

# Balancing Carbon on the Farm

by

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# Outline

- Project
- Background (GHG in Ag, govt initiatives)
- Three Case Studies
- Current Kyoto obligation
- Summary

# MAF Sustainable Farming Fund Project

- Co funded by Carbon Farming Group
- Supported by
  - NZ Farm Forestry Association
  - NZ Landcare Trust
  - Greater Wellington Regional Council
- **Aim** – To help farmers, agribusiness managers and farm foresters to understand carbon farming

- Presentation will show a basic farm carbon balance
- Not provide all the recipes

# Background

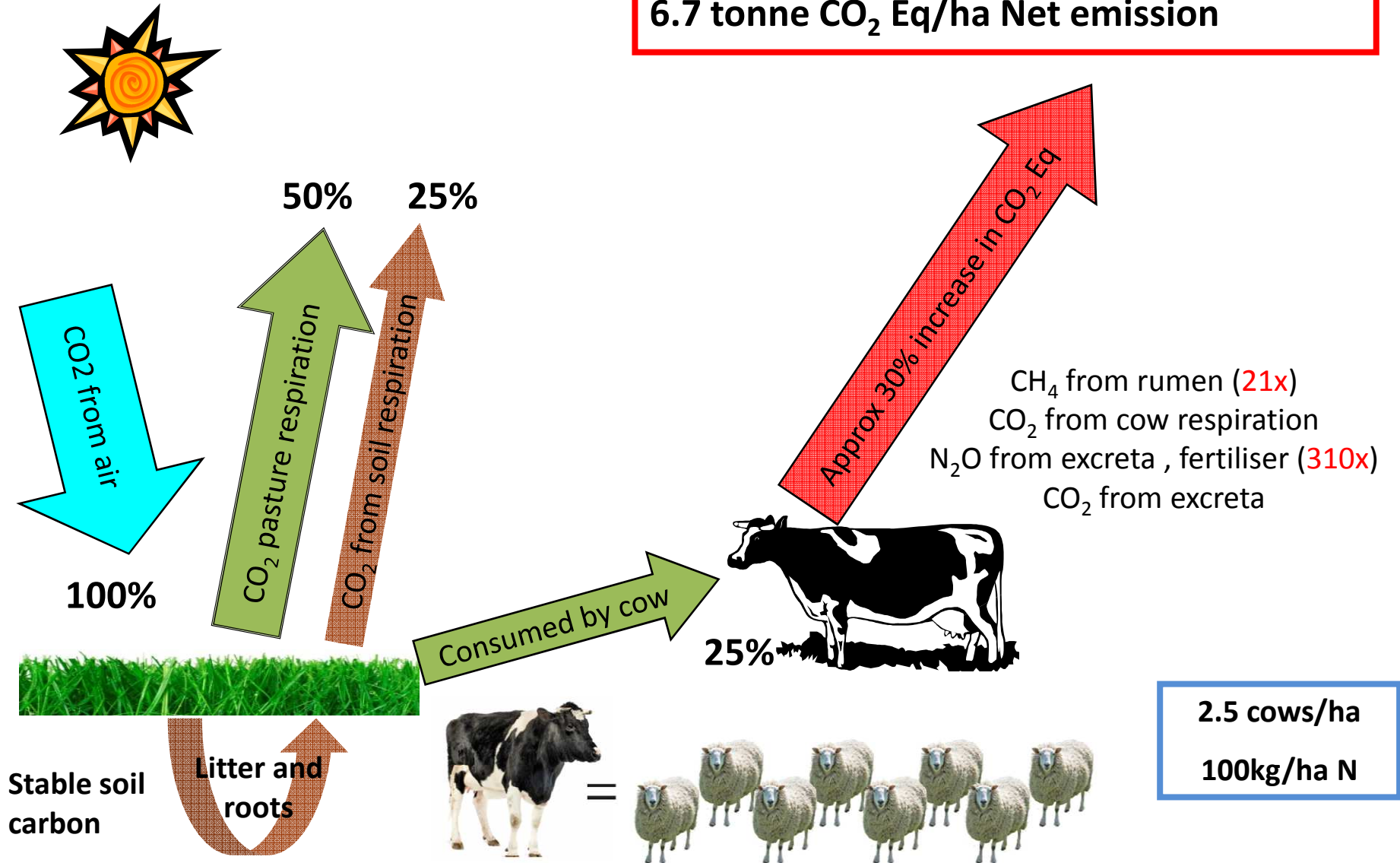
- Wide international science and government agreement and significant market trading around climate change and greenhouse gases.
- International agreement for action: Kyoto Protocol
  - NZ a signatory, agree to maintain 1990 levels of GHG emissions or pay for net increase, 1<sup>st</sup> due 2015

# Agricultural greenhouse gas emissions

- Main greenhouse gases (GHG) are carbon dioxide ( $\text{CO}_2$ ) methane ( $\text{CH}_4$ ) and nitrous oxide ( $\text{N}_2\text{O}$ ).

# Agricultural greenhouse gas emissions

6.7 tonne CO<sub>2</sub> Eq/ha Net emission



Net emissions from Carbon Farming Group Carbon Calculator and Overseer, based on NZGHG Inventory Tables

# Opportunities to manage Ag emissions

- Efficiency
  - Fertiliser application (nitrification inhibitors, accuracy)
  - Stock policy (profitability per SU, lambing %, LWG)
  - Irrigation (application uniformity, \$/kgDM)
  - Effluent management (carbon source, biogas)
  - Electricity (heat recovery, alternative on-farm sources)
  - Establish crops using no-till, reduce fuel by 2/3
- Research
  - Mitigation strategies such as Vaccine to suppress enteric methane production (PGgRc)
  - BioChar (may reduce CO<sub>2</sub> and N<sub>2</sub>O emissions)
- Afforestation
  - (off-set, transitional)



# Forestry as an Offset



Afforest appropriate on farm areas (low production, erosion)



Invest in forestry off farm

# Three Government Initiatives

- Afforestation Grant Scheme (AGS)
  - Offers a grant to establish new forests
- Emissions Trading Scheme (ETS)
  - Trading mechanism for carbon credits and liabilities
  - While under review is implemented for forestry
- Permanent Forestry Sink Initiative (PFSI)
  - Claim credits, harvest without liabilities

# Farm Carbon Balance

- Three Case Studies
- Carbon Inputs and outputs
- Emissions as CO<sub>2</sub> Equivalents

# Three Case Studies

Sheep and Beef	Dairy + dairy run-off	Arable
5300 SU	5040 SU (535 cows)	860 SU (ewes)
600 ha	220 ha	290 ha (214 irrig)
8 tonne N	39 tonne N	28 tonne N
30 ha post 1990 forestry	No forestry	No forestry

## Annual carbon inputs and outputs

Source	Sheep and Beef	Dairy + dairy run-off	Arable
Petrol (l)	2540	1500	4922
Diesel (l)	52	1100	18190
Electricity (kWh)	19660	62240	428000
Nitrogen (tN)	8	39	28
Dairy cows		535	
Sheep	2862	0	860
Cattle	469	199	
Forestry (ha)	30		

## CO<sub>2</sub> emissions equivalents from carbon calculator

Annual GHG	Sheep and Beef	Dairy + dairy run-off	Arable
Petrol	6	4	12
Diesel	0	29	48
Electricity	5	14	97
Nitrogen	45	221	157
Dairy cows	0	1321	0
Sheep	944	0	284
Cattle	802	340	0
<b>Gross Emissions</b>	<b>1802</b>	<b>1929</b>	<b>598</b>
Forestry	-660*	0	0

- ❖ Pruned and thinned radiata pine, medium fertility site, 22 tonnes/ha/yr. Conservative, simple flat rate from Indicative sequestration tables, SCION, 2008

## Emissions Split

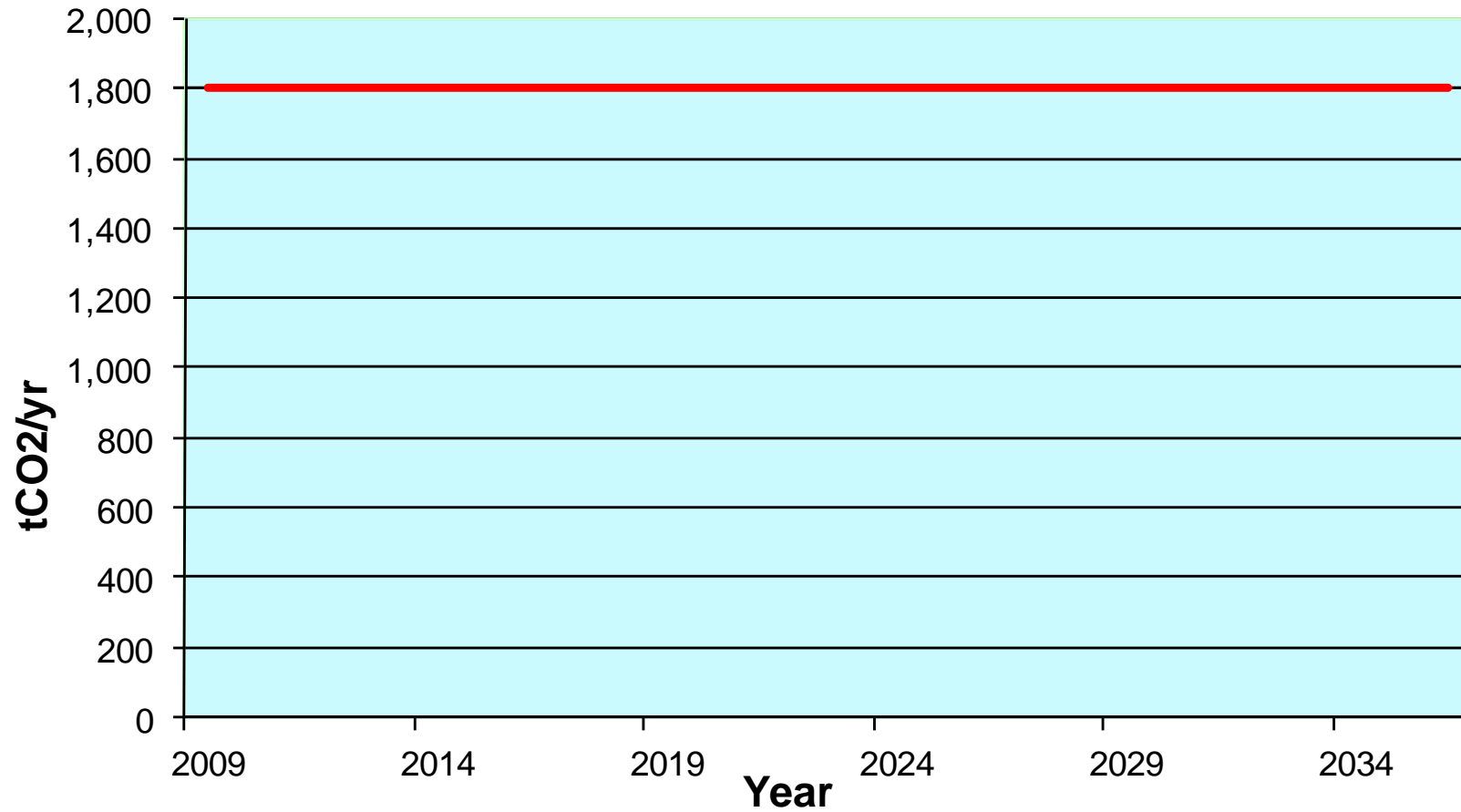
	Sheep and Beef	Dairy + dairy run-off	Arable
% Livestock	97 %	86 %	47 %
% Other	3% (2.4% N)	14% (11% N)	53 % (26% N)

# Analysis Assumptions

- High Carbon Importance Scenario
  - market demand carbon neutral
- Livestock numbers remain unchanged
- Use Sheep and Beef Case Study
  - similar to Dairy in GHG emissions
- Forestry is a viable offset, not harvested

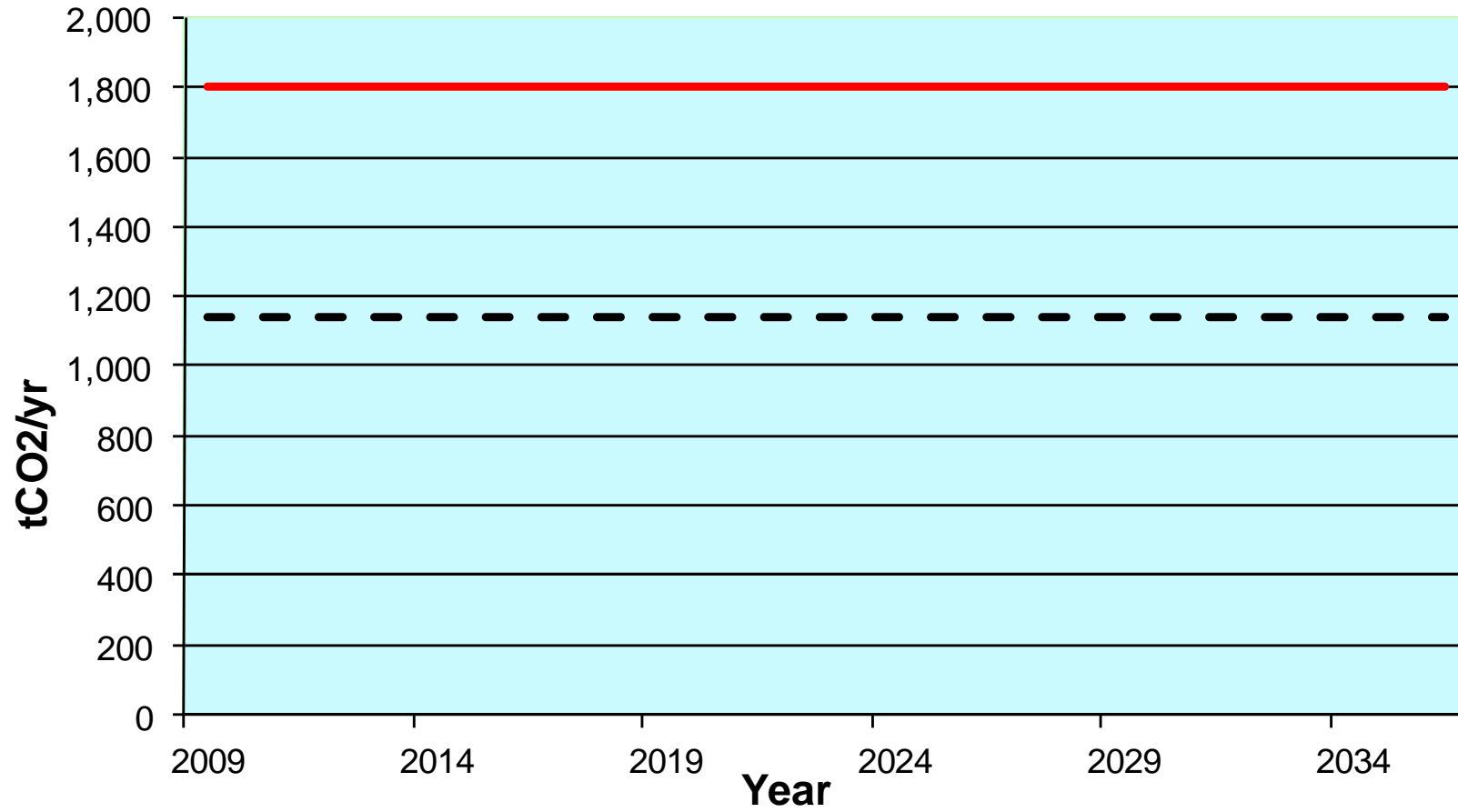


## Sheep and Beef Farm Carbon Balance Over Time



— Gross Emissions

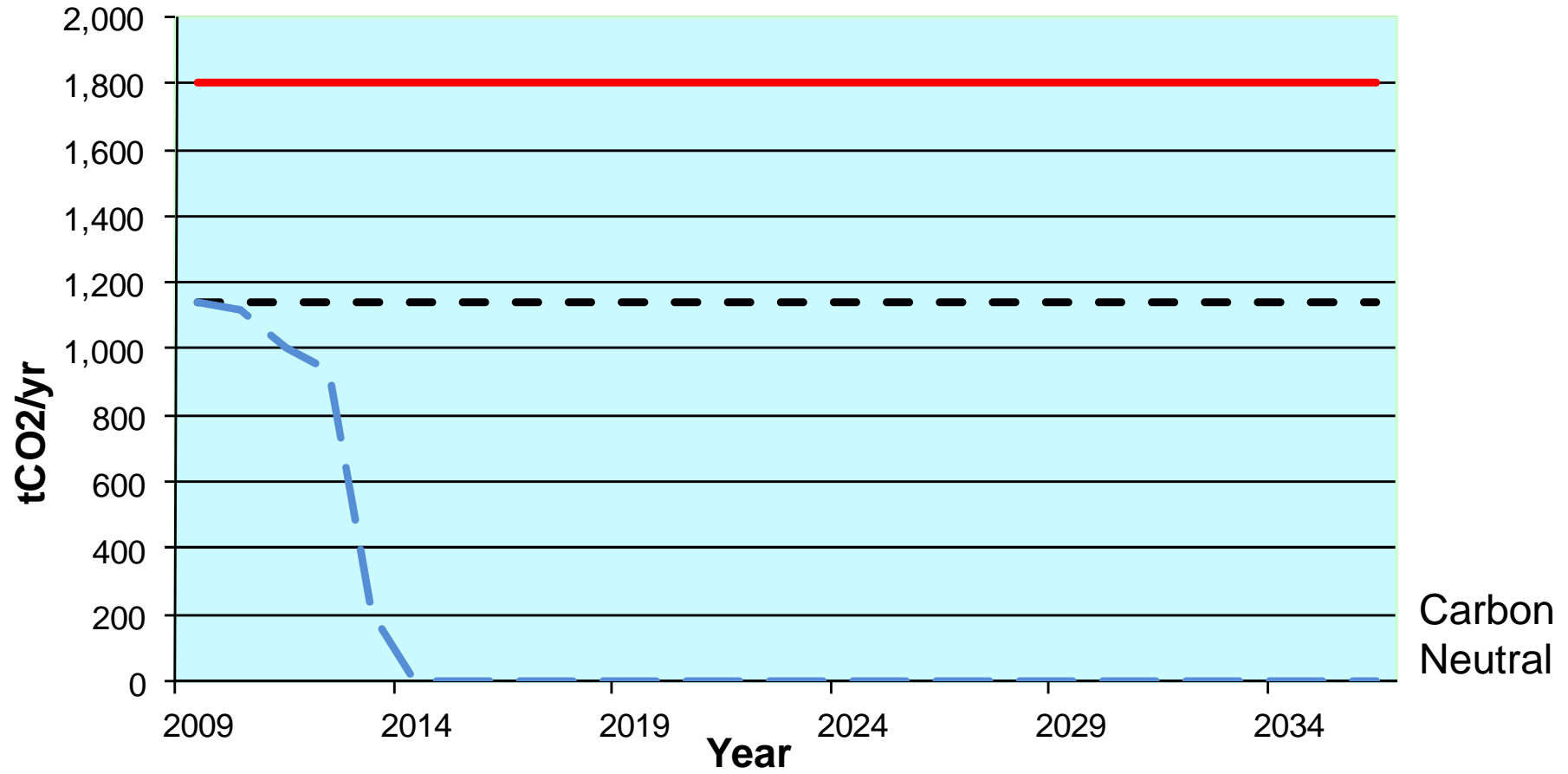
# Sheep and Beef Farm Carbon Balance Over Time



- - - Net Emissions with 30 ha Forestry

— Gross Emissions

# Sheep and Beef Farm Carbon Balance Over Time



Carbon Neutral

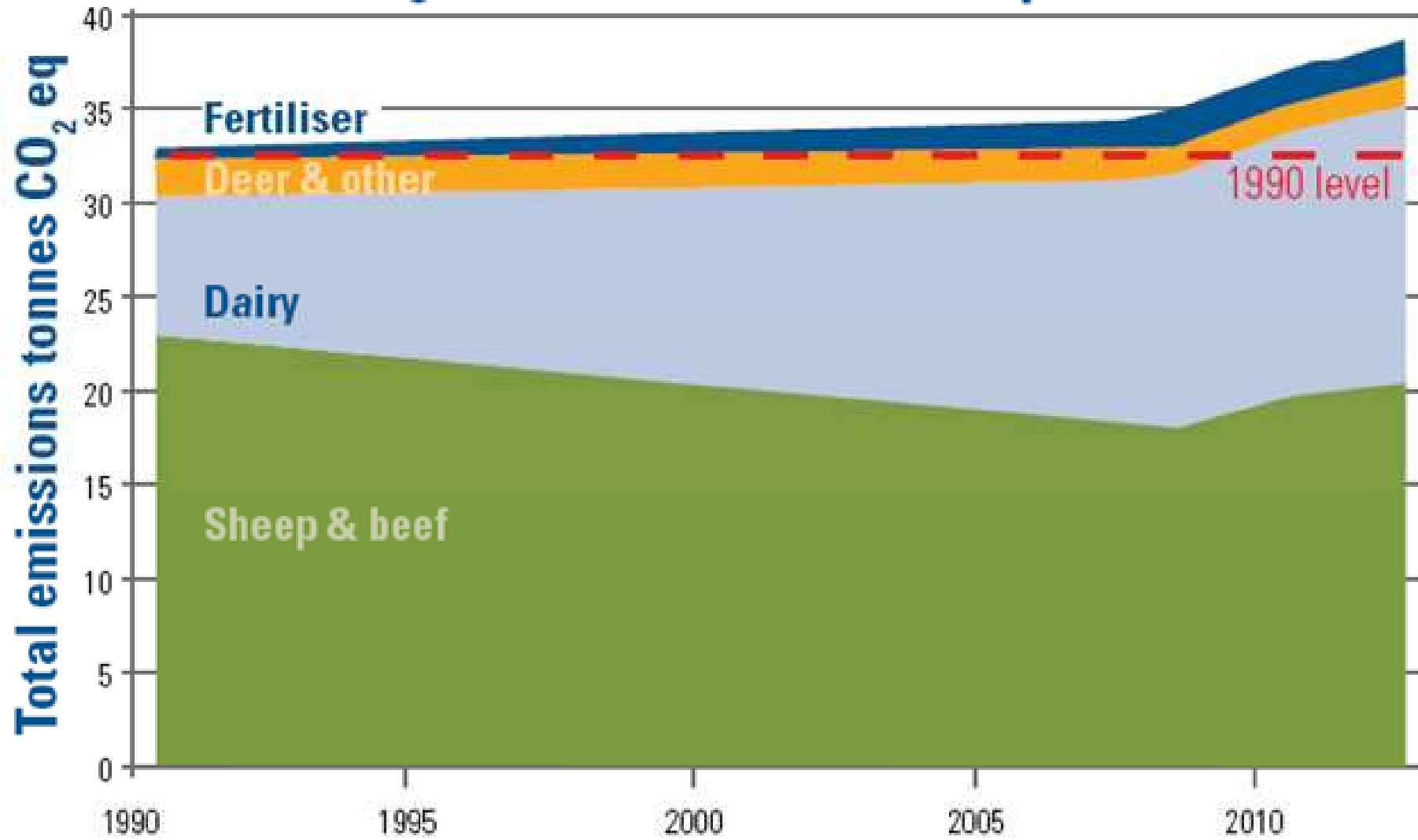


## Annual Cost of Emissions for Carbon Neutral Sheep and Beef Farm

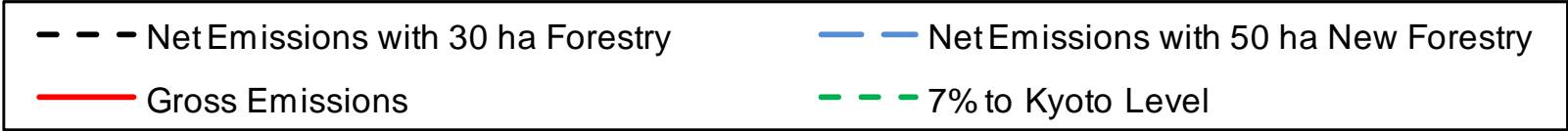
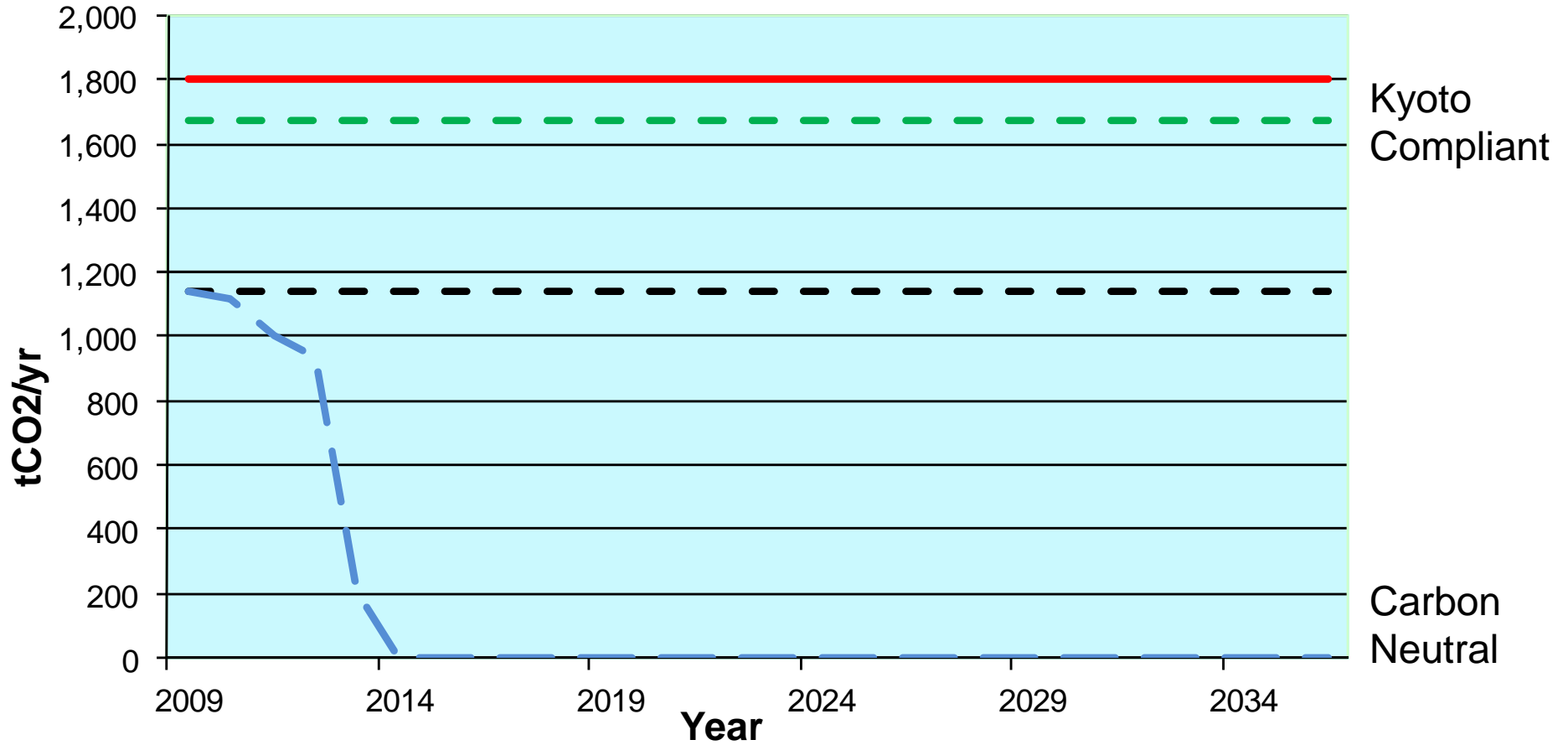
	\$25/tonne CO <sub>2</sub>	\$50/tonne CO <sub>2</sub>
No Forestry	\$45,000	\$90,000
Existing Forestry (30ha)	\$28,550	\$57,000
New Forestry (+50 ha)	0	0

# Kyoto and NZ

## Agricultural GHG emissions profile



# Sheep and Beef Farm Carbon Balance Over Time



# Forest area to be Kyoto Compliant?

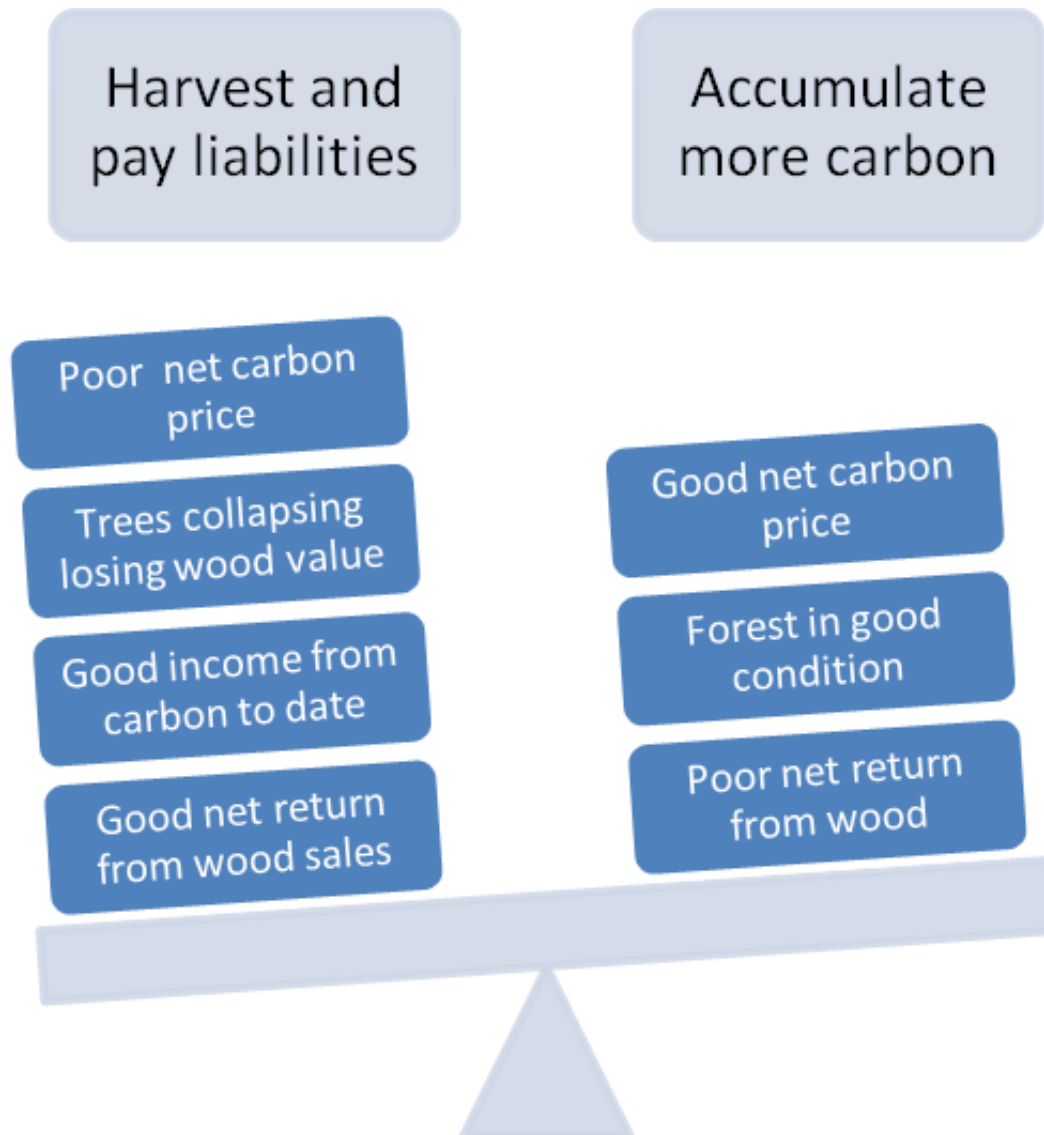
	Sheep and Beef	Dairy + dairy run-off	Arable
Kyoto 7%	5.6 ha	5.3 ha	1 ha



# Risks and Liabilities of forest carbon

- Same biological and environmental risks as existing forests only the value may be higher so premiums higher
- Self insure by banking credits

# Harvest decision factors



# Co benefits from integrating carbon

- Soil & water protection
- Income diversification
- Increase biodiversity
- Good soil management
- May address market carbon footprint concerns
- Better environmental performance – easier RC relationship

## Summary

- Ruminants considered net emitters of GHG
- Kyoto obligations
- Bulk of emissions difficult to mitigate
- Potential for integration of forestry off-set to internalise business risk, at least a medium term solution until (30 to 50 years) while new GHG mitigation technologies are implemented.
- Consider approach now for future obligations
- Develop an integrated carbon management approach, don't manage for carbon itself

# Thanks

Please take info sheets and or card for  
follow-up information