Dairy Carbon Footprint Industry Announcement

Version 4 Update Summary

A collaboration by Bord Bia, ICBF and Teagasc

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Agenda

- Introduction
  - Carbon Footprinting in SDAS
  - Improving reporting, Increasing visibility
- Version 4 Model Calculation Changes
  - Summary of changes
  - Effect of changes
  - Herd examples
- Accessing Updated Carbon Footprints
  - For farmers
  - For Co-Ops
- Future Development

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Carbon Footprinting in SDAS

- Since 2014 over 70,000 SDAS audits have been conducted.
- A carbon footprint has been calculated for 95% of these audits.
- Data used in these calculations comes from
  - The SDAS audit sustainability survey,
  - AIMS
  - Dairy Co-ops
- Figures reported back to farmers and increased visibility now necessary.
- Need to support the understanding of GHG emission counting and carbon footprinting.
- Need to ensure highest level of accuracy possible.

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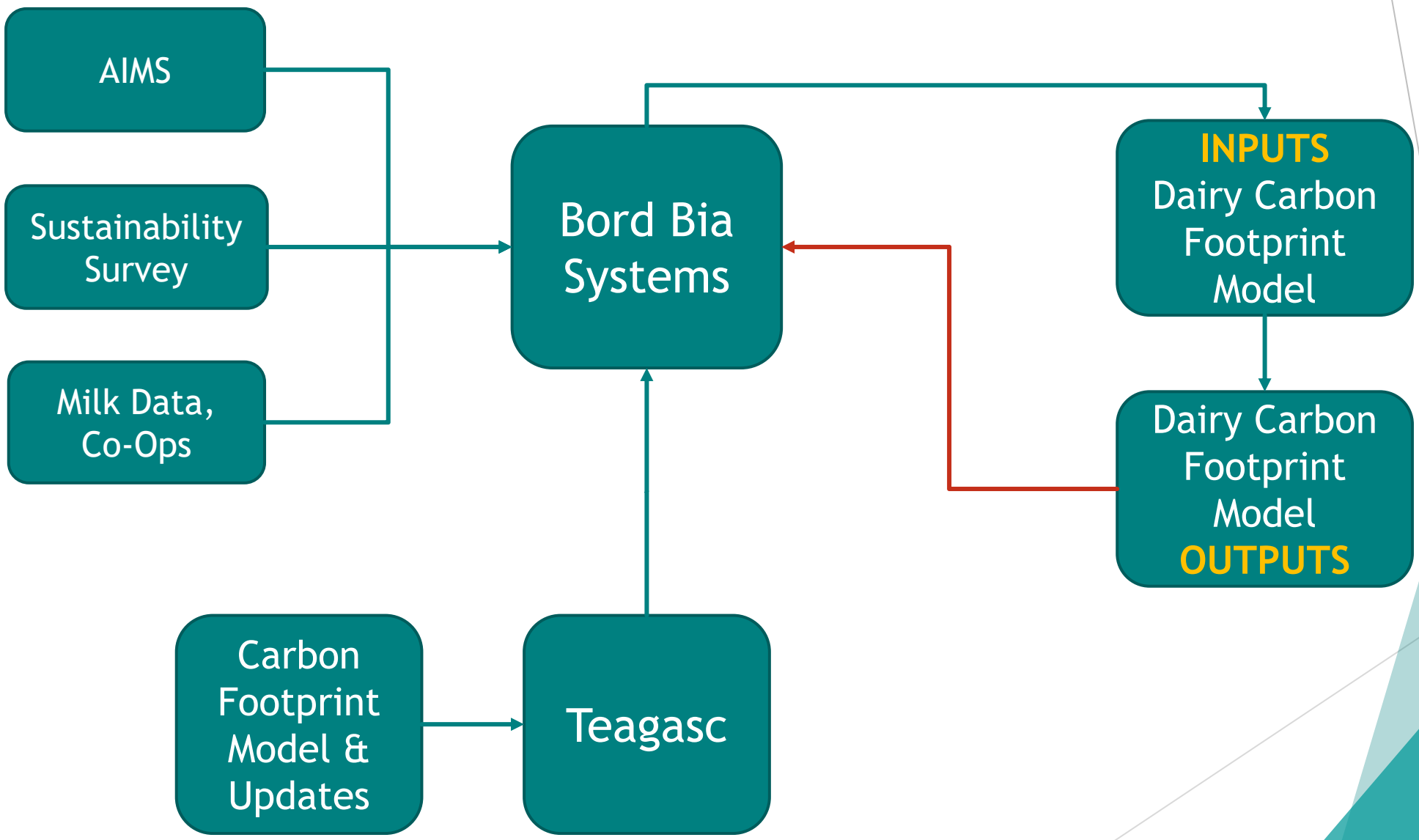
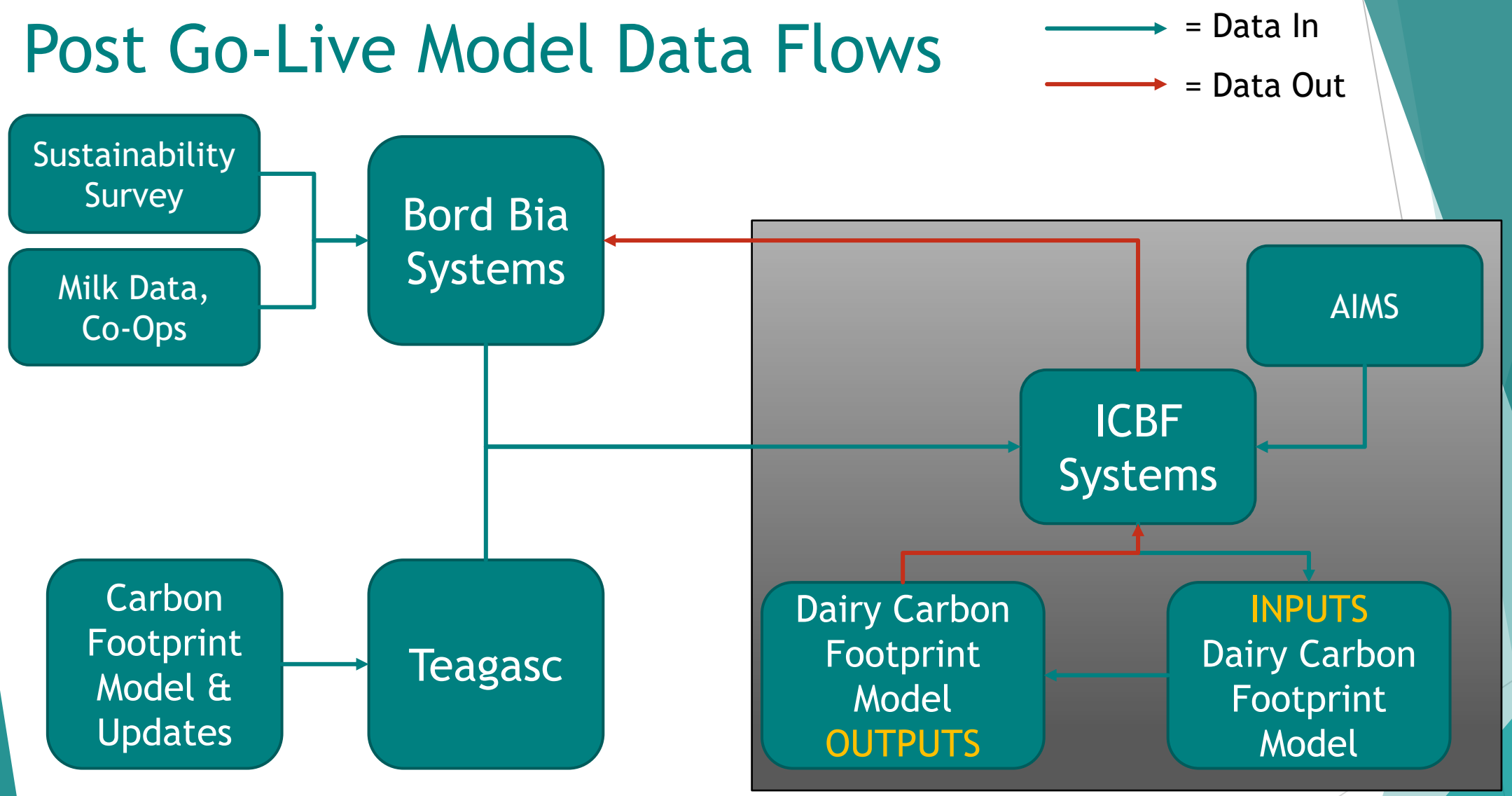
Pre Go-Live Model Data Flows



Post Go-Live Model Data Flows



Improving Accuracy

- Sustainability Survey updates, - now more accurately capturing information relating to;
  - Slurry application methods and timing
  - Types of fertilizer applied including protected urea
  - Concentrate feeding
- Input sources, - improved categorization of animals on farm.
  - AIMS data now available through ICBF eliminating the need for some herd profiling assumptions to be applied.
- Model improvements, - based on more up to date research.
  - Emission factor changes
  - incorporation of new technologies

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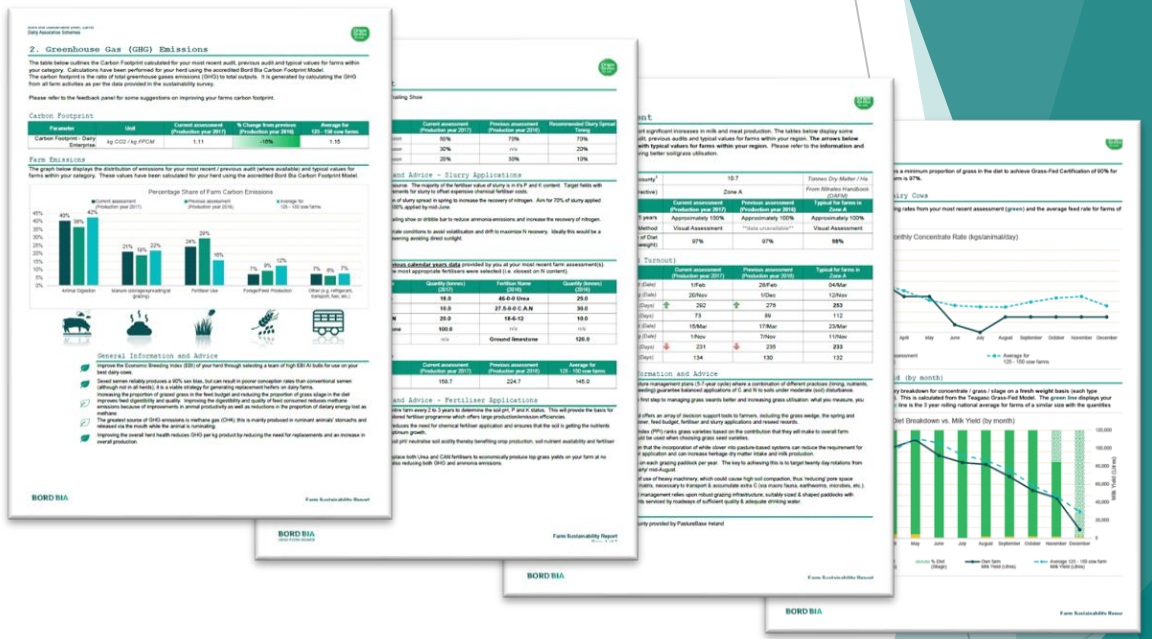
Improving Reporting

- Bord Bia Farm Feedback Report launched in 2020.
- Providing farmers with visibility on their own farm performance against previous assessments and peers.
- Aim to outline how farm inputs & activities contribute to GHG emissions and make the carbon footprint metric visible.
- Guidance element was formulated in collaboration with Teagasc and is focused on measures set out in the Teagasc MACC curve.



Striving for alignment with other reports available to farmer

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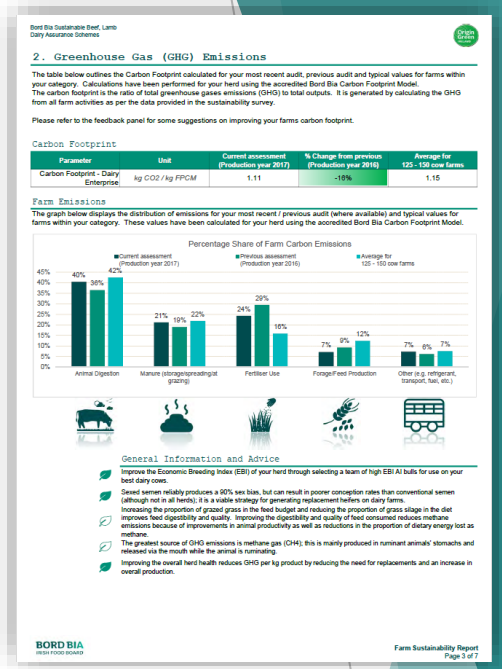
Increasing Visibility

- Bord Bia Farm Feedback Report
  - Generated after every SDAS audit
  - Includes carbon footprint and breakdown of emission sources
- SignPost Programme
  - Extensive communications around the SignPost Programme will increase awareness.
  - Being made visible at SignPost Farm walks.
  - “Know your Number” campaign.
- Milk statements
- Co-Op reports



Bord Bia Sustainable Beef, Lamb
Dairy Assurance Schemes

2. Greenhouse Gas (GHG) Emissions

The table below outlines the Carbon Footprint calculated for your most recent audit, previous audit and typical values for farms within your category. Calculations have been performed for your herd using the accredited Bord Bia Carbon Footprint Model.
The carbon footprint is the ratio of total greenhouse gases emissions (GHG) to total outputs. It is generated by calculating the GHG from all farm activities as per the data provided in the sustainability survey.

Please refer to the feedback panel for some suggestions on improving your farms carbon footprint.

Carbon Footprint

Parameter	Unit	Current assessment (Production year 2017)	% Change from previous (Production year 2016)	Average for 125 - 150 cow farms
Carbon Footprint - Dairy Enterprise	kg CO2 / kg FPCM	1.11	-16%	1.15

Farm Emissions

The graph below displays the distribution of emissions for your most recent / previous audit (where available) and typical values for farms within your category. These values have been calculated for your herd using the accredited Bord Bia Carbon Footprint Model.

Percentage Share of Farm Carbon Emissions

Current assessment (Production year 2017) · Previous assessment (Production year 2016) · Average for 125 - 150 cow farms

45% 40% 35% 30% 25% 20% 15% 10% 5% 0%

40% 38% 42% | 21% 19% 22% | 24% 29% 16% | 7% 9% 12% | 7% 6% 7%

Animal Digestion · Manure (storage/spreading/at grazing) · Fertiliser Use · Forage/Feed Production · Other (e.g. refrigerant, transport, fuel, etc.)

General Information and Advice

- Improve the Economic Breeding Index (EBI) of your herd through selecting a team of high EBI AI bulls for use on your best dairy cows.
- Sexed semen reliably produces a 90% sex bias, but can result in poorer conception rates than conventional semen (although not in all herds); it is a viable strategy for generating replacement heifers on dairy farms.
- Increasing the proportion of grazed grass in the feed budget and reducing the proportion of grass silage in the diet improves feed digestibility and quality. Improving the digestibility and quality of feed consumed reduces methane emissions because of improvements in animal productivity as well as reductions in the proportion of dietary energy lost as methane.
- The greatest source of GHG emissions is methane gas (CH4); this is mainly produced in ruminant animals' stomachs and released via the mouth while the animal is ruminating.
- Improving the overall herd health reduces GHG per kg product by reducing the need for replacements and an increase in overall production.

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Farm Sustainability Report
Page 3 of 7

SIGNPOST
Farmers for Climate Action

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Version 4 Model Calculation Changes

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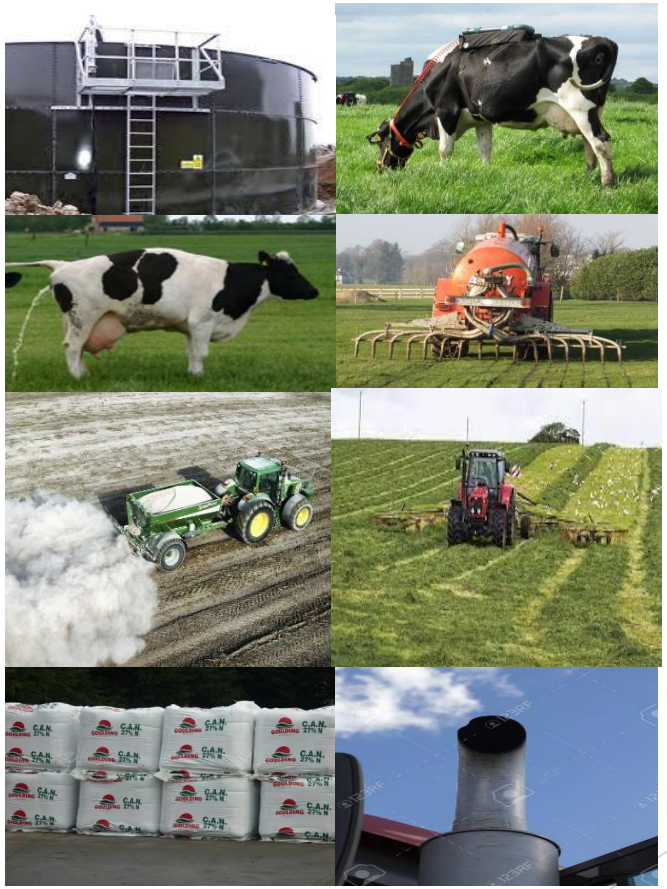
Dairy Farm Greenhouse Gases (GHG's)

- Methane (CH_4)
- Nitrous oxide (N_2O)
- Carbon dioxide (CO_2)
- Warming potential of GHG's measured in terms of CO_2
  - 1 kg CH_4 = 25 kg CO_2 equiv.
  - 1 kg N_2O = 298 kg CO_2 equiv.



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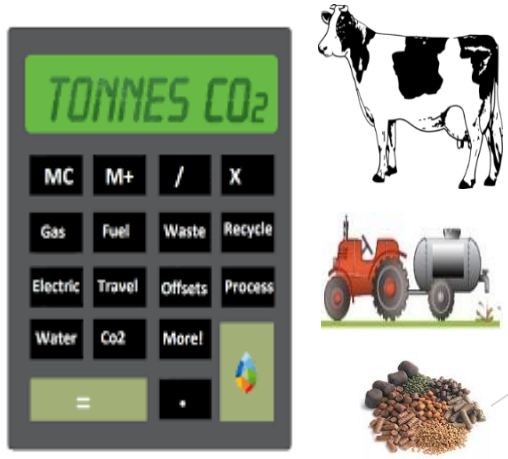
Teagasc Carbon Audit Tool

- Expensive to measure multiple emissions from many farms

- Carbon Audit – Cost effective simulation model i.e. carbon calculator
  - Certified by Carbon Trust in 2012

- Calculates farm's annual greenhouse gas emissions in carbon equivalents (CO_2e)
  - Based on experimental data "Emission factors"
  - Measured farm input and output information



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Life Cycle Assessment (LCA)

Includes:

- Greenhouse gas emissions released by on-farm processes
- Greenhouse gas emissions released during the production of farm inputs

Boundary

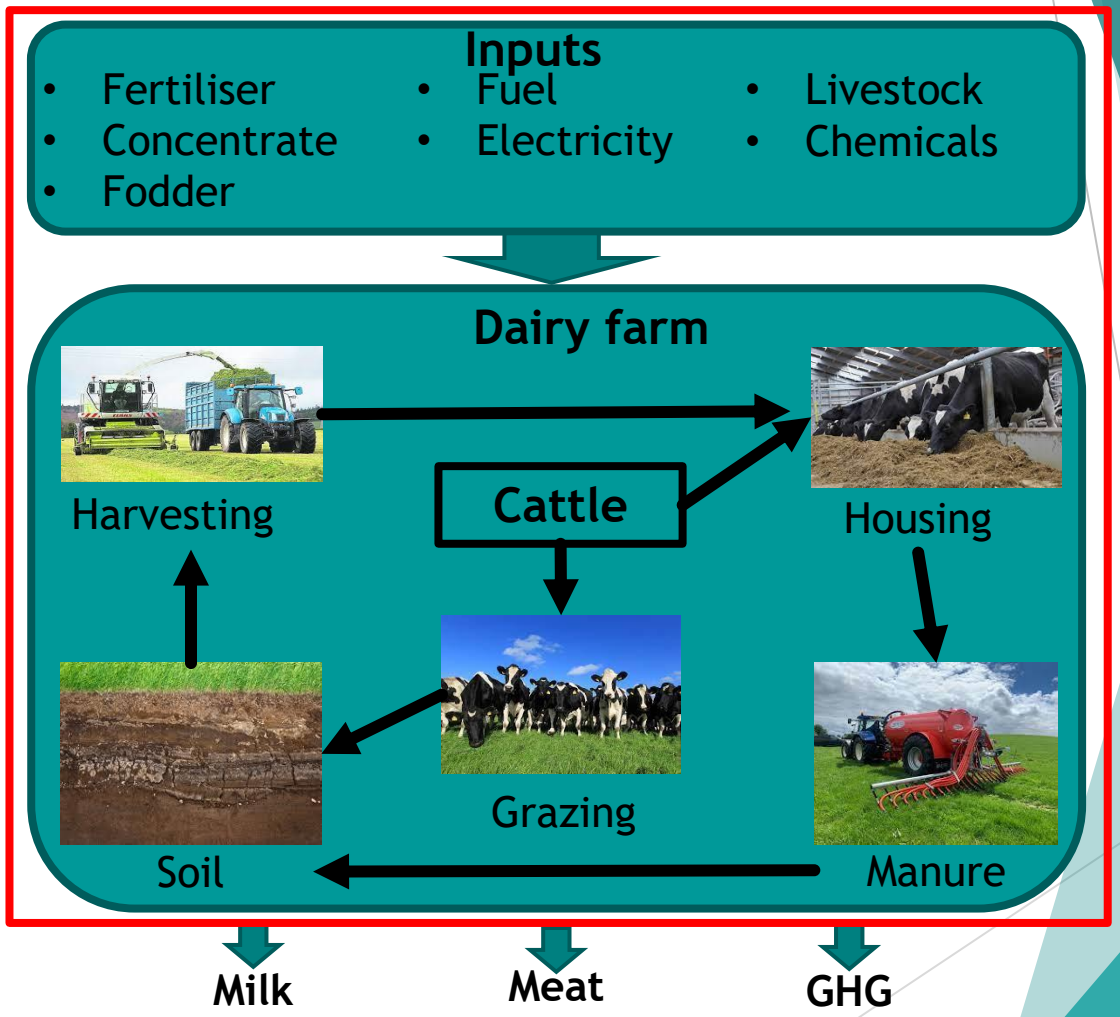
- Cradle-to-farm gate

Unit

- Global warming potential (kg CO_2-eq)
- kg fat and protein corrected milk (FPCM; 4.0%, 3.3%).

Data

- Sustainability Dairy Assessment Scheme



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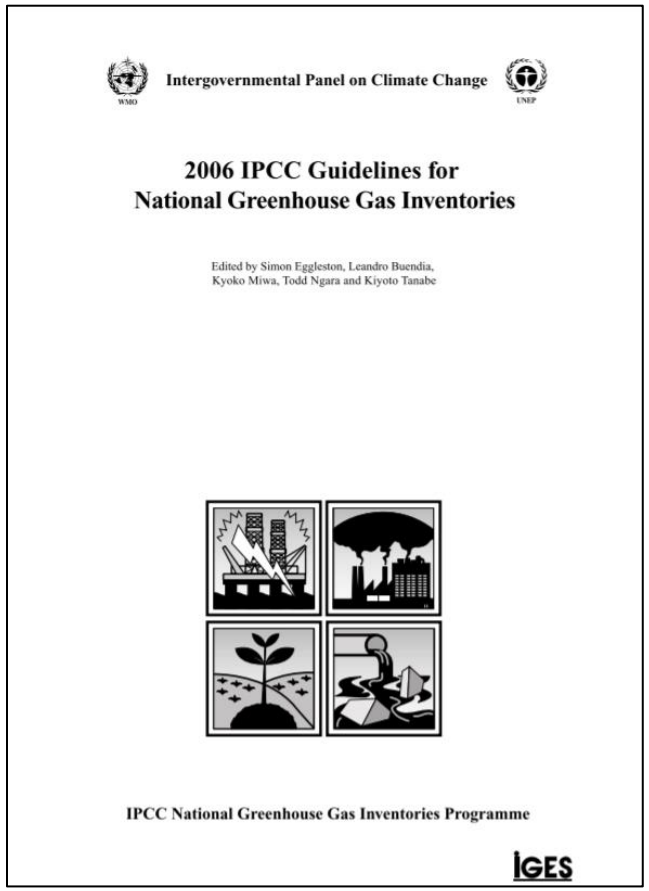
Research Updates


Intergovernmental Panel on Climate Change

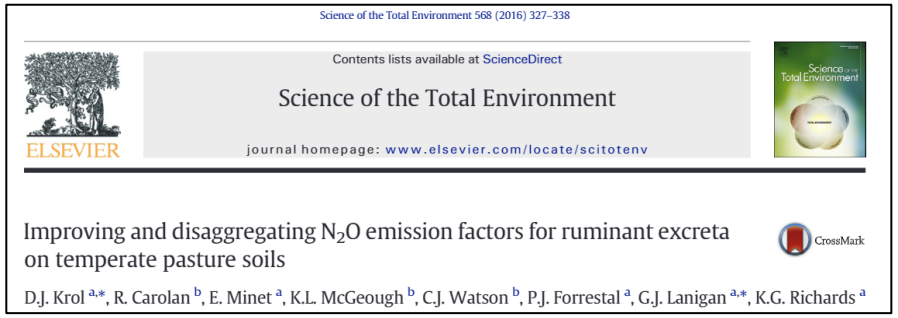
2006 IPCC Guidelines for National Greenhouse Gas Inventories

Edited by Simon Eggleston, Leandro Buendia, Kyoko Miwa, Todd Ngara and Kiyoto Tanabe

IPCC National Greenhouse Gas Inventories Programme

IGES

Version 3


Science of the Total Environment 568 (2016) 327–338

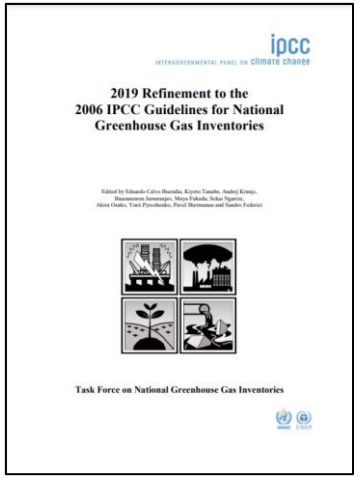
Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

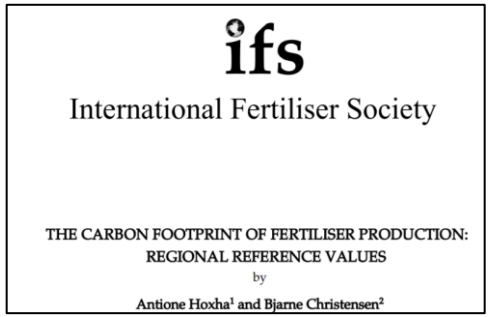
Improving and disaggregating N_2O emission factors for ruminant excreta on temperate pasture soils

D.J. Krol [a,*], R. Carolan [b], E. Minet [a], K.L. McGeough [b], C.J. Watson [b], P.J. Forrestal [a], G.J. Lanigan [a,*], K.G. Richards [a]


ipcc

2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Task Force on National Greenhouse Gas Inventories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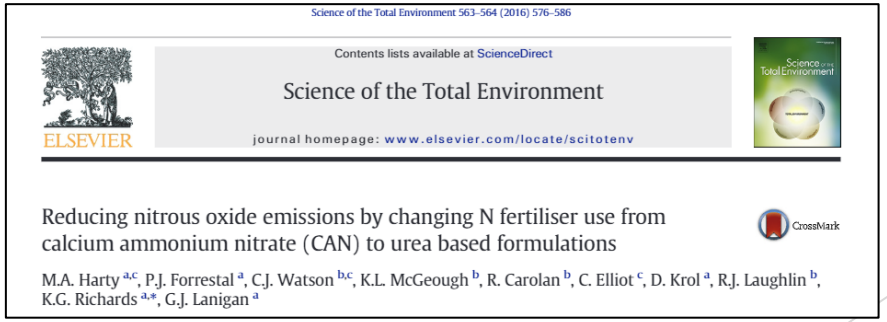
International Fertiliser Society

THE CARBON FOOTPRINT OF FERTILISER PRODUCTION: REGIONAL REFERENCE VALUES

by

Antione Hoxha[1] and Bjarne Christensen[2]


Science of the Total Environment 563–564 (2016) 576–586

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journal homepage: www.elsevier.com/locate/scitotenv

Reducing nitrous oxide emissions by changing N fertiliser use from calcium ammonium nitrate (CAN) to urea based formulations

M.A. Harty [a,c], P.J. Forrestal [a], C.J. Watson [b,c], K.L. McGeough [b], R. Carolan [b], C. Elliot [c], D. Krol [a], R.J. Laughlin [b], K.G. Richards [a,*], G.J. Lanigan [a]

Version 4

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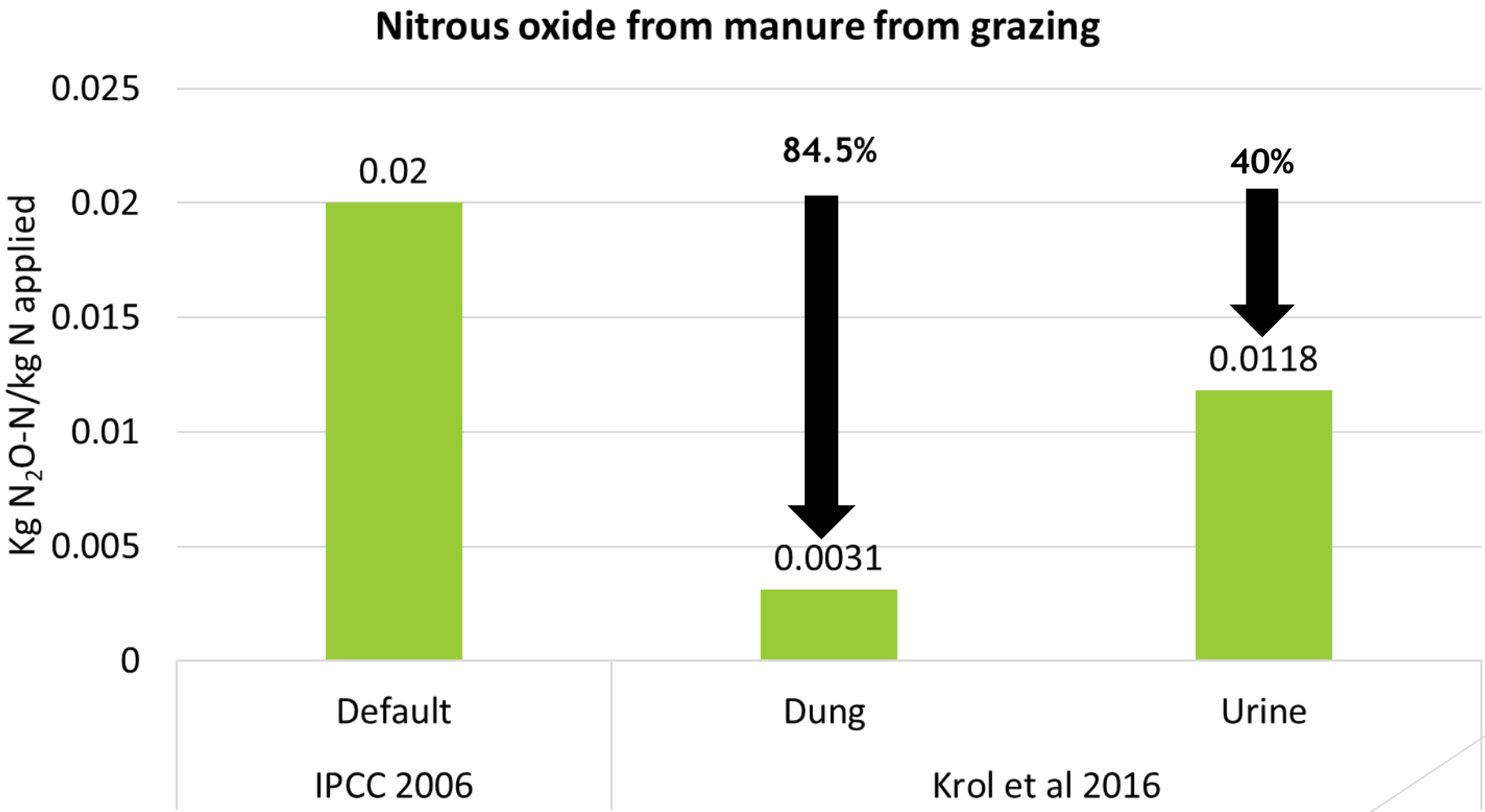
Change 1: Nitrous Oxide (Manure) Update



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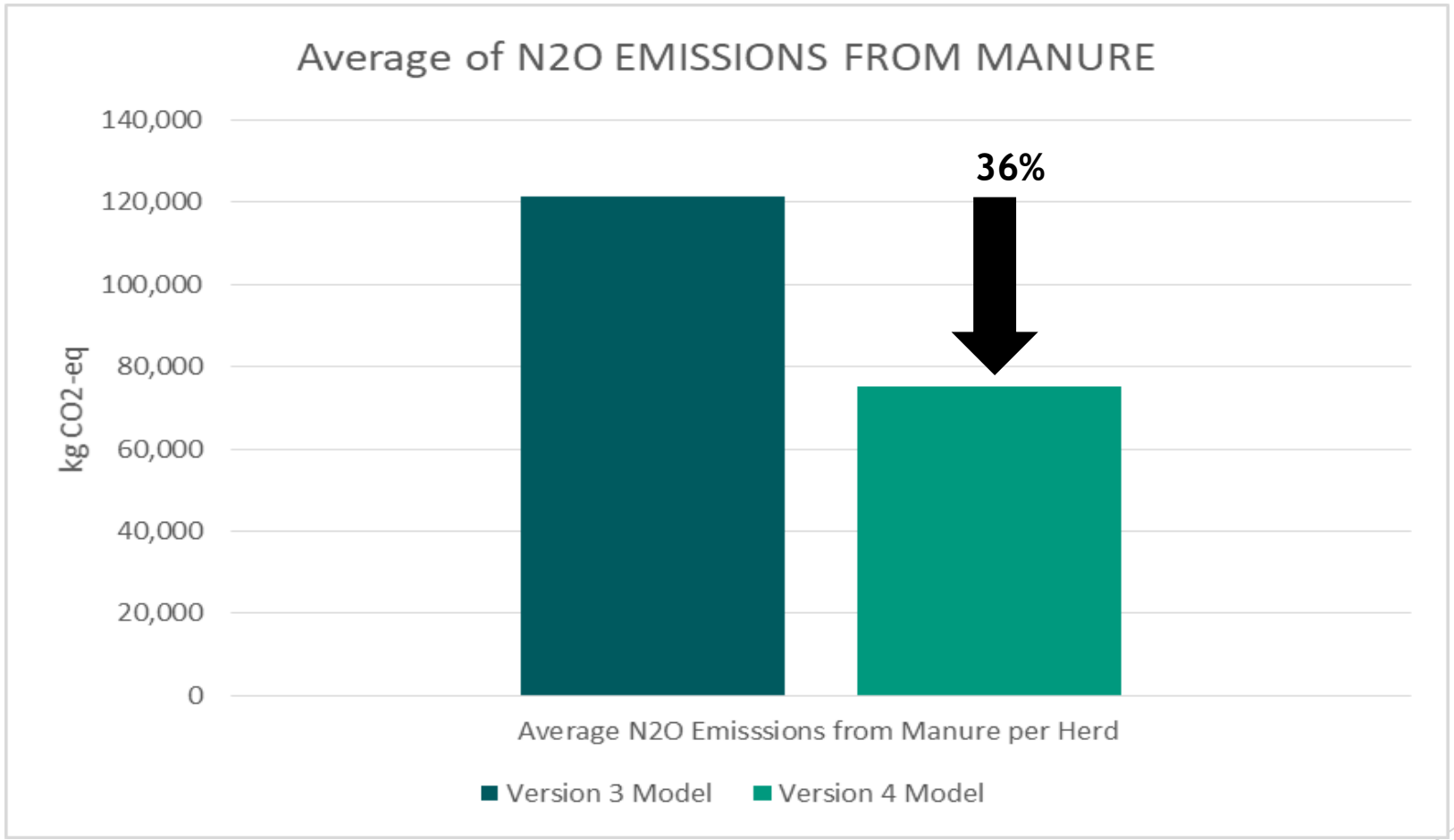
Nitrous Oxide (Manure) Update - IMPACT



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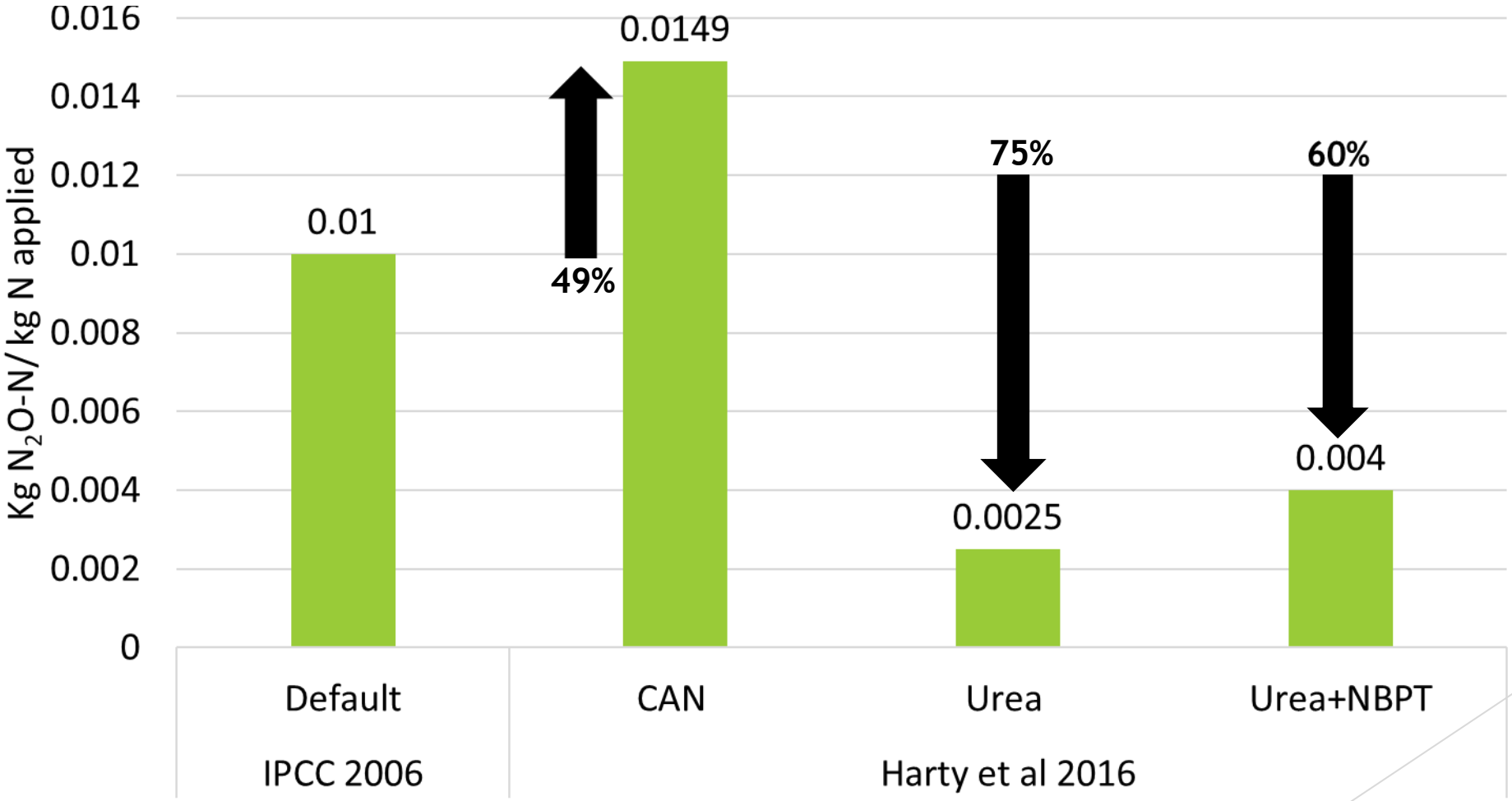
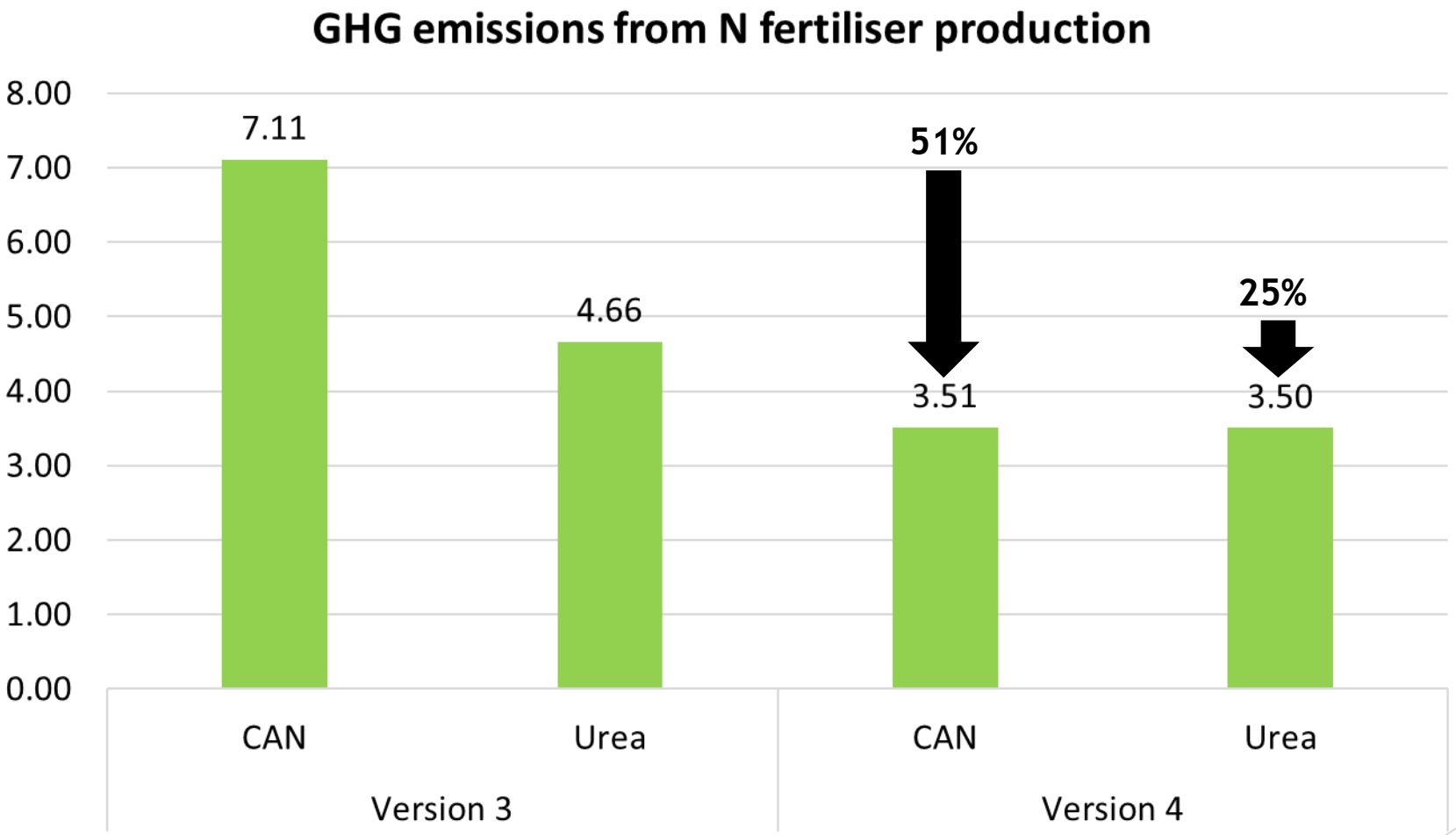
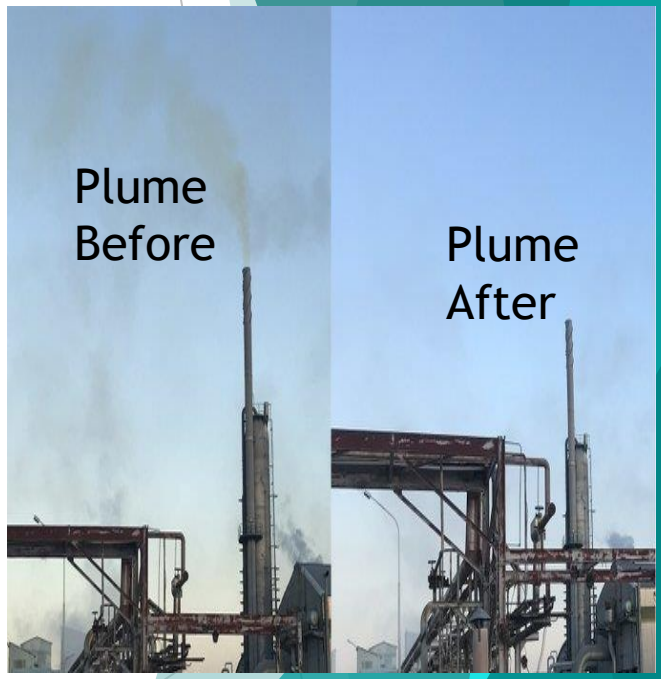
Change 2: Nitrous Oxide (Fertiliser Application) Update



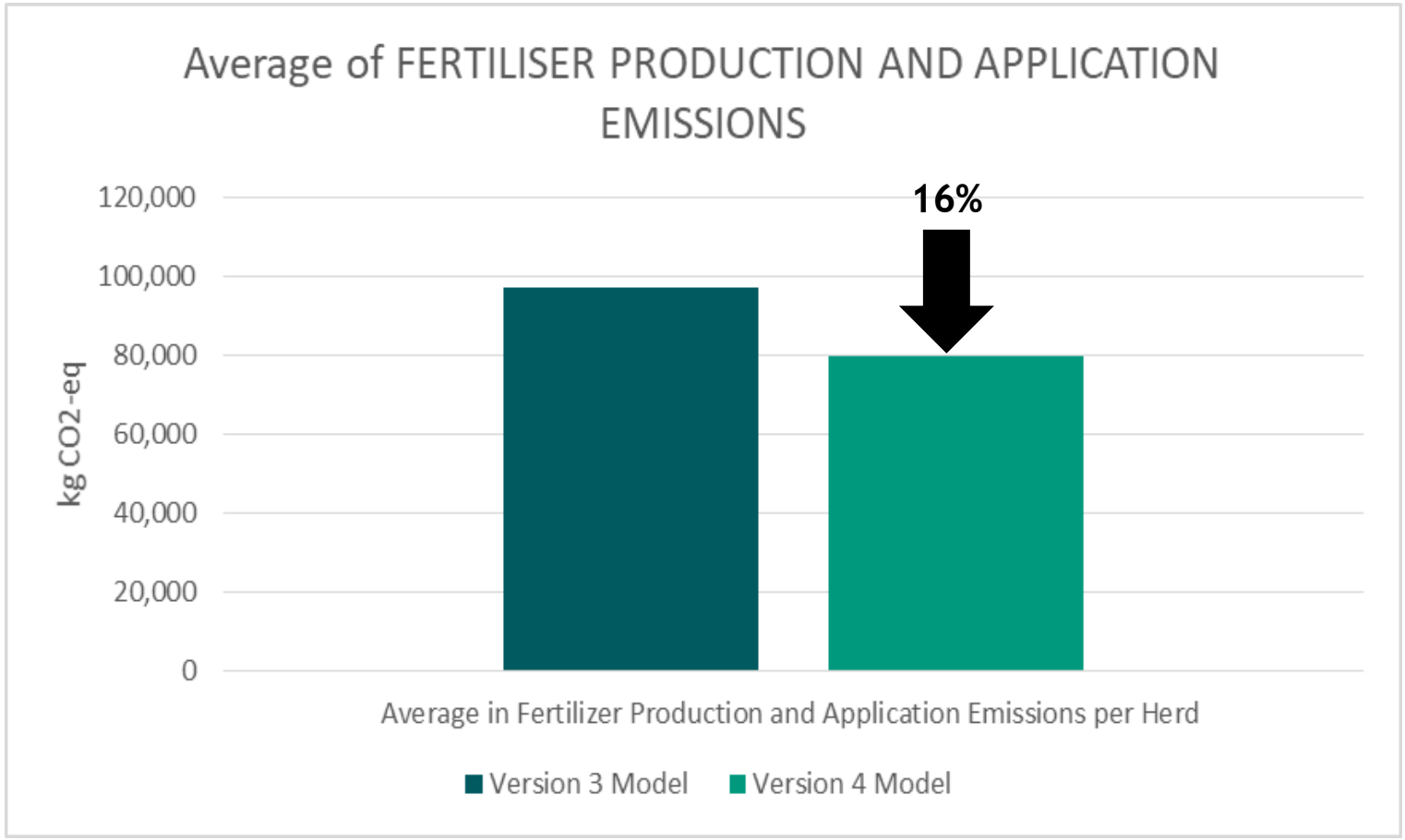
Change 3: Nitrous Oxide (Fertiliser Production) Update





Nitrous oxide abatement Catalyst

Nitrous Oxide (Fertiliser) - IMPACT



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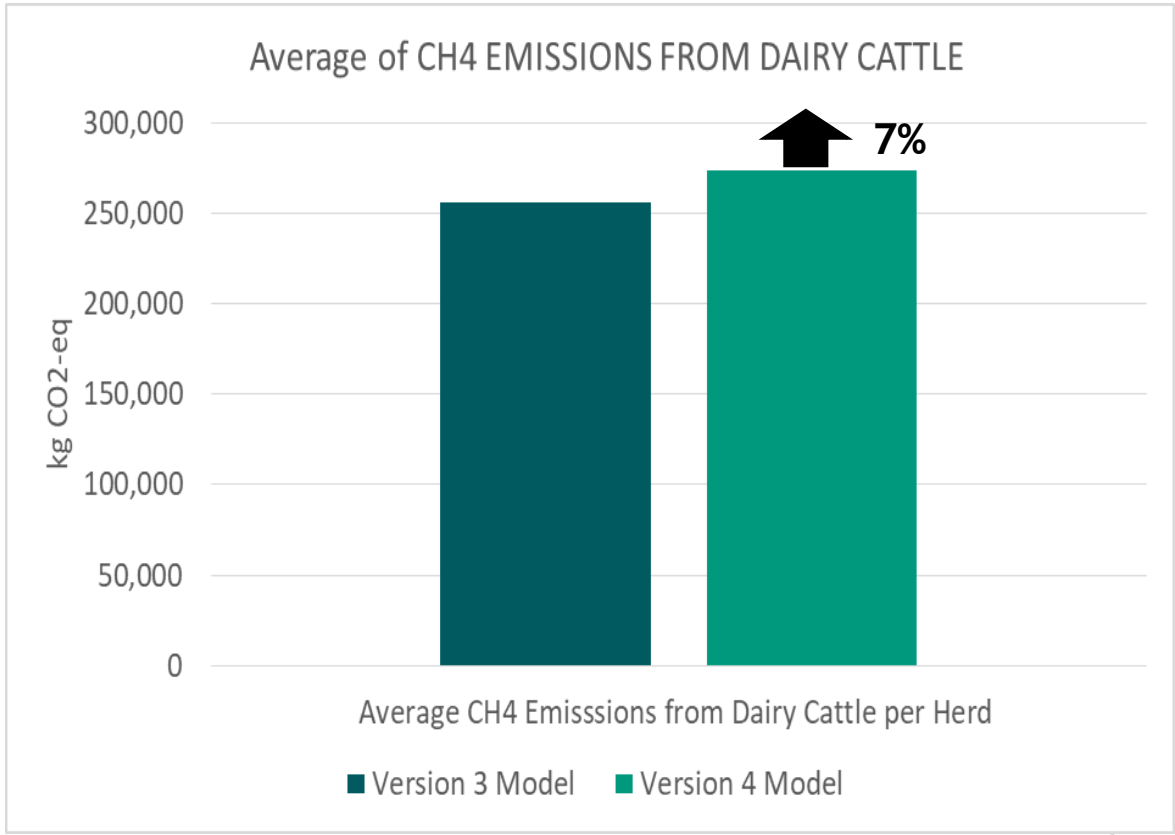
Change 4: Methane From Dairy Cattle

Methane from enteric fermentation

- Gross energy intake lost as CH_4 decreased
  - Version 3 = 6.5%
  - Version 4 = 6.3%
- Weight gain now considered
  - 35kg per lactation
- Average live weight of milking cow increased
  - 535 kg
- Heifer live weight at calving increased 90% of mature weight.



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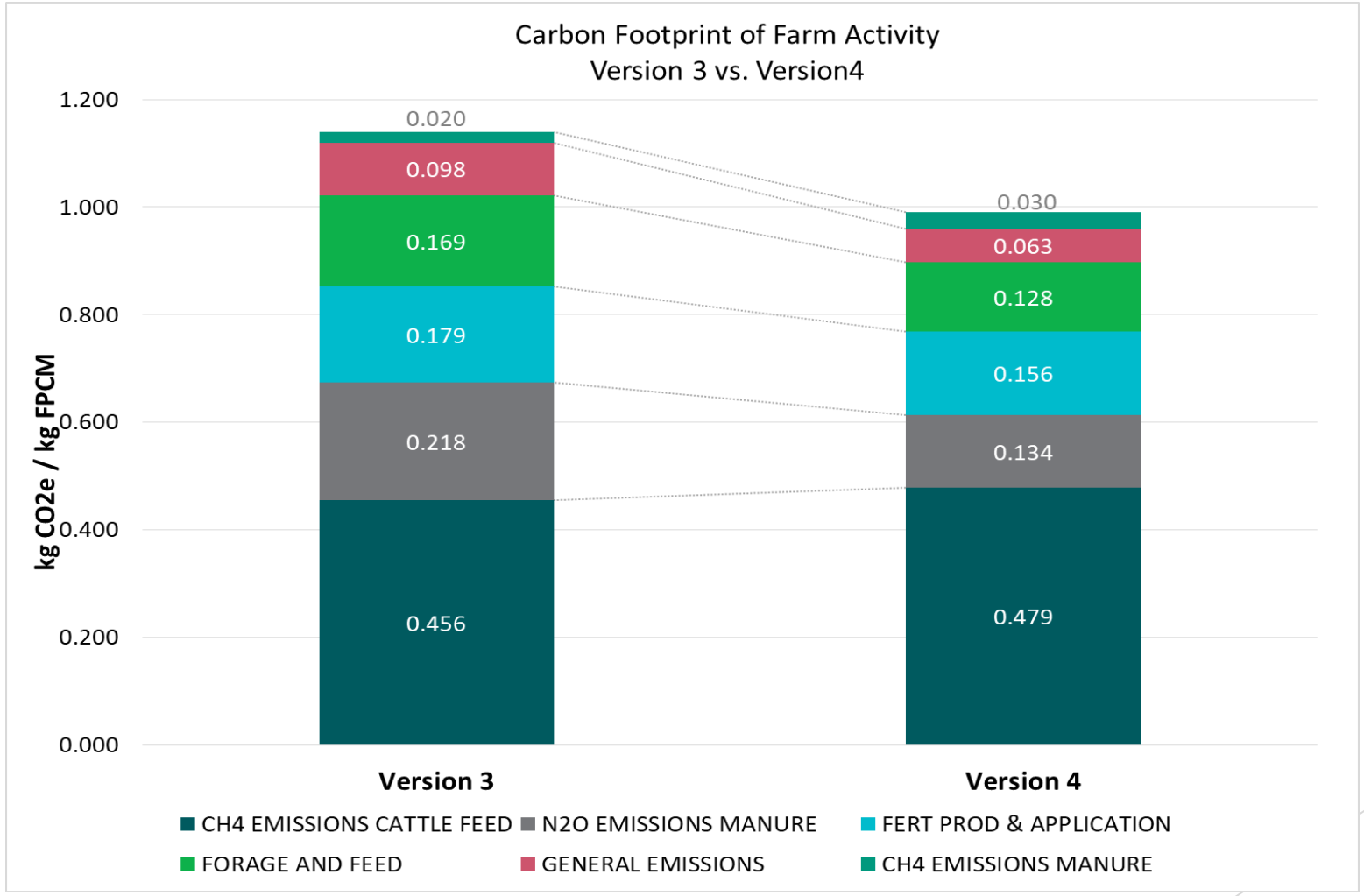
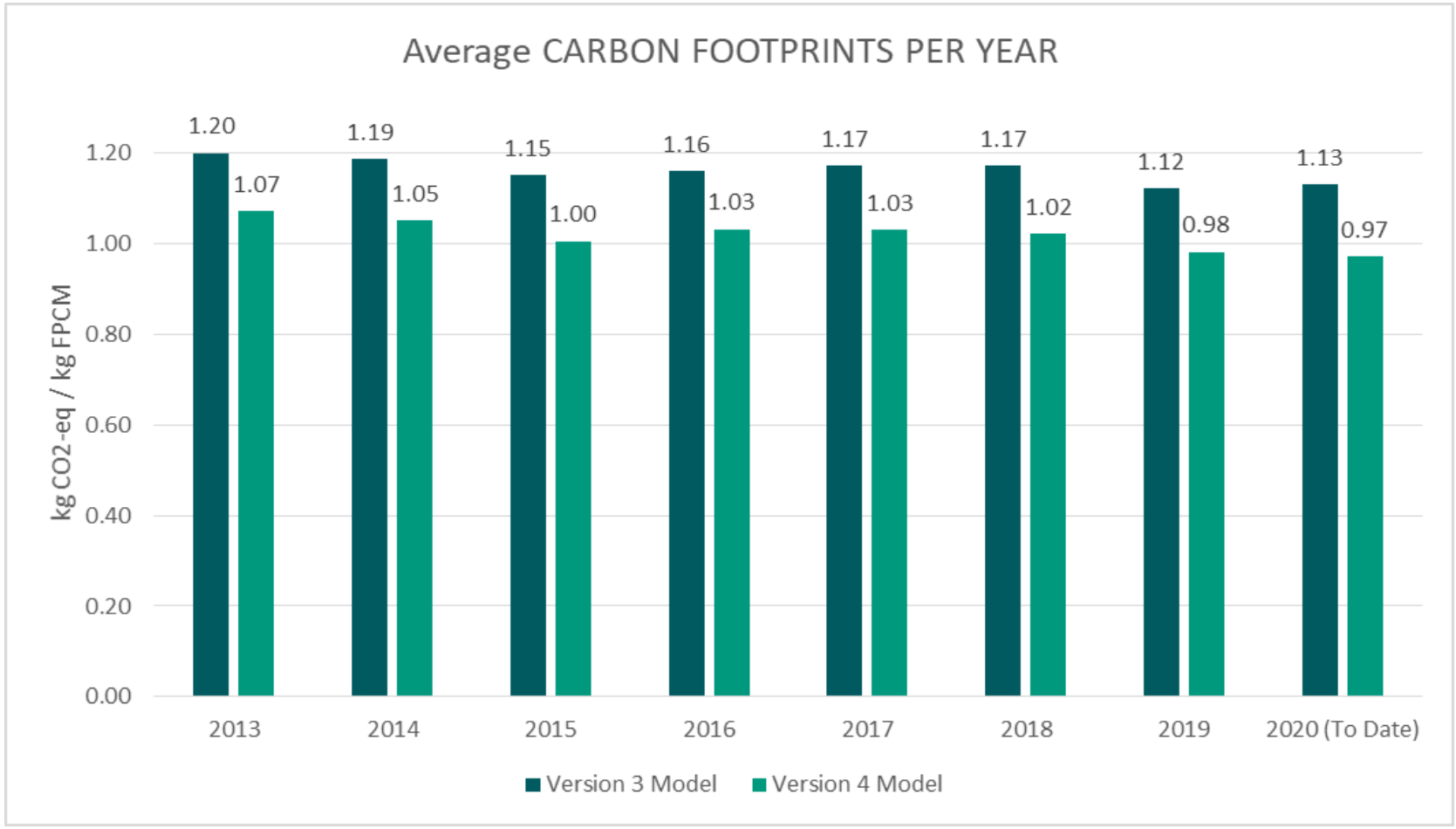
Carbon Footprint Farm Activity Influence -V3 to V4



SDAS Average Carbon Footprint Changes - V3 to V4



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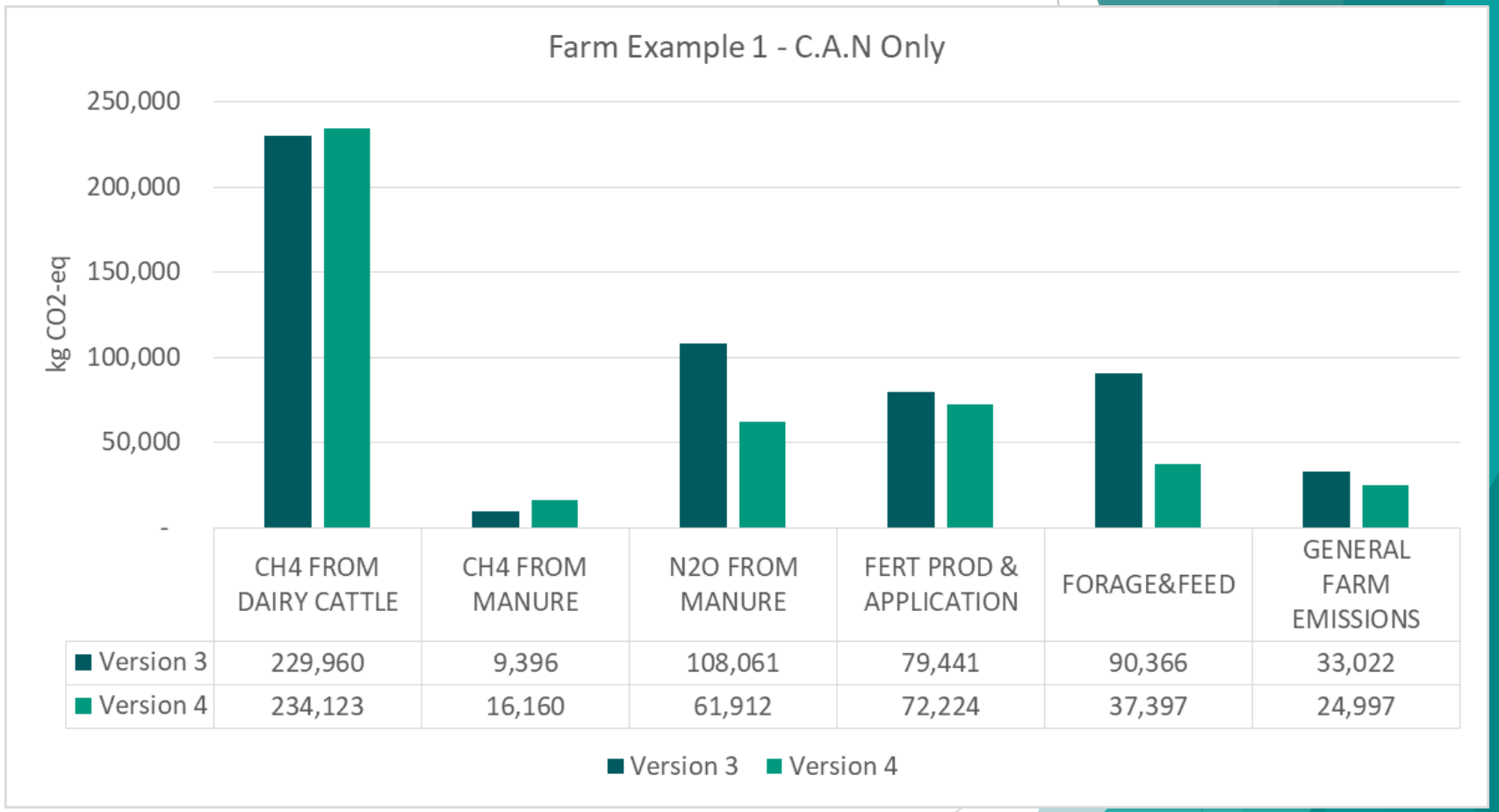
Herd Carbon Footprint Change
Example 1 – C.A.N only

- 72 Dairy Cows
- 7700 L/Cow
- Recorded C.A.N as the only form of fertiliser.
- 9% reduction in fertiliser emissions.

- V3 CF – 0.99 kg CO2 / kg FPCM
- V4 CF = 0.76 CO2 / kg FPCM



	CH4 FROM DAIRY CATTLE	CH4 FROM MANURE	N2O FROM MANURE	FERT PROD & APPLICATION	FORAGE&FEED	GENERAL FARM EMISSIONS
Version 3	229,960	9,396	108,061	79,441	90,366	33,022
Version 4	234,123	16,160	61,912	72,224	37,397	24,997

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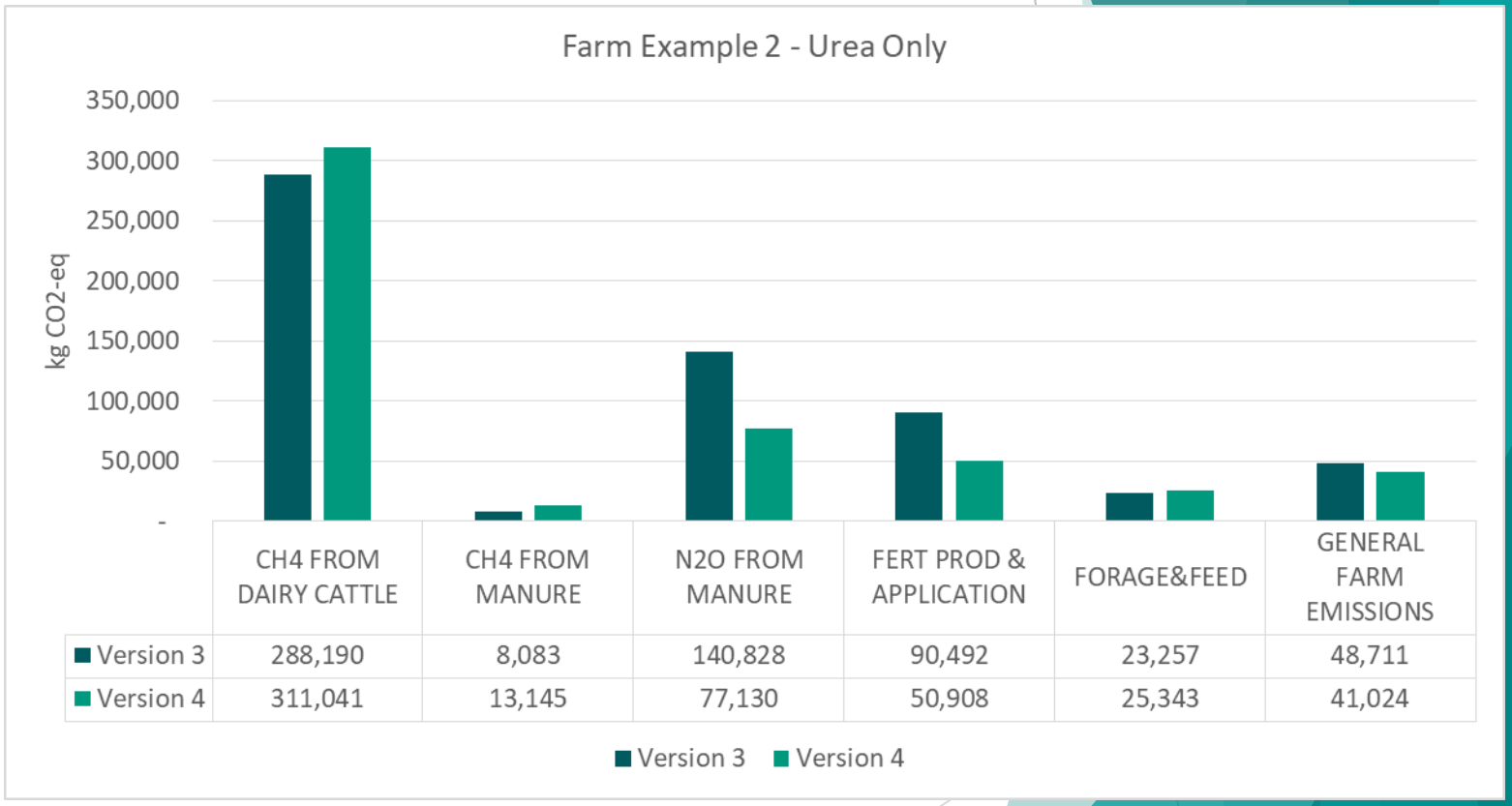
Herd Carbon Footprint Change
Example 2 – Urea only

- 111 Dairy Cows
- 6200 L/Cow
- Recorded Urea as the only form of fertiliser.
- 44% reduction in fertiliser emissions.

- V3 CF – 0.83 kg CO2 / kg FPCM
- V4 CF = 0.68 CO2 / kg FPCM



	CH4 FROM DAIRY CATTLE	CH4 FROM MANURE	N2O FROM MANURE	FERT PROD & APPLICATION	FORAGE&FEED	GENERAL FARM EMISSIONS
Version 3	288,190	8,083	140,828	90,492	23,257	48,711
Version 4	311,041	13,145	77,130	50,908	25,343	41,024

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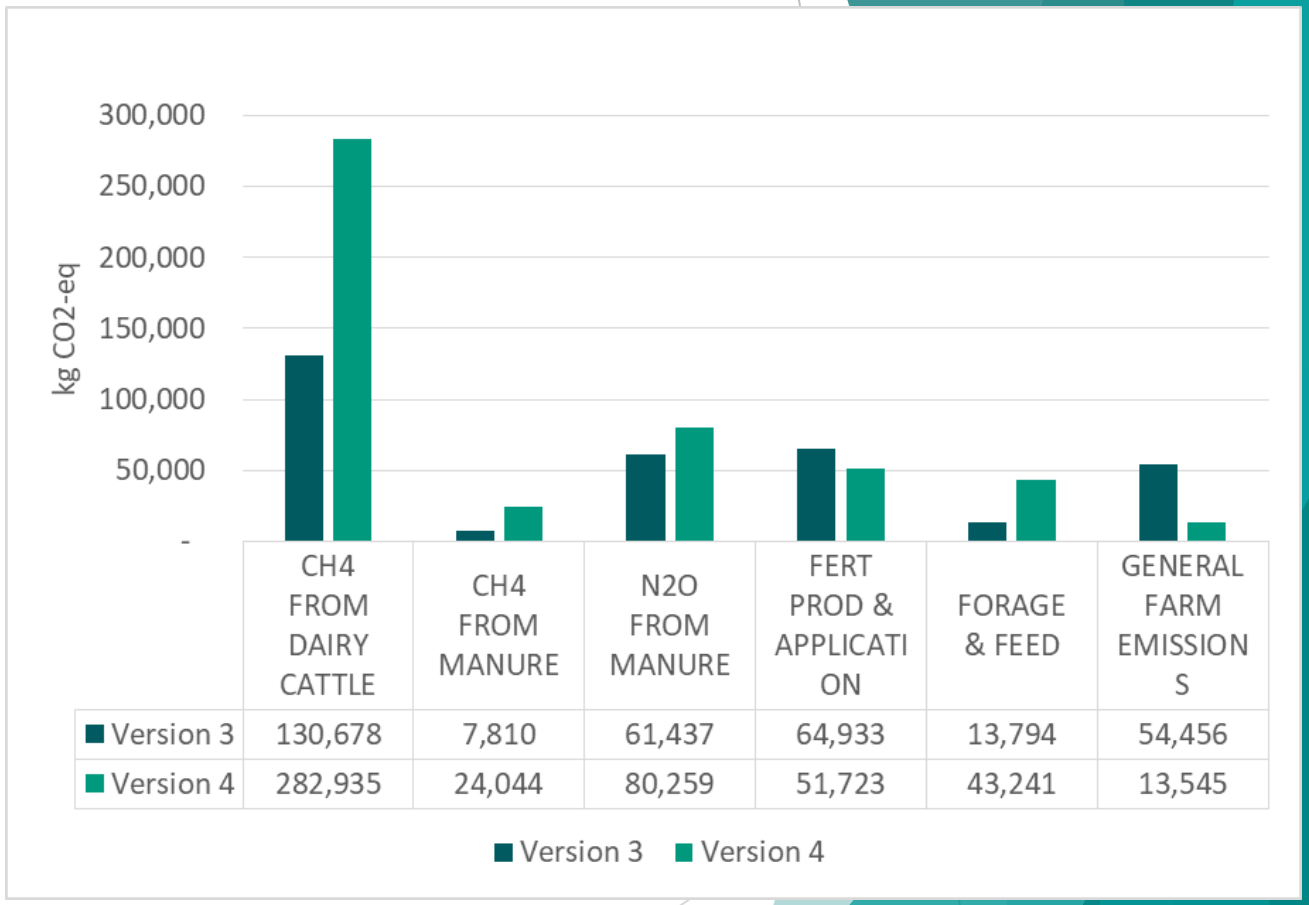
Herd Carbon Footprint Change Example 3 - Outlier

Metric	Version 3	Version 4
Carbon Footprint	0.79	1.84
AIMS Dairy Cow Count	19	44
AIM Data	Unusual animal movement activity not captured by assumptions in Version 3 Model.	No assumptions required.

- Increase in all animal related emissions due to more cows counted.
- Influence of high rates of purchases and sales results on final CF.



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EBI and Carbon Footprint

Co-Op Key Performance Indicators (KPI's) broken down by Herd EBI							
KPI Metric	No EBI	Bottom 20%	20-40%	40-60%	60-80%	Top 20%	Average
Average EBI	-	**€61**	**€102**	**€121**	**€139**	**€165**	**€118**
Number of Herds	1,141	2,936	2,936	2,937	2,937	2,937	**15,824**
Average Number of Dairy Cows	59	83	77	86	102	131	**93**
% Herds Milk Recording	9%	39%	35%	43%	60%	82%	**49%**
% Herds in HerdPlus	10%	34%	39%	50%	70%	90%	**53%**
Average Milk Litres per Cow	4,723	5,364	5,146	5,268	5,500	5,648	**5,337**
Average Butterfat %	4.04%	4.01%	4.10%	4.16%	4.22%	4.36%	**4.16%**
Average Protein %	3.46%	3.43%	3.49%	3.53%	3.57%	3.66%	**3.53%**
Average Kgs Milk Solids per Cow	365	410	402	416	441	466	**423**
Average SCC	227	206	203	192	174	149	**188**
Average Calving Interval (days)	398	407	394	389	382	374	**390**
Average Six-Week Calving Rate	62%	56%	61%	65%	70%	79%	**66%**
Average of Replacement Rate	13.5%	16.7%	16.4%	17.7%	19.0%	20.5%	**17.8%**
Average Parity	3.9	3.7	3.8	3.7	3.6	3.5	**3.7**
Kg CO2 / Kg FPCM	1.08	1.04	1.00	0.98	0.95	0.90	**0.98**

Accessing Updated Carbon Footprint Figures

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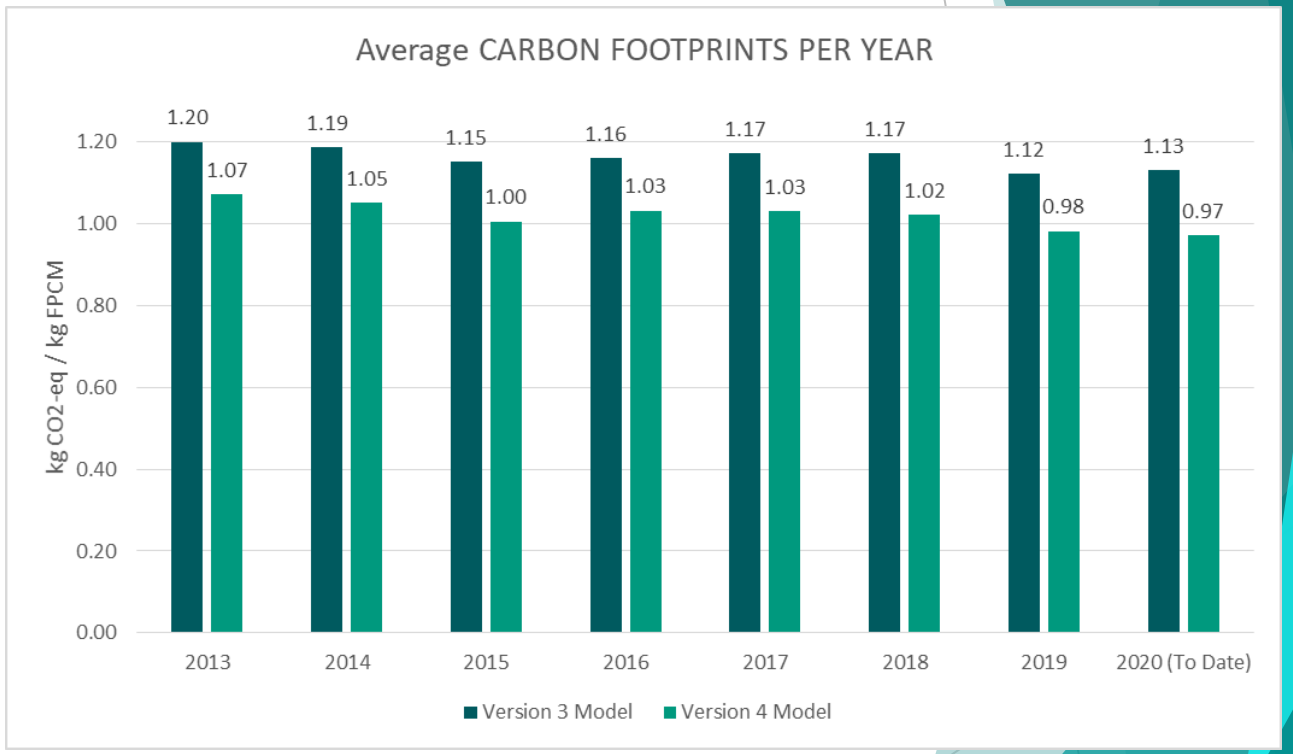
Retrospective Calculations

- All carbon footprint calculations for all audits to be re run.
- New values will be stored on the Bord Bia Quality Assurance Database.
- Will be used to populate future reporting for individual farms and full cohort of SDAS membership.
- V3 results will be archived for comparison exercises if needed



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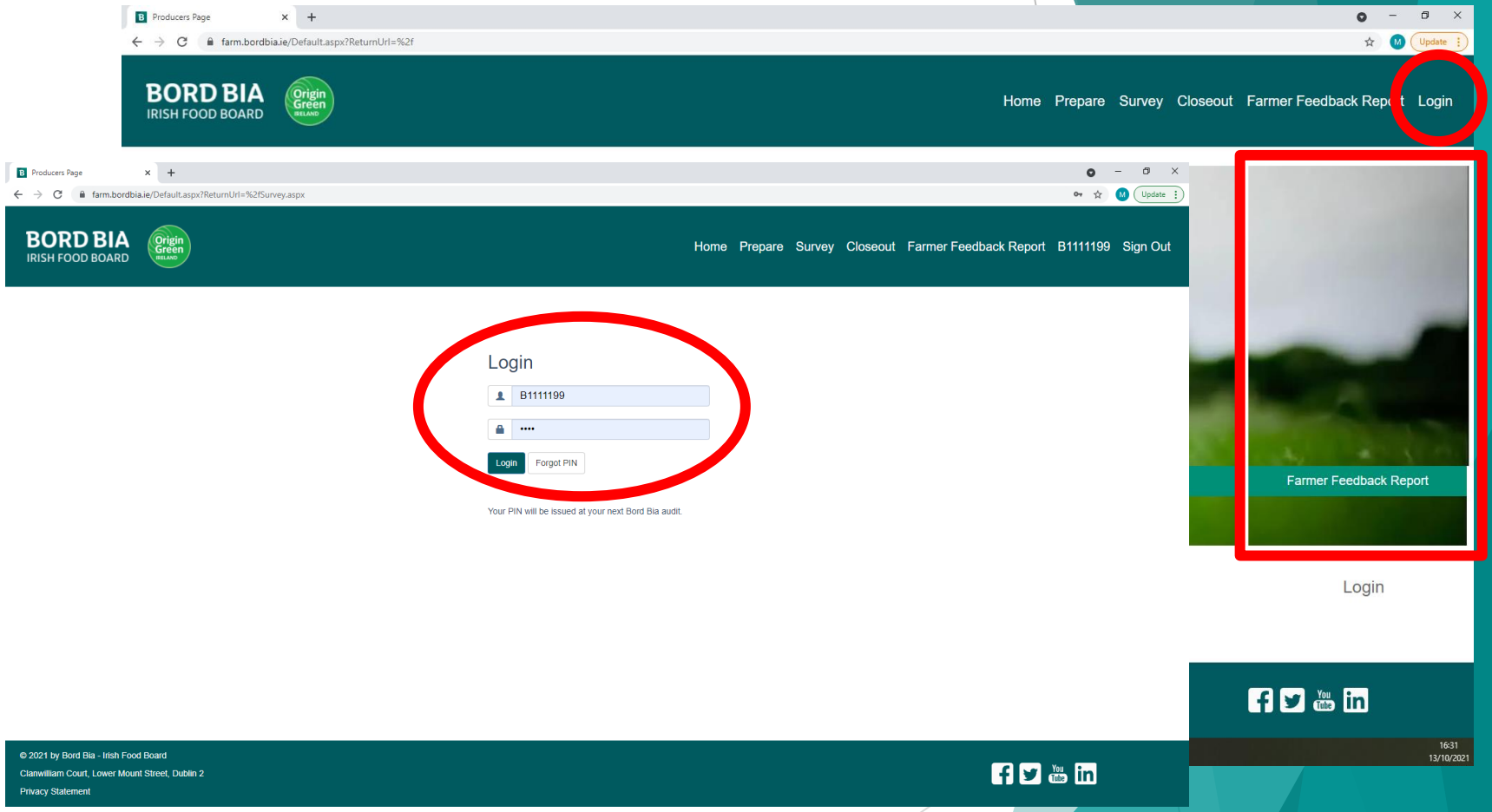
Farmer Access to Updated Carbon Footprint

https://farm.bordbia.ie

Username = Herd Number
PIN = 4 Character Code

Forgot PIN function recently added

Click on Farmer Feedback Report section



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Co-Op Access to Updated Carbon Footprints

Co-Op Reports

- Pending Applications
- Pending Audit
- Pending Remote Audit (next 10 days)
- Batch Herd Look Up
- Cancelled Audits
- Carbon Footprint
- Carbon Footprint - Average Annual
- Completed Audits
- Expired / Suspended Producers
- Pre-Assessment Audits
- BLQAS Postponed for Dairy
- Herd History
- Certified Producers
- Co-Op Summary
- Missing Milk Data
- Opted in to Grass Fed Records
- SDAS Renewal Audits
- Audits in Review Process
- Checklist Score Analysis
- Grass Fed Status
- Herd 3 Year Figures

- Reports available through Co-Op interface with Bord Bia Database.
- Carbon Footprint =Includes carbon footprint for each audit of each supplier.
- Carbon Footprint – Average Annual = Average carbon footprint of suppliers audited in an audit year.
- Certified Producers = Access suppliers Farmer Feedback Report

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Opportunities for Continued Evolution of the Carbon Footprinitng Process

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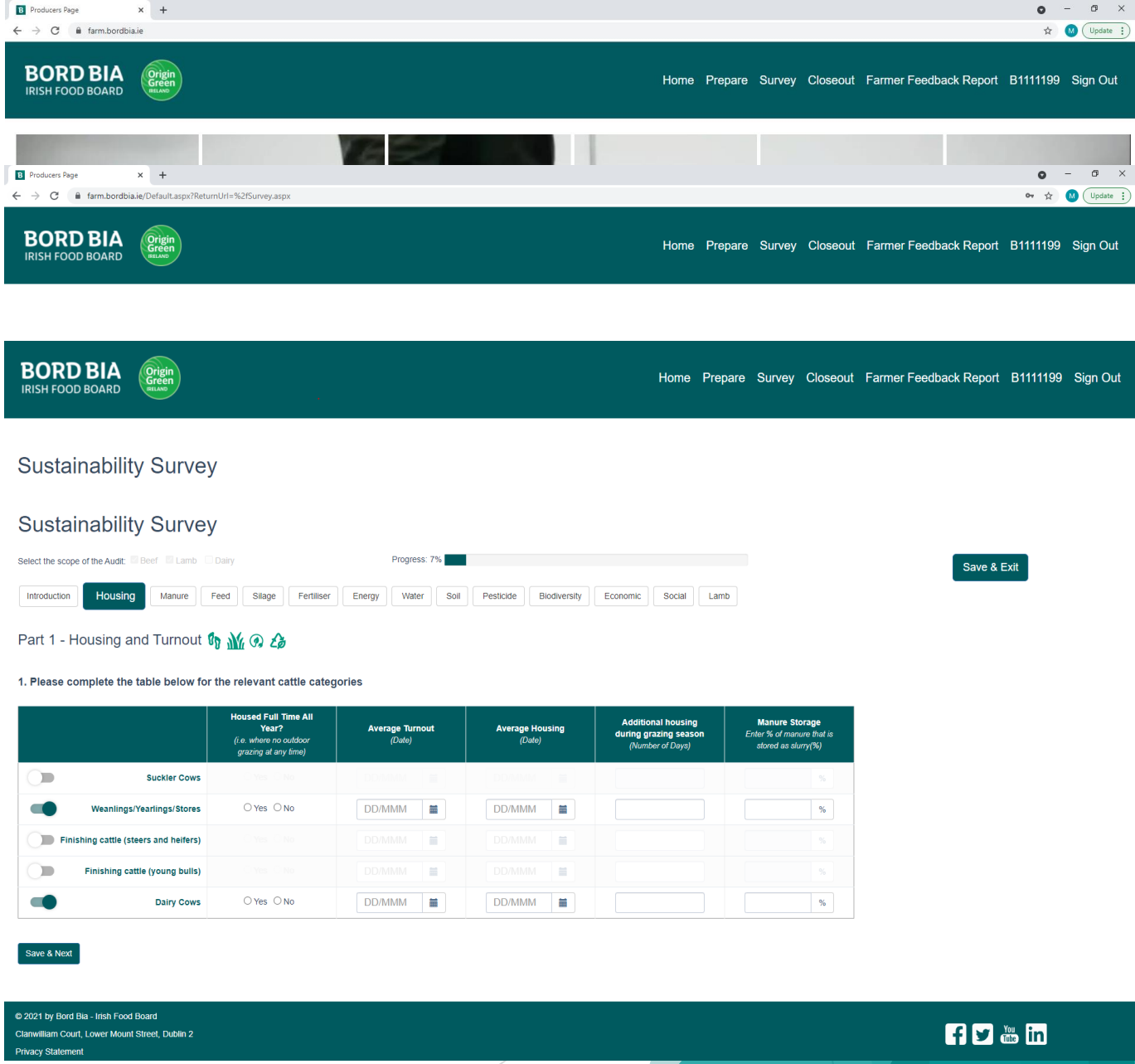
Sustainability Survey

- Survey to be open to all farmers to complete on an annual basis.
- Will enable more up to date reporting of carbon footprint and GHG emissions for SDAS members.
- Allow farmers see impact of adoption of mitigation actions quickly.
- Allow farmers more accurately track carbon footprint and GHG emission trends.



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Support for Annual Carbon Footprint Calculation

- Opportunity for Co-Ops to promote annual updating of farm activity data.
- Annual completion of Sustainability Survey in Jan/Feb will enable this.
- Promote to famers participating in Joint Programmes and other Co-Op farm initiatives.
- Highlight to interested suppliers through Co-Op communication channels.
- If completed, data will not need to be collected as part of SDAS audit.
- Can be completed on Bord Bia farmer portal by farmer or with assistance from Helpdesk.

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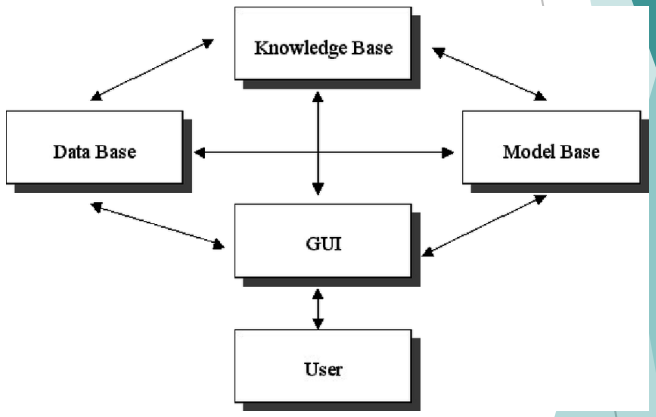
Future Developments

Data

Develop linkages with other databases:

- Pasture Base
- Feed Merchants
- Fertiliser merchants



Model

- Country specific emission factors
- Carbon sequestration
- Annual review/update
- Development of decision support tool

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Support for Links to Merchant Databases

- Potential to pilot use of merchant feed and fertiliser data with consent of the farmer to increase accuracy of inputs further.
- Would support annual carbon footprint calculations.
- Support the development of a long term solution
  - Improving accuracy
  - Removing burden from farmer
- All feed and fertiliser inputs would need to be accounted for.
- Pilot with farms and Co-Ops in a closed loop system.

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Thank you for
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