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NEW ZEALAND AGRI-BUSINESS ADVISORS

“Carbon Neutral Project” – The Farmers

King Country River Care

6/17/2024

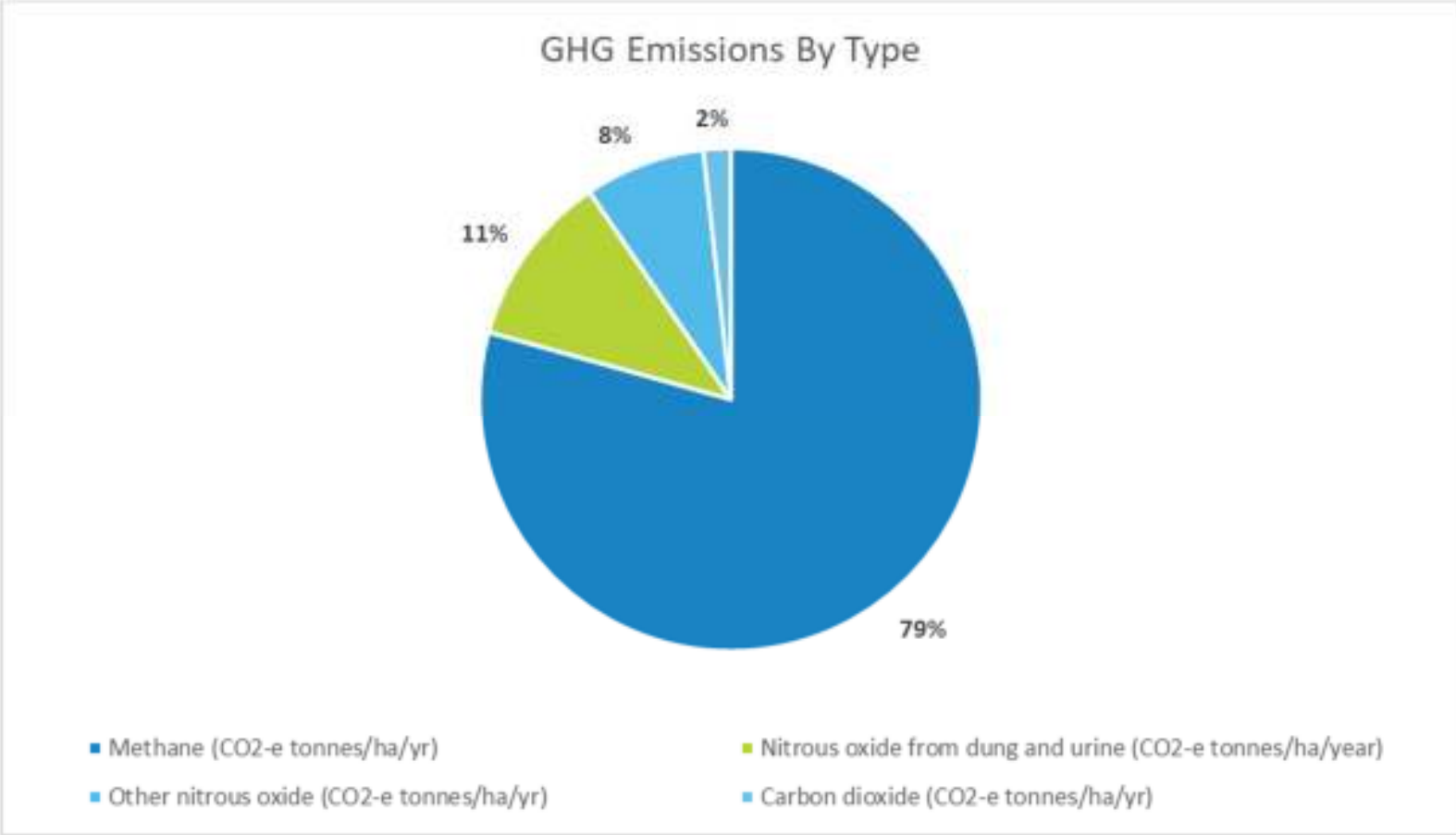
Watkins “Base” system

- Related to what Phil has described with key points being:
  - 360 ha self contained dairy operation.
  - Another 60 ha in the property – including over 42 ha of this at various stages of retirement and other vegetation.
  - 640 cows/R2 heifers (2.4/ha on milking platform) and 160 R1 heifers.
  - 206,600 kg MS.
  - 74 kg N/ha.
  - 478 kgDM/cow of maize silage – 24% bought in – fed on feed pad.
  - 50 ha pasture silage.
  - Already quite an OAD milking component.
- Farmax farm operating (EBITRD) profitability of $780,000.
- Sequestration (tonnes CO_2) from:
  - None from 18.2 ha of older bush;
  - 6.6 ha of retired and planted at 6.8 tonnes CO_2/ha/year
  - None from 17 ha of retired riparian areas
  - Total of 44.9 tonnes CO_2 sequested per year.

The base system - emissions

Emissions Summary			
	Methane (CO_2-e tonnes/ha/yr)	5.23	"Average dairy farm emitting **9.6** tonnes CO_2/ha/yr".
	Nitrous oxide (CO_2-e tonnes/ha/yr)	1.25	
	Carbon dioxide (CO_2-e tonnes/ha/yr)	0.12	
	Total GHG emissions (CO2-e tonnes/ha/yr) - Scope 1 and Scope 2 only	**6.60**	
Emissions from livestock			
	Methane	79%	
	Nitrous oxide from dung and urine	59%	
	Proportion of GHG emissions from livestock	90%	
Other contaminants			
	Nitrogen loss (kg/total ha)	38.8	
	Phosphorous loss (kg/total ha)	2.11	
Intensity			
	Total long-lived gas (Scope 1 and Scope 2) emissions (excluding biogenic methane) per kg of milk solids produced (kg CO_2-e/kgMS)	2.78	
	Total Methane (Scope 1 and Scope 2) emissions per kg of milk solids produced (kg CH_4/kgMS)	0.43	
	Nitrogen loss per kg of milk solids produced (kg nitrogen/kgMS)	0.08	

The base system - emissions



The scenarios – summary table of differences

Scenario Differences	Base	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Milking area	265 ha	263 ha	255 ha	255 ha	244 ha
Runoff area	95 ha	95 ha	95 ha	89 ha	117 ha
Planted area - natives	6.6 ha	8.6 ha	8.6 ha	8.6 ha	6.6 ha
Planted area - Douglas-fir	0.0 ha	0.0 ha	4.0 ha	7.0 ha	0.0 ha
Planted area - "pines"	0.0 ha	0.0 ha	4.0 ha	7.0 ha	0.0 ha
Cows	640	640	640	620	595
Yearlings	160	160	160	155	195
Cows/milking ha	2.41	2.43	2.51	2.43	2.44
kg N/ha	74 kg	79 kg	79 kg	74 kg	53 kg
Maize silage/cow	478 kg	478 kg	584 kg	494 kg	393 kg
Milk production - kg MS	206,784	206,779	206,745	200,718	192,779
Milk production - kg MS/cow	323	323	323	324	324

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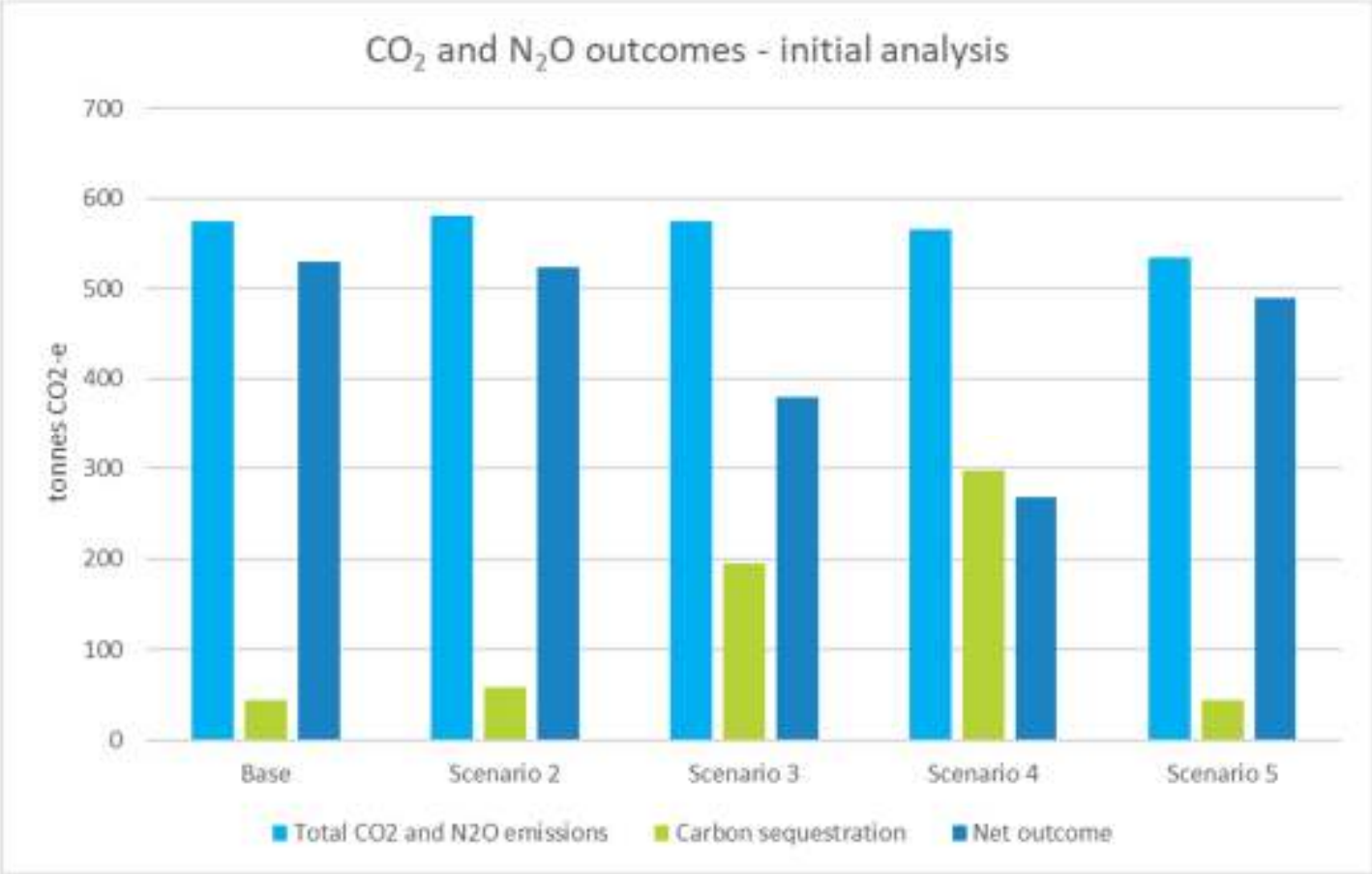
Changes to CO_2 and N_2O



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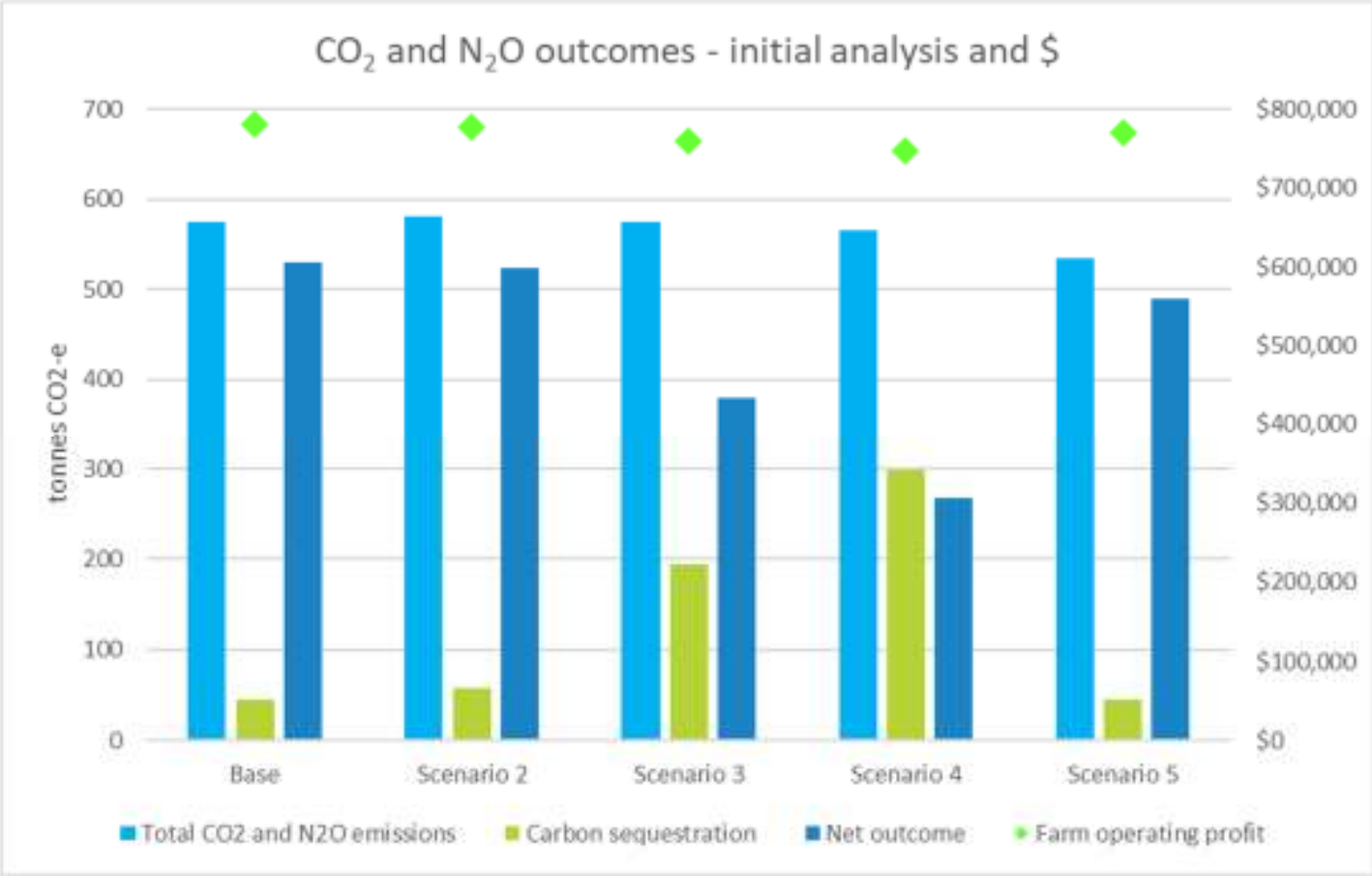
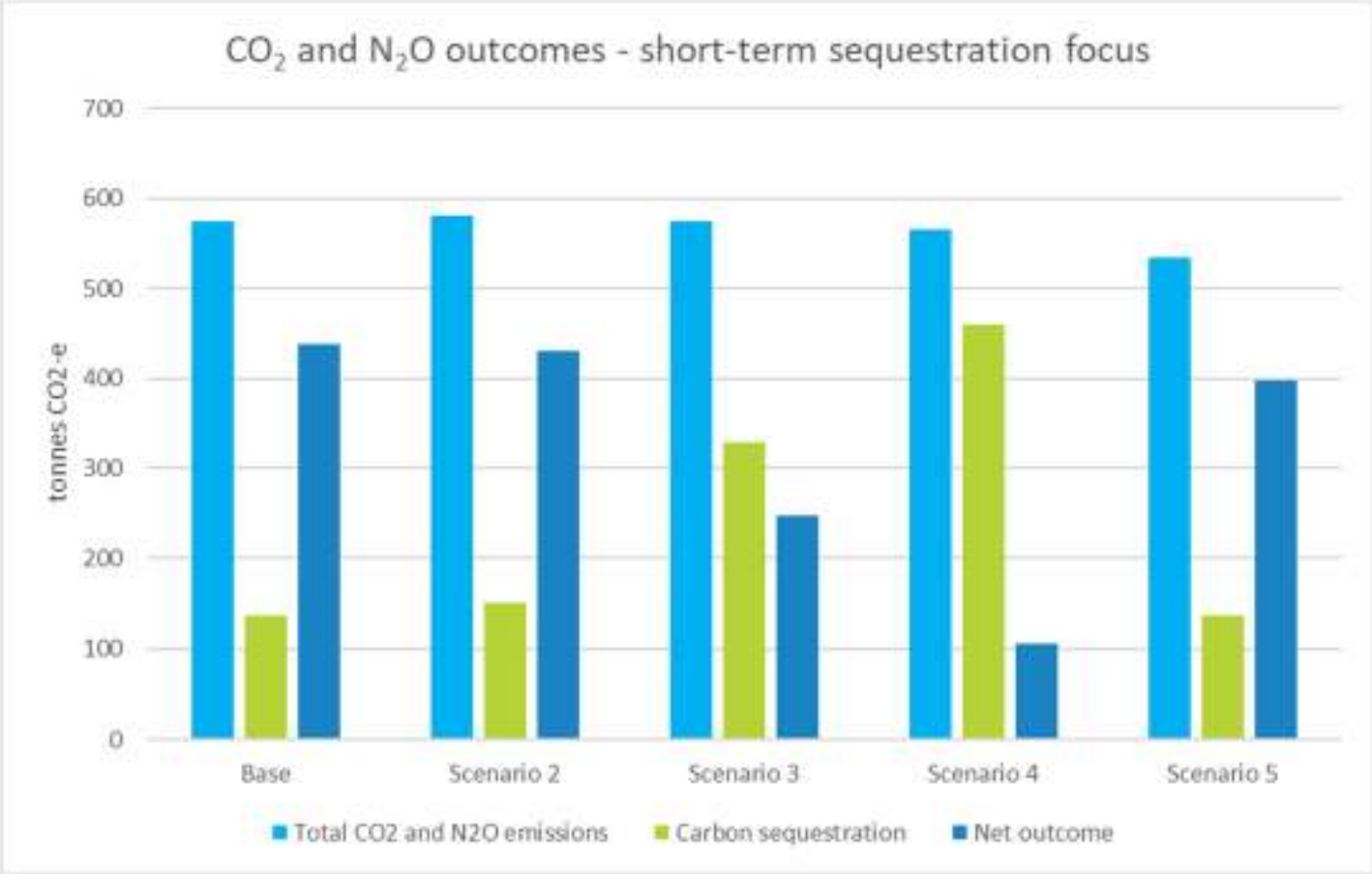


Changes to CO_2 and N_2O

- No net-zero carbon dioxide and nitrous oxide emissions outcomes (under the project parameters).
- Other “short-term” options:
  - More farm system changes?
  - Will the mature bush be able to count for some sequestration?
  - Changes to the existing planting options:
    - After next 2 ha of native planting then next groups of planting being chosen for high sequestration planting – “pine trees”; and
    - Riparian areas currently assumed at zero sequestration – move to native planting, and indigenous forest sequestration rates over 80% of the area.
- Or - take a longer-term view and consider indigenous forest sequestration rates at year 25 [2050] of the existing planting plan.

Changes to CO_2 and N_2O



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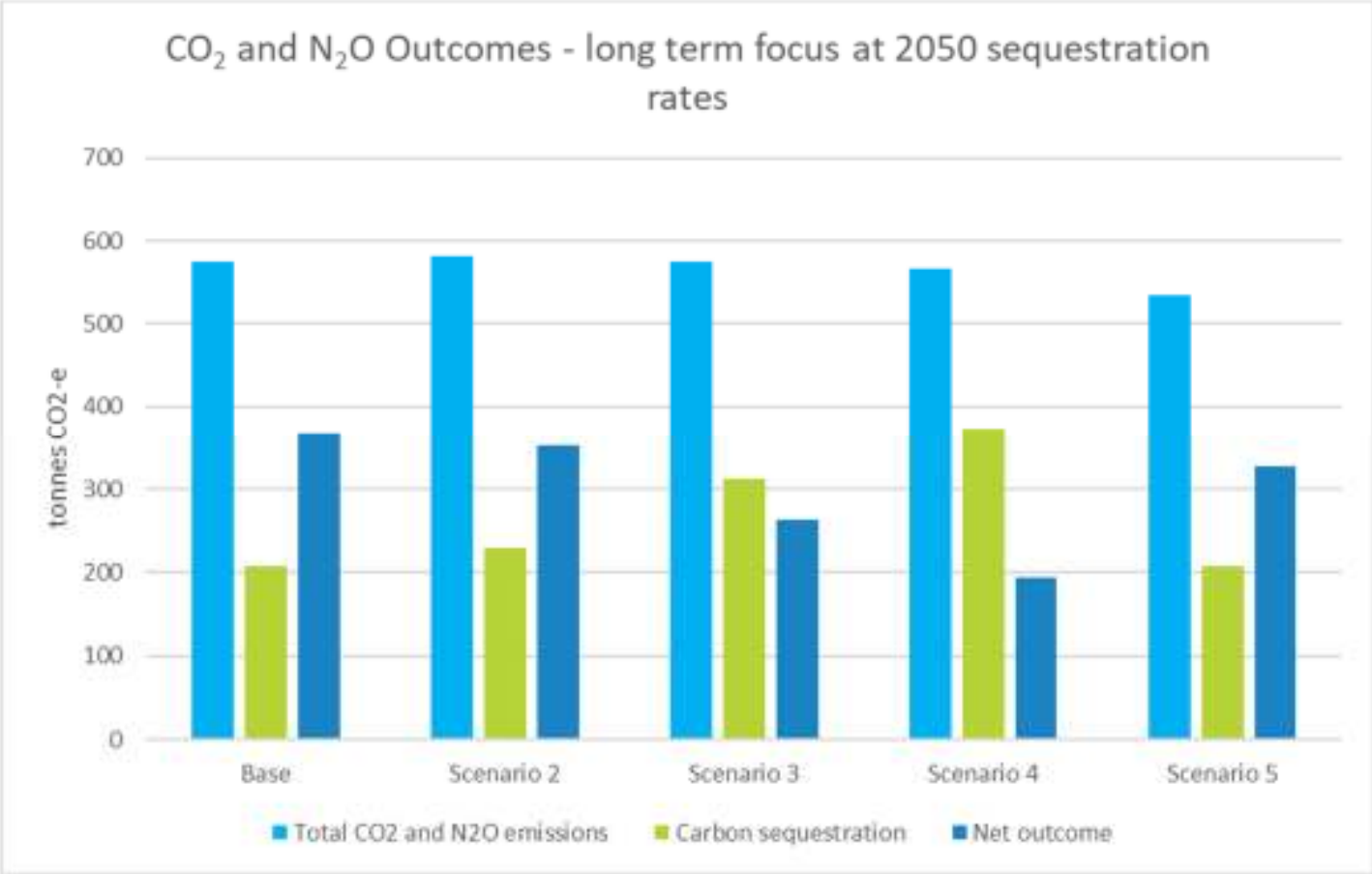
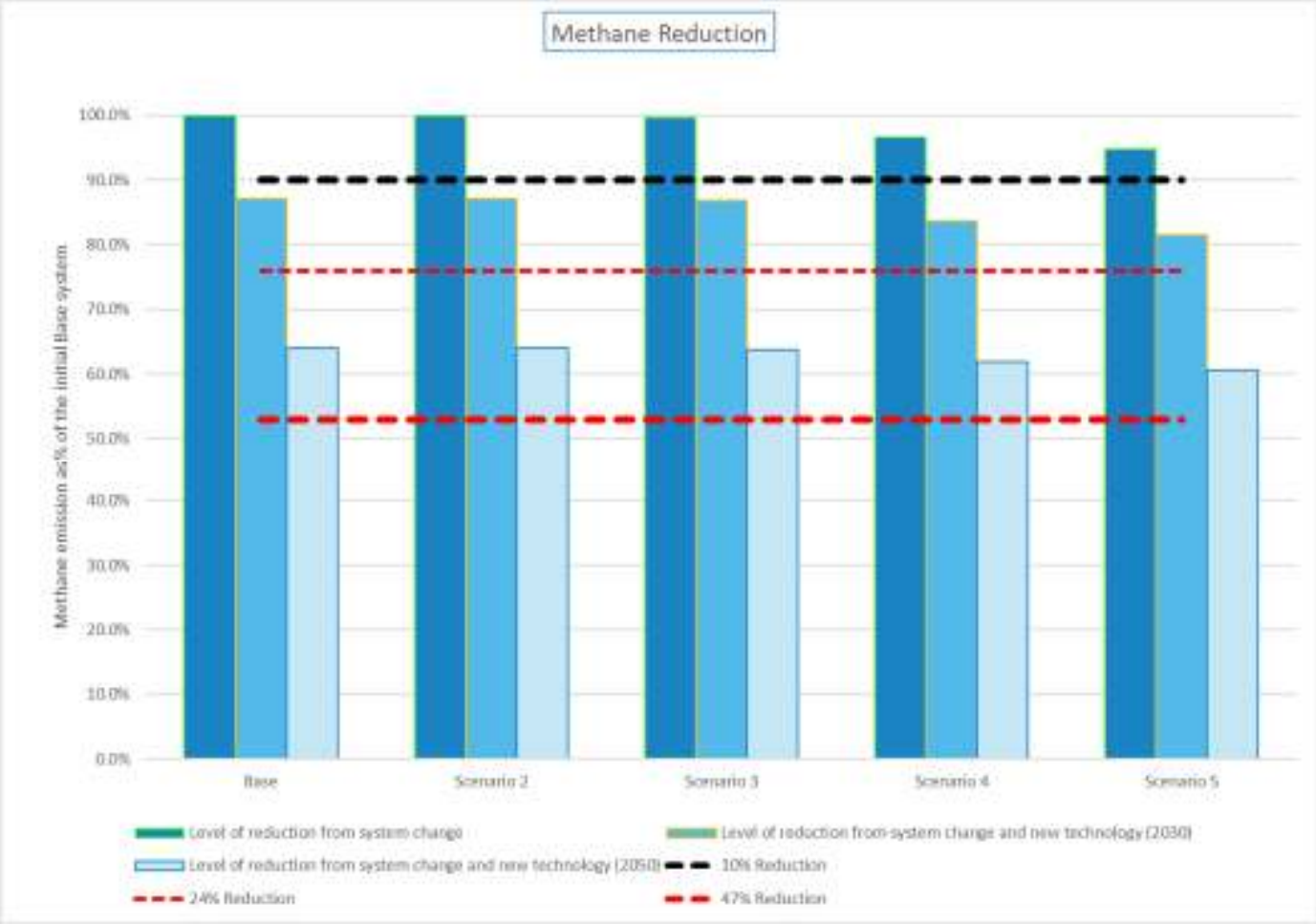


Methane results



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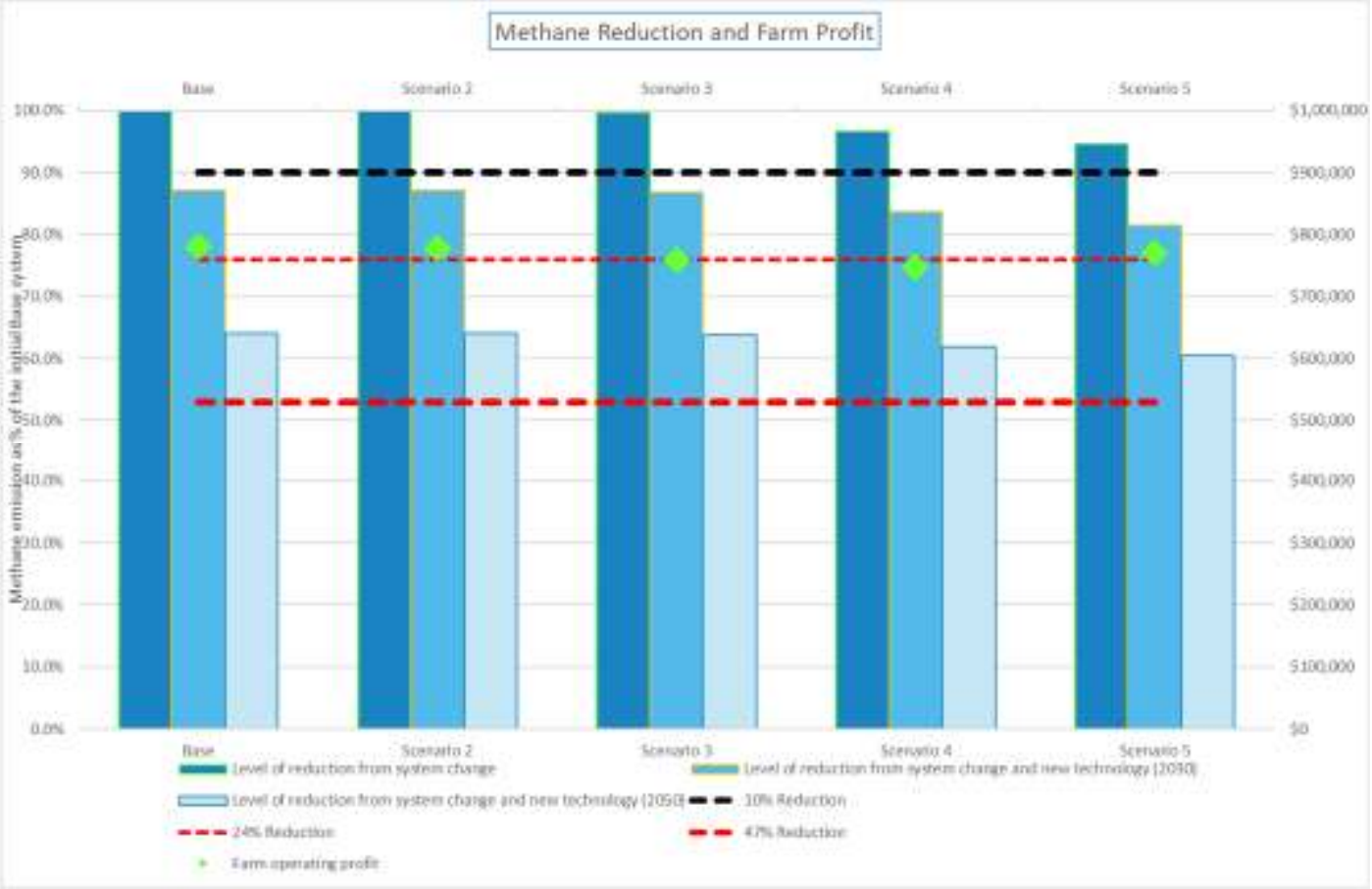
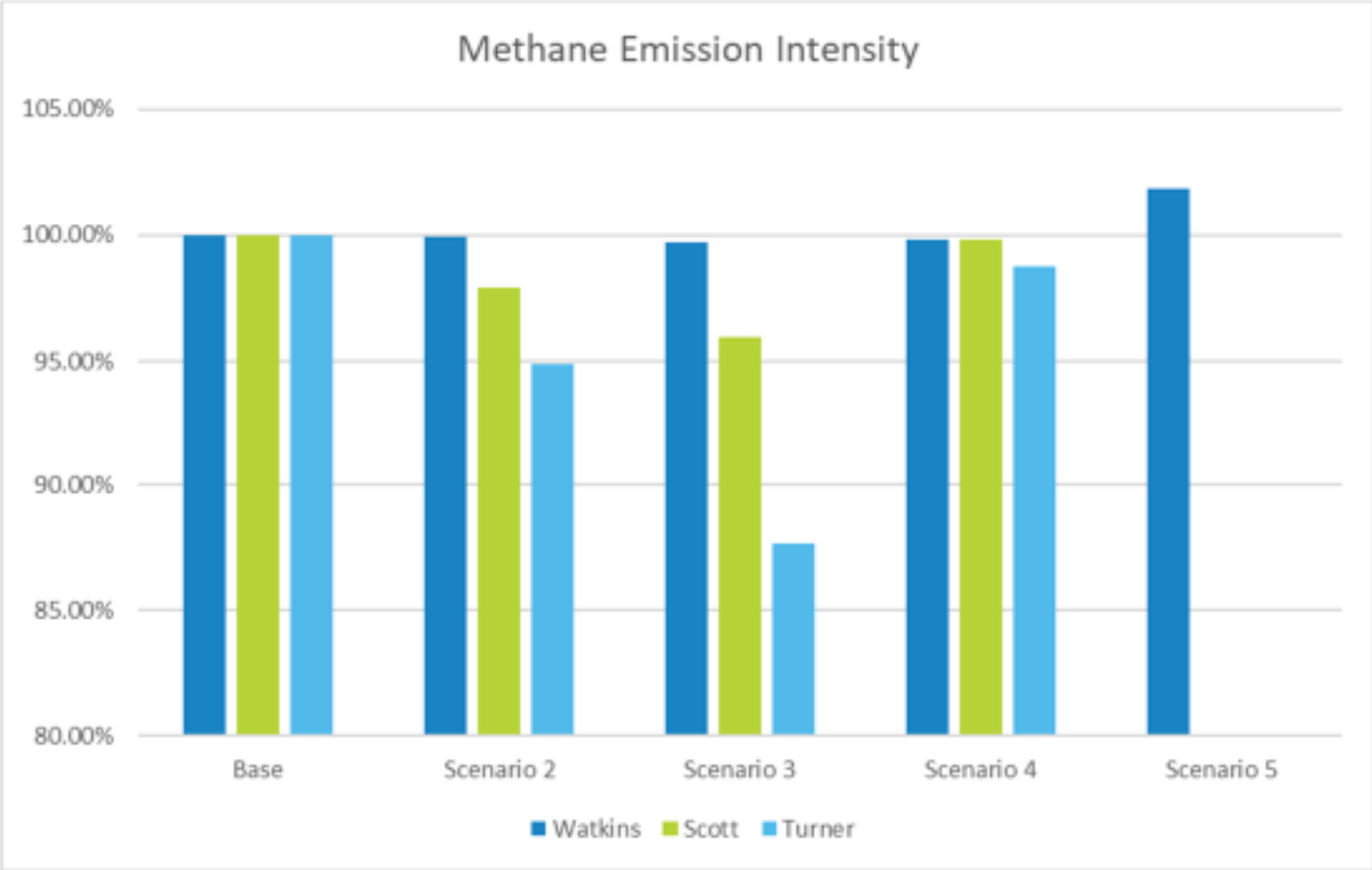
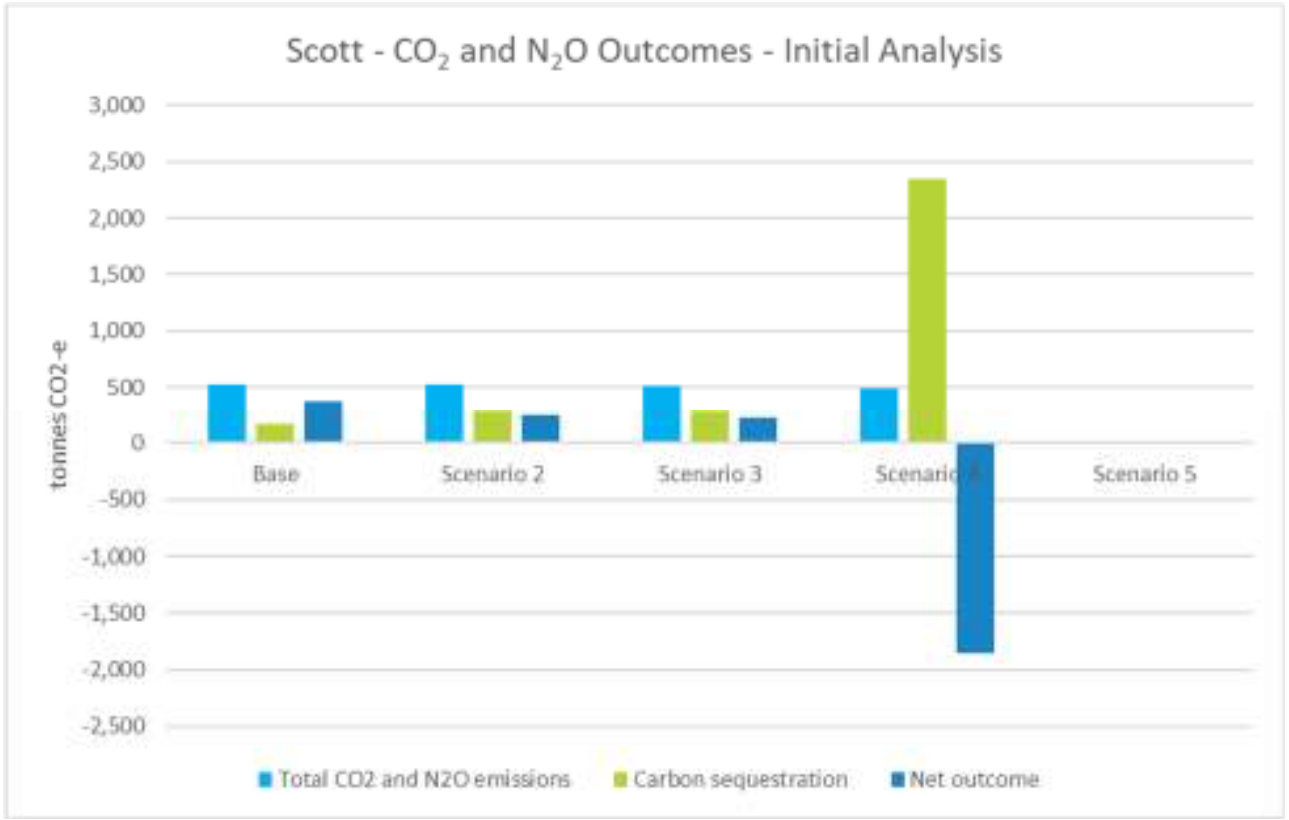


Emissions intensity - example



Other farmer results - Scott

- Scott – 1,636 ha sheep and beef property with existing 12 ha contributing to sequestration and 139 ha bush and retired areas not contributing.



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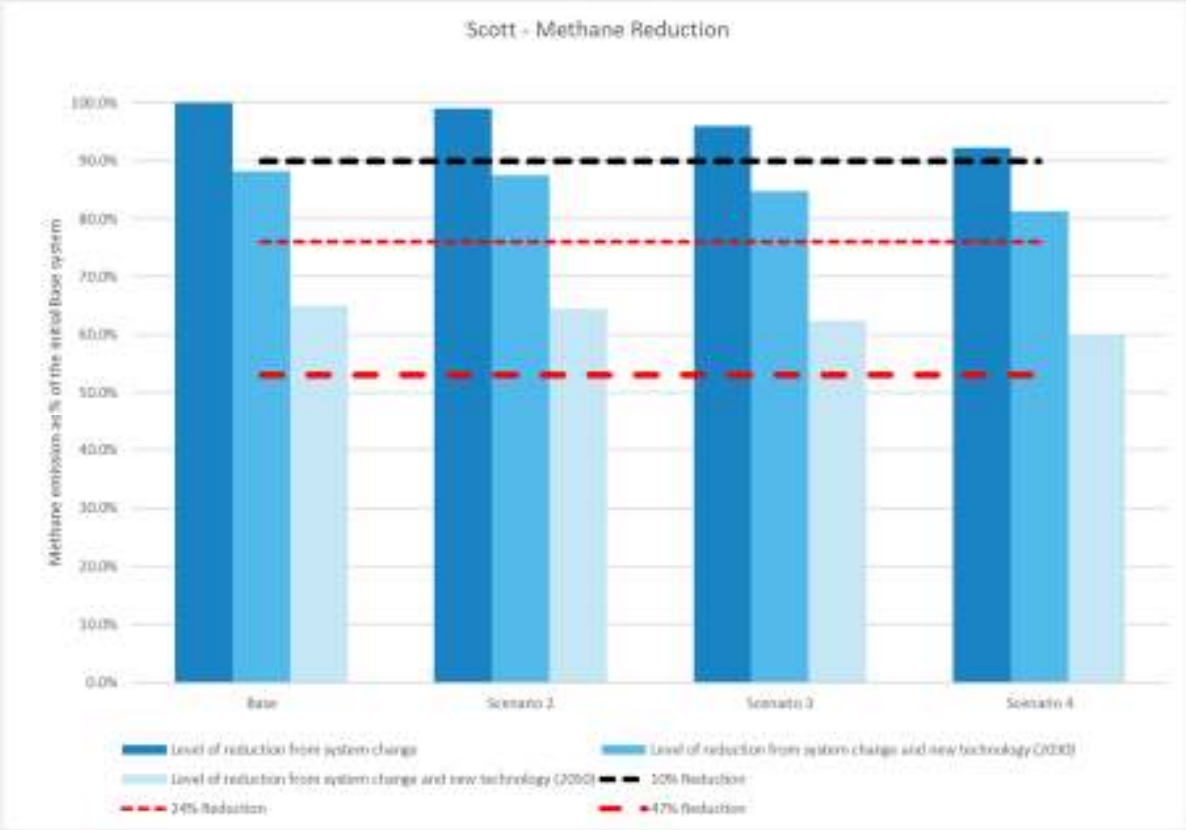
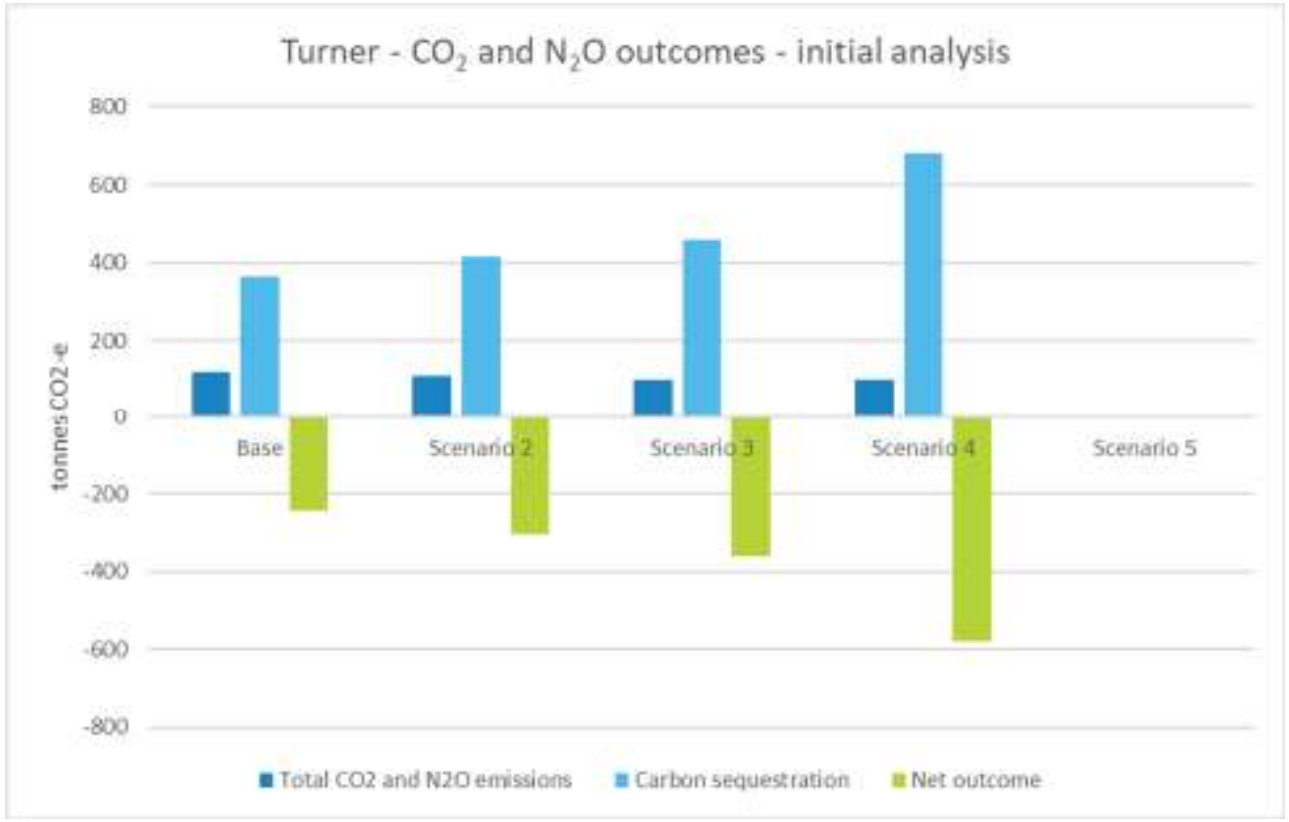


Other farmer results - Turner

- Turner – 381 ha sheep and beef property with existing 15 ha contributing to sequestration and 78 ha bush and retired areas not contributing.



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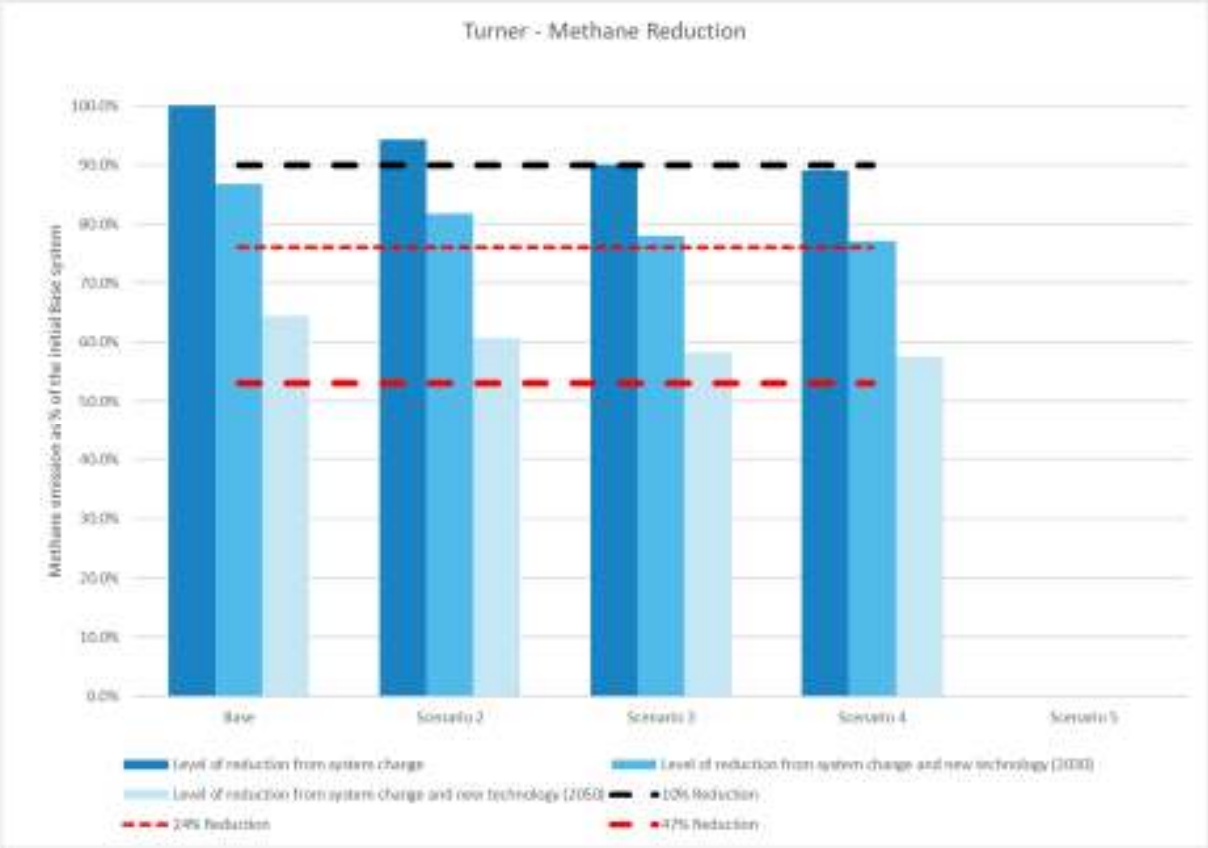

Conclusions

1. Excluding bio-genic methane it is possible to make changes that result in **a net-carbon zero emissions position**.
2. You **maybe in that position now** – this will depend on the area and type of vegetation you have on hand, and what is determined as an allowable rate of sequestration for each different block of vegetation.
3. A reduction in gross methane emissions will require a reduction in feed used – changes that result in **less pasture grown and/or less feed imported** onto the farm.
4. Trees – there is flexibility, can be "right tree in the right place" approach.
5. **Unless** you are **dramatically changing** your feed use level, achieving the agriculture sector reduction targets on an individual farm will most likely require the use of **new "lower methane genetics"** and/or the **successful development and use of** new vaccine/inhibitor technology.
6. You can **start a methane emissions reduction plan now**. This will most likely be for your customers (namely our processors) and debt access advantages. There will be a focus on methane emissions intensity and gross methane emissions. If your emissions intensity is improving, you may not have to reduce your gross emissions.
7. BUT … the possibility of a **cost being applied to methane emissions has not gone away**.

What the hell might I do now?

1. You should choose a method of calculating your GHG emissions – which means which model and who. You may have an existing regulatory requirement that this can be linked too.
2. MPI was (and is) building a model for the pending regulatory requirements – but in the meantime …?
3. Understand your existing non-pasture vegetation:
    - Mapping for areas and locations;
    - Description by age and type;
    - Possible contribution to sequestration; and
    - Remember – can only "sell it once".
4. Keep learning about this issue:
    - There is unlikely to be a magic bullet that makes it go away completely; and
    - It can link into other considerations – freshwater management and biodiversity.
5. Ask about what is involved to get premium for your product or a discount on your loan.
6. Listen out for what is happening in the industry and regulatory space. Please contribute your thoughts to that process.

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