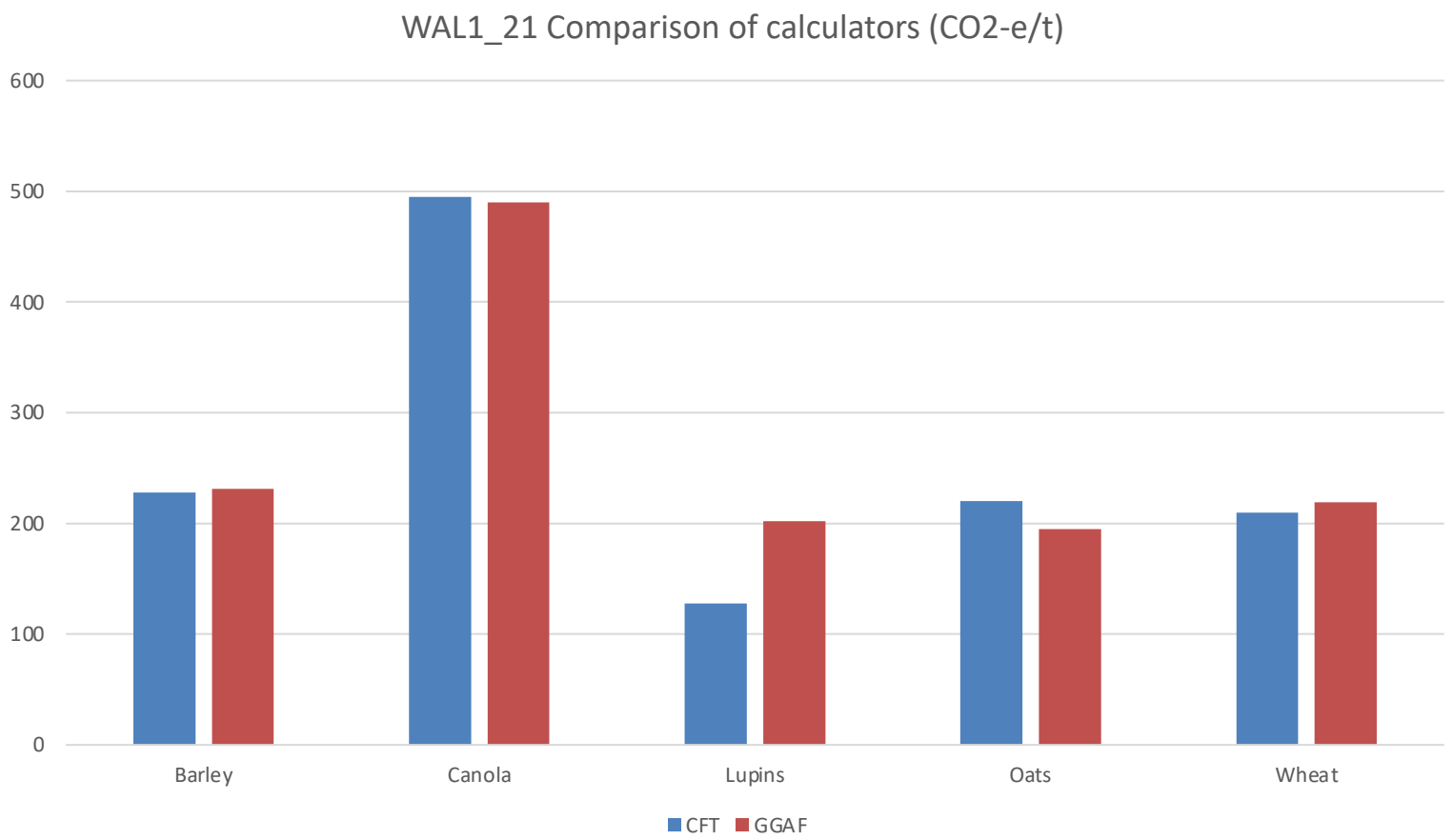
Total emissions	Emissions per hectare	Emissions per tonne
1.21M kg CO2e	755.13 kg CO2e	228.83 kg CO2e

Total Emissions (kg CO2e)



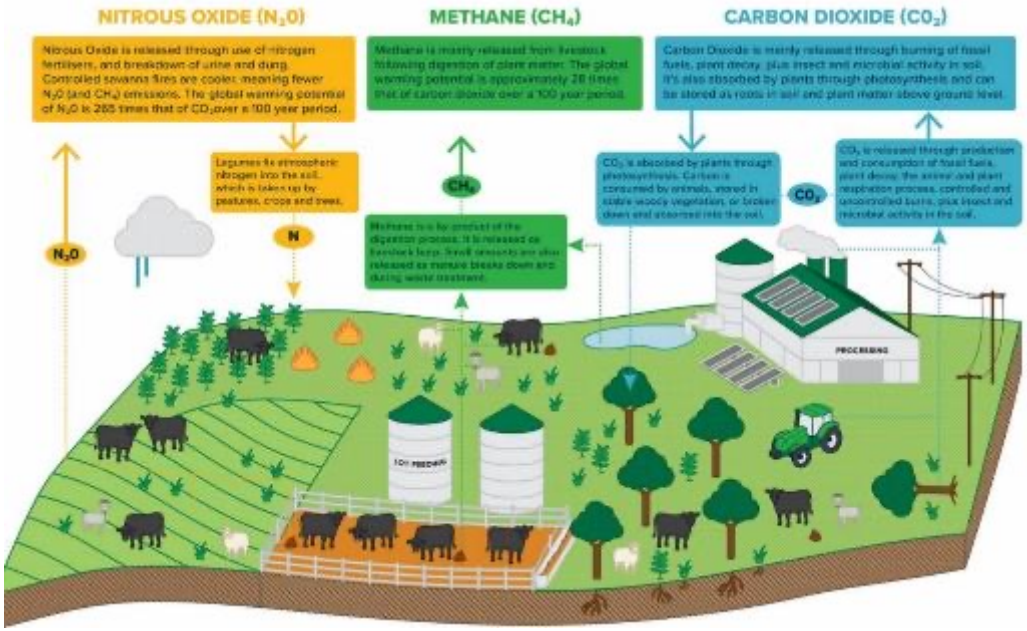
Detailed data (all values in kg) — Hide data

Sources	CO_2	N_2O	CH_4	Total CO_2 eq	Per ha	Per tonne
Seed production	0	0	0	0	0	0
Residue management	0	441.64	0	120.57k	75.03	22.74
Fertiliser production*	374.43k	0	0	374.43k	233	70.61
Soil / fertiliser	68.61k	1.59k	0	502.62k	312.77	94.78
Paddy methane	0	0	0	0	0	0


WAL1_21 Comparison of calculators (CO2-e/t)
600
500
400
300
200
100
0
Barley
Canola
Lupins
Oats
Wheat
CFT
GGAF

SBGAF

Richard Brake: Richard Brake Consulting



Enter your farm data for each animal class and season

Farm name: Tanswic Station
Choose your region in Australia: QM

Is your property north of the Tropic of Capricorn? No
Is your property in orange zone? (Ref Map. 1) Yes

Click here to populate the calculator with example beef data

Livestock inventory

		Breeder cattle and owner bred cattle							Traded cattle			
		Bulls >1	Steers <1	Steers 1-2	Steers >2	Cows >2	Heifers<1	Heifers 1-2	Heifers >2 (not calving)	Cows	Heifers	Steers	Units
Livestock Numbers	Spring	1	82			211	82	37					head
	Summer	1	82			209	82	37					head
	Autumn	1	82			208	82	37					head
	Winter	1				175	37	37					head
	Average	1	82			201	71	37					head
Liveweight	Spring	800	81			475	81	318					kg/head
	Summer	800	172			489	167	373					kg/head
	Autumn	800	245			513	236	423					kg/head
	Winter	800				529	277	464					kg/head
	Average	800	166			501	190	394					kg/head
Liveweight gain (LWG)	Spring	0.00	1.00			0.00	1.00	0.60					kg/hd/day
	Summer	0.00	1.00			0.30	0.90	0.60					kg/hd/day
	Autumn	0.00	0.60			0.24	0.60	0.50					kg/hd/day
	Winter	0.00				0.13	0.30	0.40					kg/hd/day
	Average	0.00	0.87			0.16	0.73	0.53					kg/hd/day
Crude Protein (CP)	Spring	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	%
	Summer	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	%
	Autumn	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	%
	Winter	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	%
	Average	9.0	0.0	9.0	0.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	%
Dry matter digestibility (DMD)	Spring	53.00	53.00	53.00	53.00	53.00	53.00	53.00	53.00	53.00	53.00	53.00	%
	Summer	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	57.00	%
	Autumn	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	%
	Winter	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	%
	Average	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	%

Purchase inventory

	Bulls >1	Steers <1	Steers 1-2	Steers >2	Cows >2	Heifers<1	Heifers 1-2	Heifers >2 (not calving)	Cows	Heifers	Steers	Purchases - Breeder operation
No. head purchased	2											
Purchase weight (LW/hd)	800											
Live weight / category	1600	0	0	0	0	0	0	0	0.0	0.0	0.0	1,600

	Breeding herd	Trade
Region where majority of cattle purchased from	nth QLD	nth QLD
% of cattle purchased from this location	0%	100%

Sale inventory

												Sales - Breeder operation
No. head sold	2	82			32	45						
Sale weight (LW/hd)	800	272			510	259						
Live weight / category	1,600.0	22,304.0	0.0	0.0	16,320.0	11,655.0	0.0	0.0	0.0	0.0	0.0	51,879

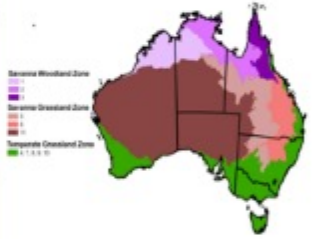
LWG (trade cattle)

					Total LWG trade cattle (kg)
kg/hd				0.0	0.0
kg/category				0.0	0.0

Percentage of cows calving	Spring	78%

The question is really – does your farm get enough rainfall or irrigation to drain through the

Map 1. The ratio of mean annual evapotranspiration to annual precipitation (E/P)



Introduction | Data summary | Data input - beef | Data input - sheep | Data input - vegetation | Enteric fermentation - beef | Enteric fermentation - sheep | Manure manager ...

	Autumn	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%	55.00%	
	Winter	51.00%	51.00%	51.00%	51.00%	51.00%	51.00%	51.00%	51.00%	51.00%	51.00%	51.00%	
	Average	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0 %	

Purchase inventory	Bulls >1	Steers <1	Steers 1-2	Steers >2	Cows >2	Heifers<1	Heifers 1-2	Heifers >2 (not calving)	Cows	Heifers	Steers	Purchases - Breeder operation
No. head purchased	2											
Purchase weight (LW/hd)	800											
Live weight / category	1600	0	0	0	0	0	0	0	0.0	0.0	0.0	1,600

	Breeding herd	Trade
Region where majority of cattle purchased from	nth QLD	nth QLD
% of cattle purchased from this location	0%	100%

Sale inventory											Sales - Breeder operation
No. head sold	2	82			32	45					
Sale weight (LW/hd)	800	272			510	259					
Live weight / category	1,600.0	22,304.0	0.0	0.0	16,320.0	11,655.0	0.0	0.0	0.0	0.0	0.0	51,879

LWG (trade cattle)					Total LWG trade cattle (kg)
kg/hd					
kg/category	0.0	0.0	0.0		0.0

Percentage of cows calving	Spring	70%
	Summer	0%
	Autumn	0%
	Winter	0%
	Total	70%

		Dryland	Irrigated		
Urea Fertiliser Pasture (enter as tonnes of urea)			0	0	tonnes
Urea Fertiliser Crops (used for grazing cattle - tonnes urea)			0	0	tonnes
Other N fertiliser (enter value as tonnes of N)					tonnes N
Total Nitrogen			0	0	
Single Superphosphate					tonnes
Limestone applied to soils	Total for farm				t
	Fraction		1		Fraction

Energy and Fuel		
Electricity Source		State Grid
Annual Diesel Consumption (for cattle enterprise)		3500 litres/year
Annual Petrol Consumption (for cattle enterprise)		1800 litres/year
Annual Electricity Use (for cattle enterprise)		2000 KWh
Grain Purchased for Cattle Feed (all grains)		tonnes
Cotton Seed Purchased for Cattle Feed		30 tonnes
Hay Purchased for Cattle Feed		tonnes
Herbicides/pesticides		L

Savannah Burning				
	Rainfall	Low	Fire Season	Late Dry Season
	Vegetation Class	Open woodland with mixed grass	Years since fire	0
	Patchiness	Low	Fire Scar Area	0 ha
	Fuel Class Size	Coarse		

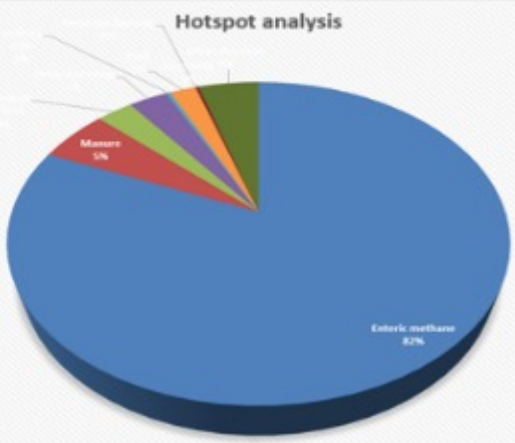
Introduction | Data summary | **Data input - beef** | Data input - sheep | Data input - vegetation | Enteric fermentation - beef | Enteric fermentation - sheep | Manure manage ...

Beef & Sheep Greenhouse Accounting Tool

Outputs	beef t CO_2e/farm	sheep t CO2e/farm	total t CO2e/farm
Scope 1 Emissions			
CO_2 - Fuel	13.59	0.00	13.59
CO_2 - Lime	0.00	0.00	0.00
CO_2 - Urea	0.00	0.00	0.00
CH_4 - Fuel	0.00	0.00	0.00
CH_4 - Enteric	576.59	0.00	576.59
CH_4 - Manure Management	38.21	0.00	38.21
CH_4 - Savannah Burning	0.00		0.00
N_2O - Fertiliser	0.00	0.00	0.00
N_2O - Urine and Dung	21.33	0.00	21.33
N_2O - Atmospheric Deposition	2.24	0.00	2.24
N_2O - Leaching and Runoff	0.00	0.00	0.00
N_2O - Savannah Burning	0.00		0.00
N_2O - Fuel	0.08	0.00	0.08
Scope 1 Total	**652**	**0**	**652**
Scope 2 Emissions			
Electricity	1.62	0.00	2
Scope 2 Total	**2**	**0**	**2**
Scope 3 Emissions			
Fertiliser	0.00	0.00	0.00
Purchased feed	32.98	0.00	32.98
Herbicides/pesticides	0.00	0.00	0.00
Electricity	0.24	0.00	0.24
Fuel	0.71	0.00	0.71
Lime	0.00	0.00	0.00
Purchased livestock	19.84	0.00	19.84
Livestock on agistment			
Scope 3 Total	**54**	**0**	**54**
Carbon Sequestration			
Carbon sequestration in trees	-22.13	-17.43	-39.56
Net Farm Emissions	**685**	**-17**	**668**

Summary	t CO2e/farm
CO_2	33
CH_4	615
N_2O	37

Breakdown of Scope 1 GHGs

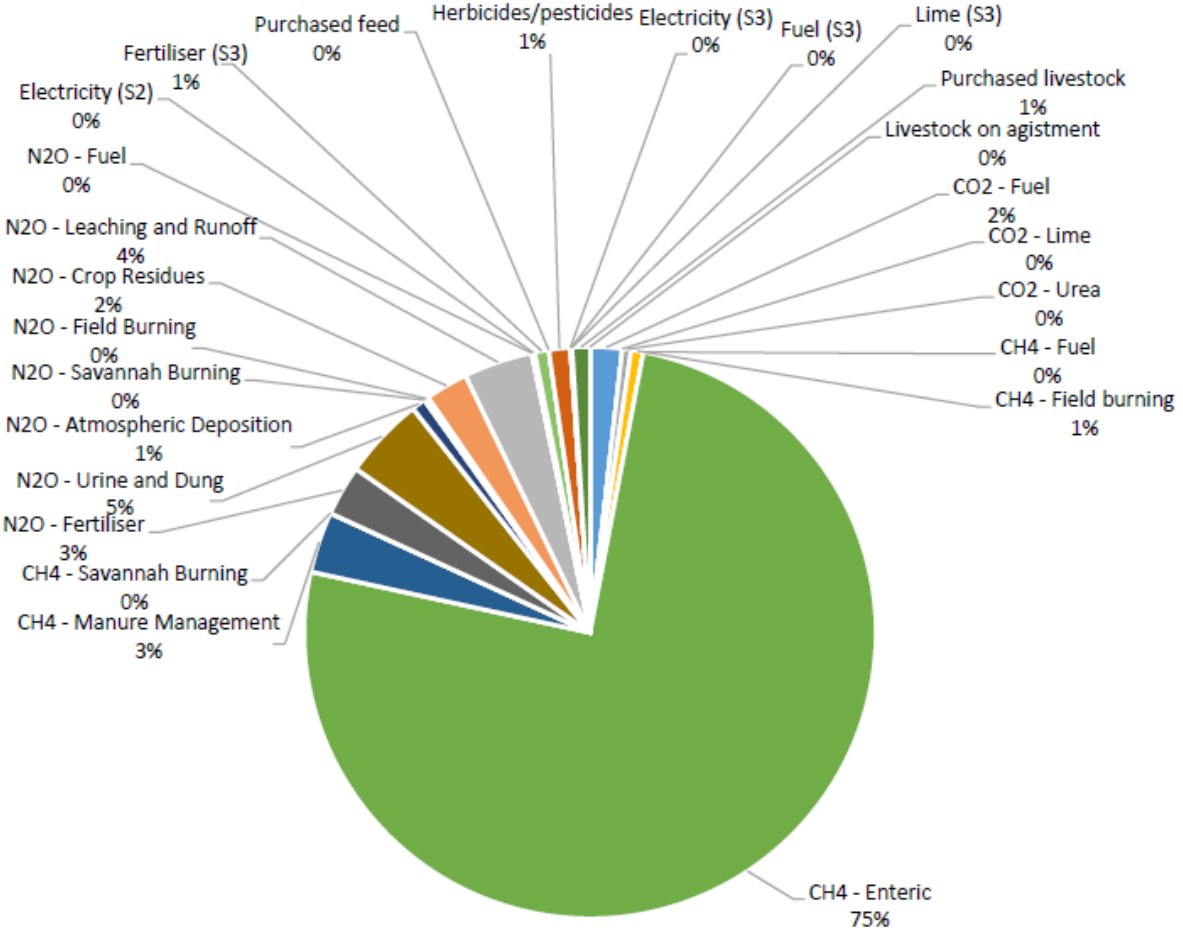


Emissions intensity		
Sheep meat (breeding herd) excl. sequestration		kg CO2-e / kg LW
Sheep meat (breeding herd) inc. sequestration		kg CO2-e / kg LW
Wool excl. sequestration		kg CO2-e / kg greasy
Wool inc. sequestration		kg CO2-e / kg greasy
Beef excl. sequestration	**13.6**	kg CO2-e / kg LW
Beef inc. sequestration	**13.2**	kg CO2-e / kg LW

DPIRD central woolbelt mixed farm example

Enterprise:

- 3,000ha
- 60% sheep 40% crop
- M4 Zone
- 199mm GSR
- 6000 ewe SR flock
- 100% lambing
- No crop grazing



Brent Searle BJW

Thank you & Questions