

# ClieNFarms

## codeveloping low GHG systems

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NESTLE-UK&I-UNIVLEEDS



CRA-W



Danone



NESTLE-UA



**Pedoclimatic regions**

- Mediterranean
- Continental
- Mountain
- Oceanic

**Production systems**

- Dairy
- Monogastrics
- Arable crops
- Specialised culture
- Beef
- Sheep

TEAGASC



WR



ACTA-EDF



IBNA



AGACAL



AgResearch



NUTRIFARMS



NESTLE-CH



JLU



UCSC



New Zealand



**AIM** To co-develop and upscale locally relevant solutions for climate neutral/C zero sustainable farms.

# Proposed SDRF farmlets

<p style="text-align: center;"><b>Wintering</b></p> <p><b>Intensity</b></p>	<p style="text-align: center;"><b>Crop-based (fodder beet)</b></p>	<p style="text-align: center;"><b>Grass-based (silage/baleage)</b></p>
<p><b>Standard (SI)</b>                      N fert ~180 kg N/ha                      3 cows/ha                      Standard per cow production</p>	<p><b><u>SI crop wintering</u></b>                      Cows outdoors year-round                      On crop during winter</p> <p style="text-align: right;">87 ha</p>	<p><b><u>SI housed wintering</u></b>                      Cows indoors in winter (2 months)                      Fed grass silage</p> <p style="text-align: right;">78 ha</p>
<p><b>Lower (LI)</b>                      N fert ~60 kg N/ha                      2.5 cows/ha                      Higher per cow production</p>	<p><b><u>LI crop wintering</u></b>                      Cows outdoors year-round                      On crop during winter</p> <p style="text-align: right;">61 ha</p>	<p><b><u>LI baleage wintering</u></b>                      Cows outdoors year-round                      On pasture and baleage in winter</p> <p style="text-align: right;">61 ha</p>

# On-farm emissions and C footprint

**FARM****MAX**

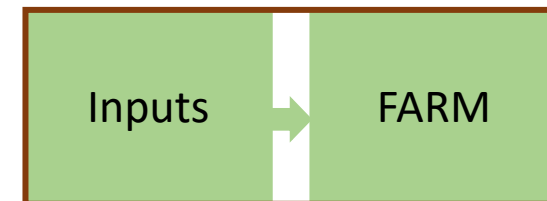
<https://www.farmax.co.nz/>



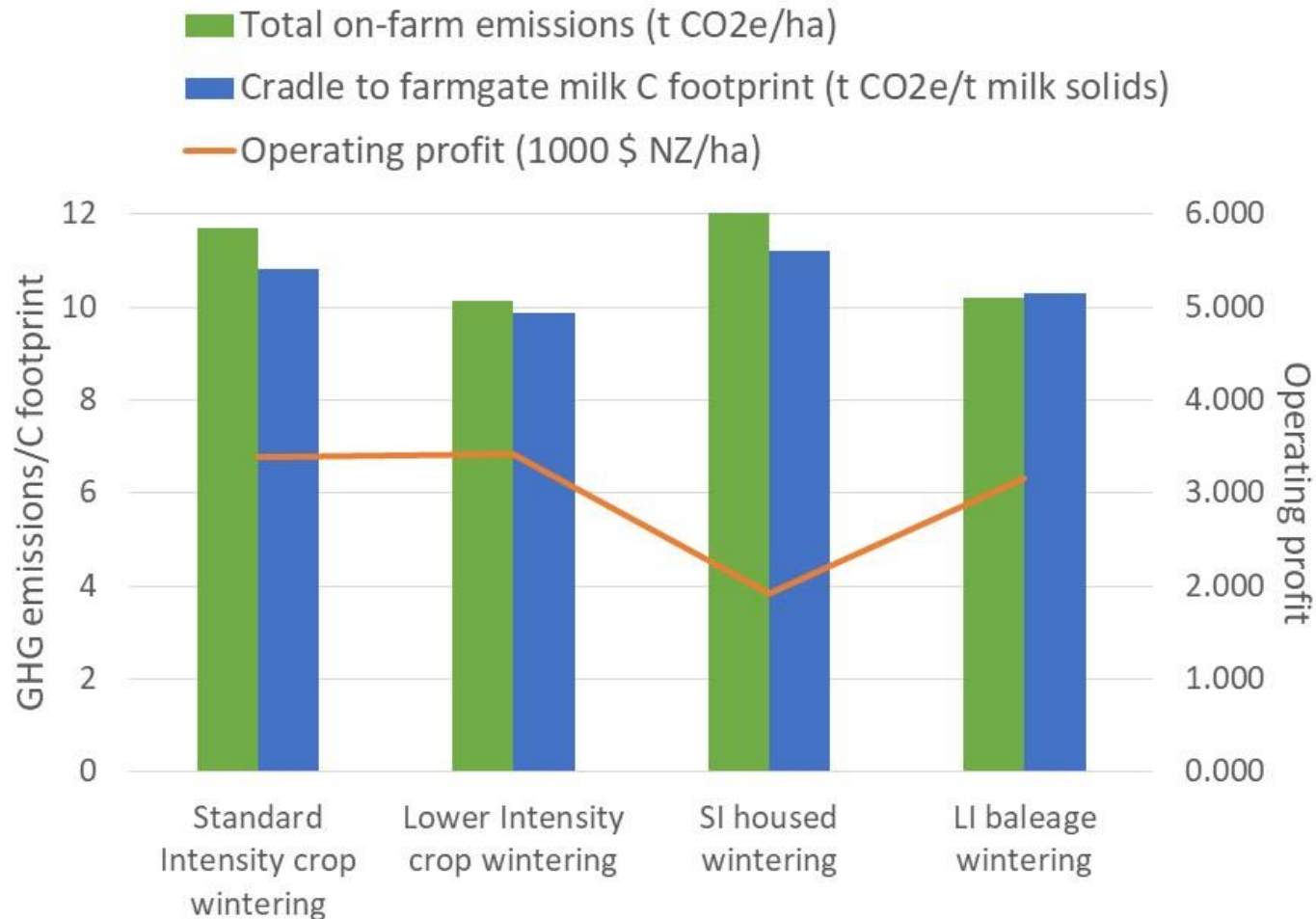
Cowculator

# What GHGs are counted in on-farm emissions and in milk carbon footprint?

- On-farm emissions – within farm boundary
  - Methane from enteric and manure emissions
  - Nitrous oxide from urine, dung, manure and fertiliser
  - Carbon dioxide from urea fertiliser
- Milk carbon footprint – cradle to farm gate
  - As above, plus:
  - On-farm fuel and electricity use
  - Pre-farm: production and transport of farm inputs (feed, fertiliser, lime and pesticide)



# On-farm GHG emissions and C footprints



## **Lower intensity**

- 13% reduction in GHG emissions
- 8% reduction in C footprint

## **Wintering system**

- No effect on GHG  
(but will affect water quality)

Operating profits similar, except for housed system due to repayment of capital investment for barn

# Modelling scenarios for each farmlet for 2030

**Animal genetics that is likely in 2030**

*For all farmlets*

*Only for standard input farmlets*

**1.** At **reduced** stock #s compared with 2023, but same total MS

-4%  
+6%  
+15%

GHG  
profit  
profit+GHG credits

0%  
+16%  
+20%

**2.** At **same** stock #s compared with 2023, thus increase total MS

+

+

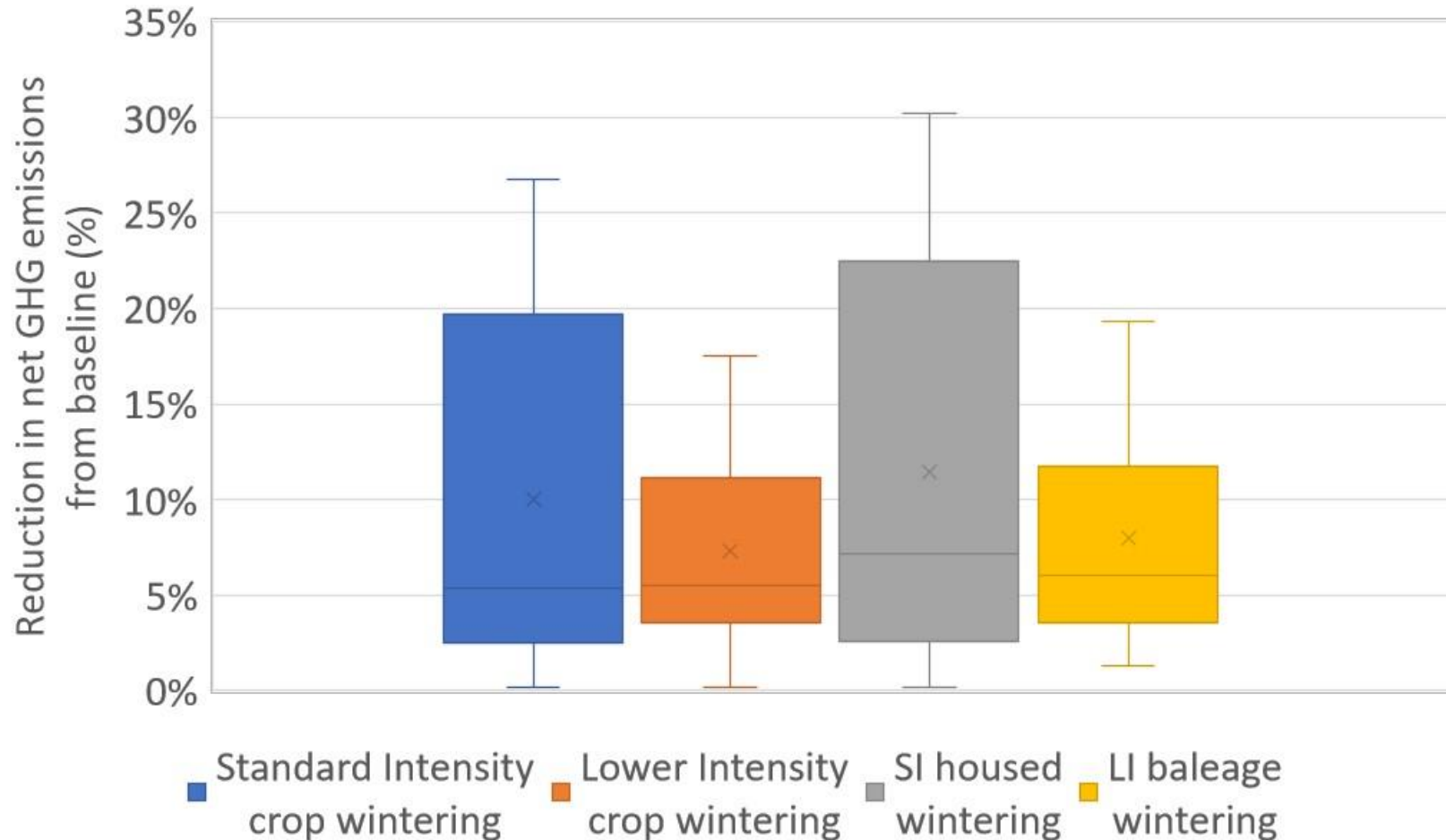
- 3.** Alternative feed (PKE replaced by barley grain)
- 4.** In-setting trees for C sequestration (on 4% area)
- 5.** Cash crop (Hops or Crop rotation on 4% area)
- 6.** No N fertiliser use (stock #s adjusted)

Individually, or in various combinations of 2, 3 or 4 options

- 3.** Alternative feed (PKE replaced by barley grain)
- 4.** In-setting trees for C sequestration (on 1% area)
- ~~**5.** Cash crop (Hops or Crop rotation)~~
- 6.** No N fertiliser use (stock #s adjusted)

Individually, or in various combinations of 2 or 3 options

# On-farm GHG reductions scenarios

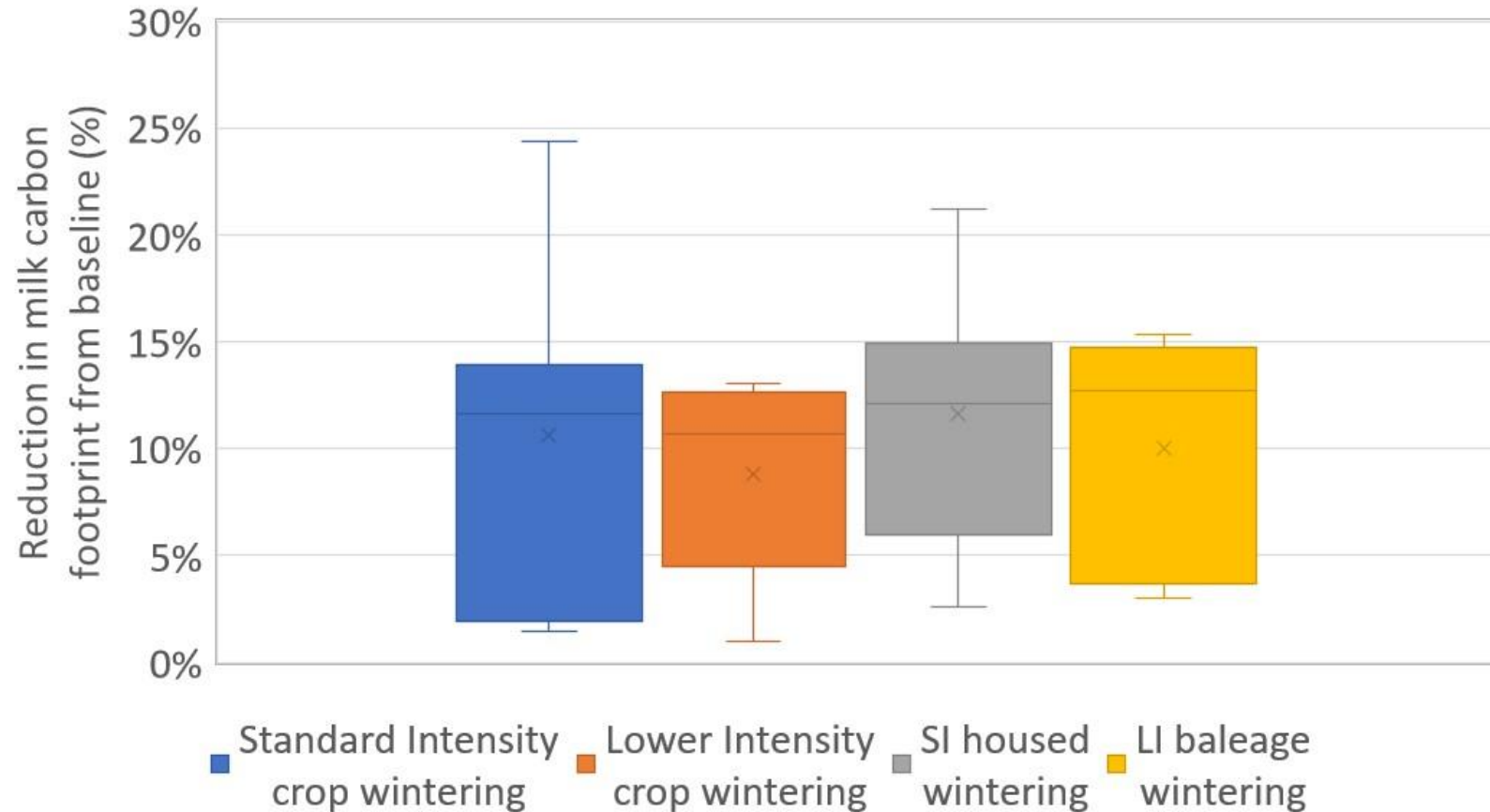


GHG reduction potentials larger for Standard Intensity farmlets (up to 35%).

Emission reductions:  
No N fertiliser > Trees > Cash crop > Replace PKE with barley



# C-footprint reductions scenarios

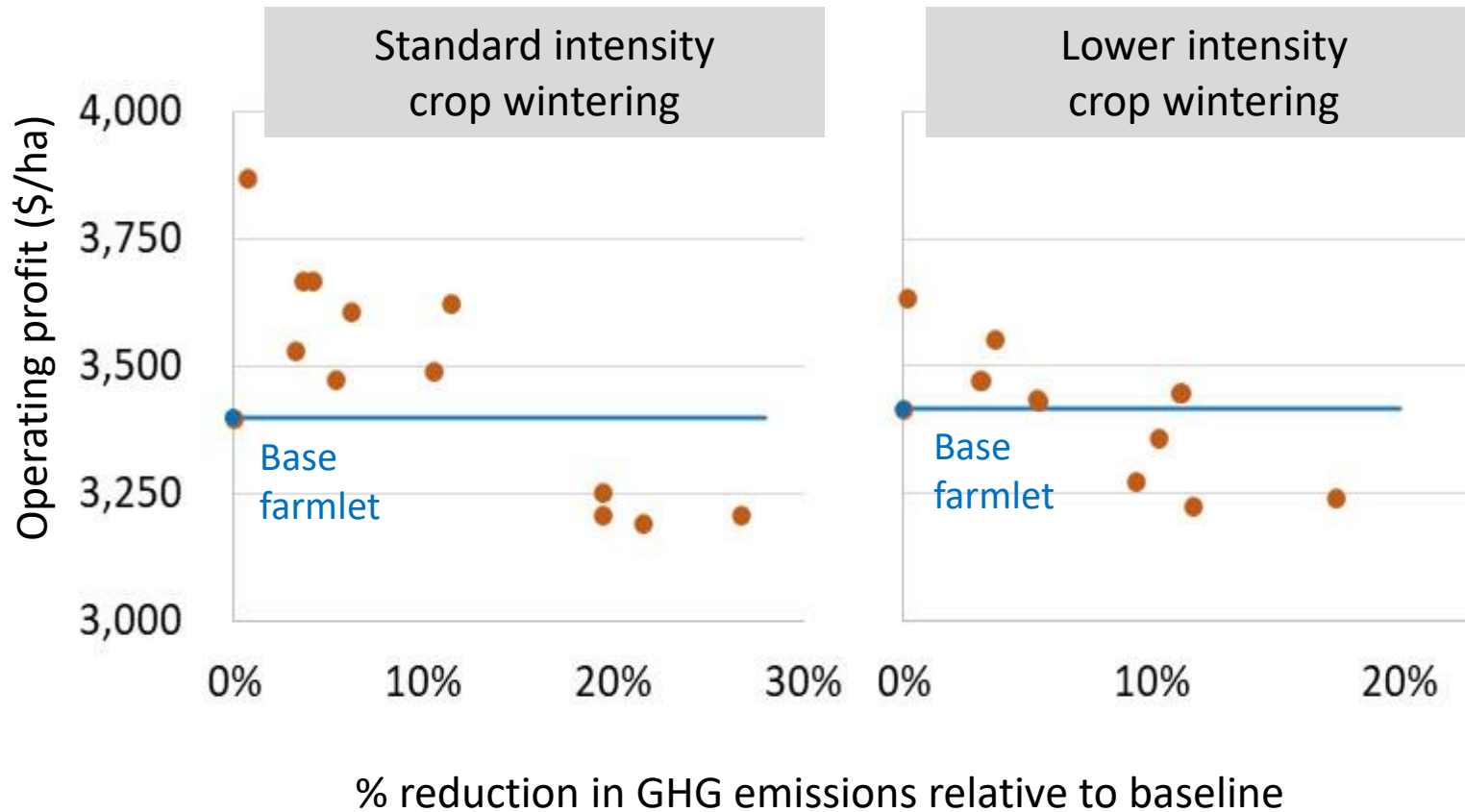


GHG reduction potentials larger for Standard Intensity farmlets (up to 25%).

Emission reductions:  
Replace PKE with local barley  
> No N fertiliser > Trees > Cash crop

*Note: C sequestration of trees is not (yet) included*

# On-farm GHG reductions vs Operating profit

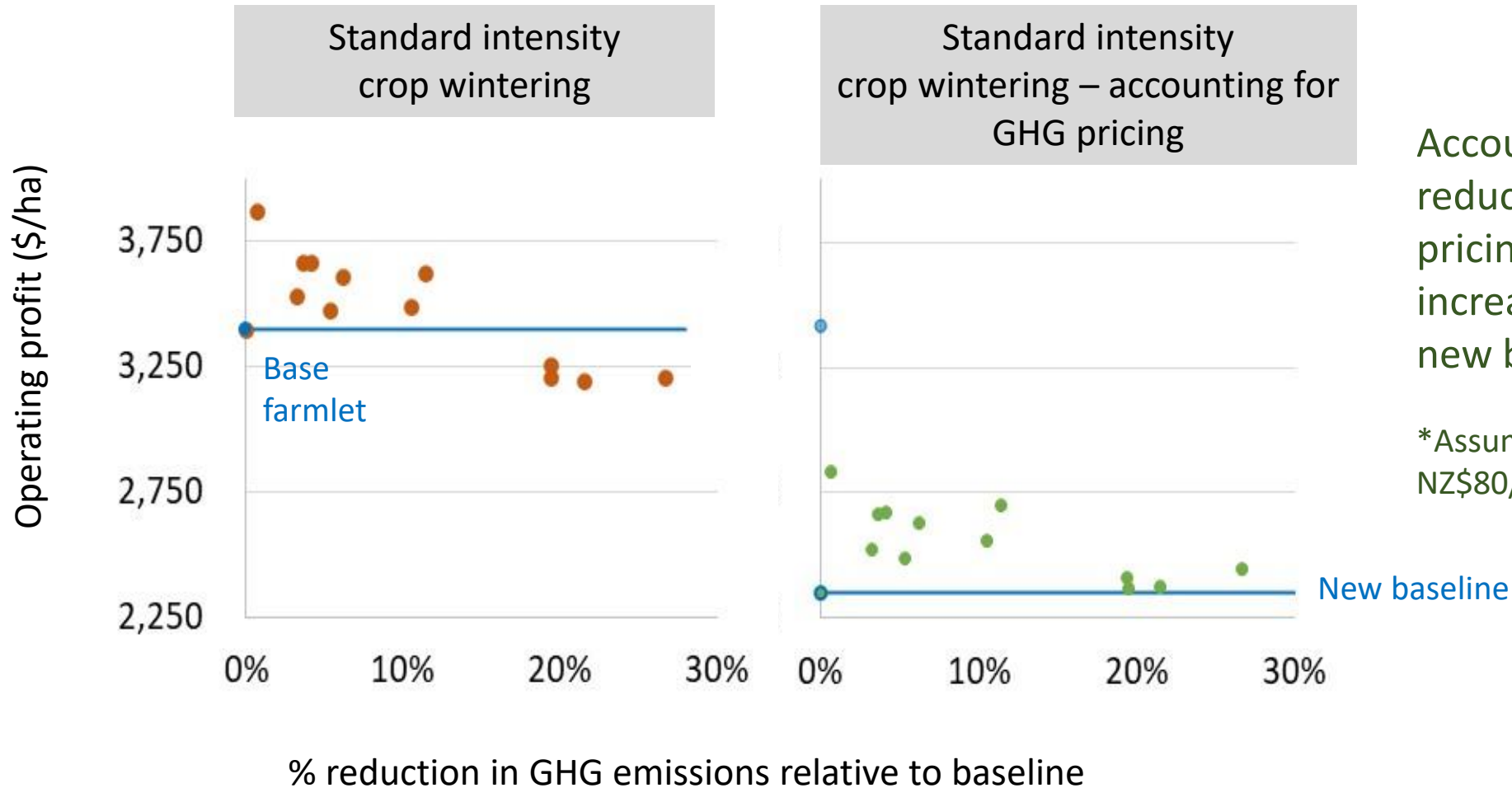


Generally, trade-off between GHG reduction and profit, but all still profitable.

Worst impact on profit was 'No N fertiliser' scenario.

*Note: scenarios with hops not included*

# On-farm GHG reductions vs Operating profit when accounting for reduction in GHGs



Accounting for GHG reduction under a possible pricing mechanism -> increased profits relative to new baseline.

\*Assumes a carbon price of NZ\$80/tCO<sub>2</sub>e

## Take home messages

- With current options 30% less GHG emissions possible for standard intensity systems  
‘No N fertiliser’ had largest reduction, especially when combined with ‘In-setting trees’
- 20% lower milk carbon footprint possible for standard intensity systems  
‘Replacing PKE with barley grain’ had largest reduction, especially when combined with ‘No N fertiliser’
- All scenarios were profitable, but profitability tended to decline with reducing GHG emissions
- Focus on efficiency of milk production will provide resilience for achieving both on-farm GHG emission and milk C footprint targets



# Acknowledgements

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