

Modelling the land-use response to climate change: LURNZ simulations for RCP 8.5

Levente Timar, Motu Economic and Public Policy Research

CCII Uplands Workshop

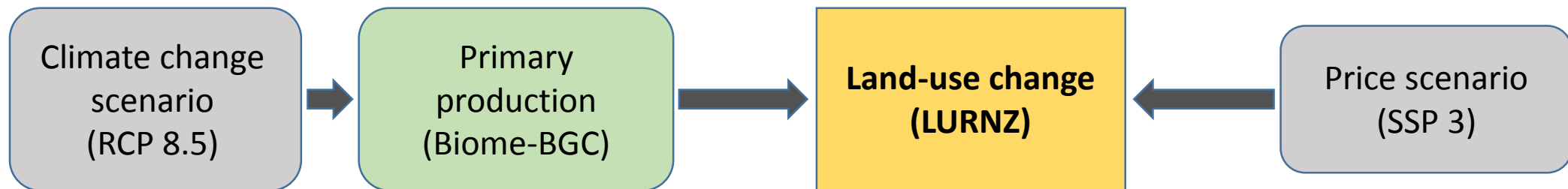
Riccarton, 4 October 2016

Main Points

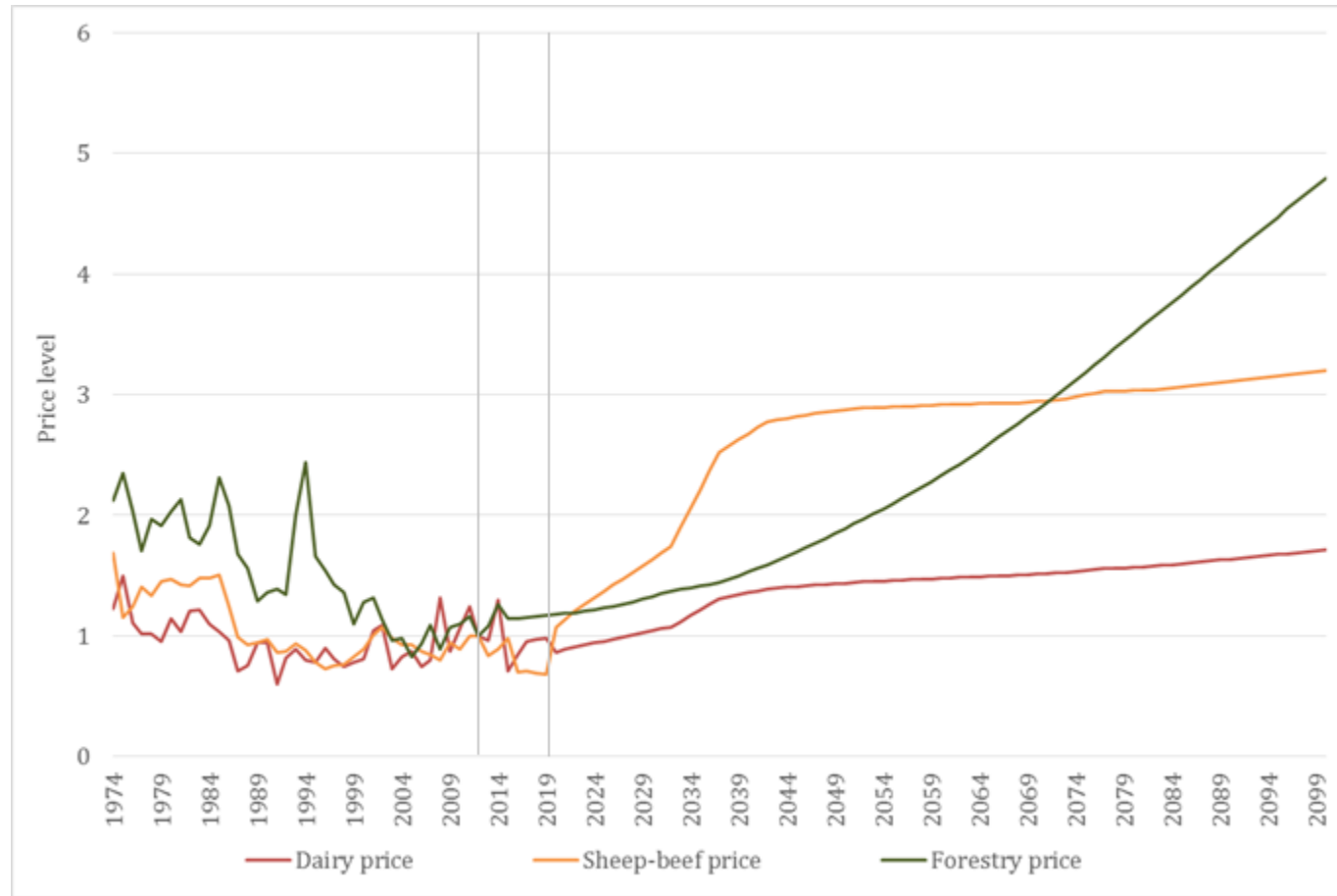
- Caveats...
- SSP 3 – price effect volatile
- RCP 8.5 – climate effect
 - NZ: increase in dairy and forestry
 - NZ: decrease in sheep-beef and scrub
 - Upper Waitaki: little change
- Land-use impact consistent across climate models
- Rate of land-use change not high in historical context

Land Use in Rural New Zealand (LURNZ)

- Econometric model of national land use
- Drivers of land-use change in LURNZ
 - Commodity prices
 - Pasture yields (spatial)
- Simulations require assumptions about future prices and yields (out to 2100)

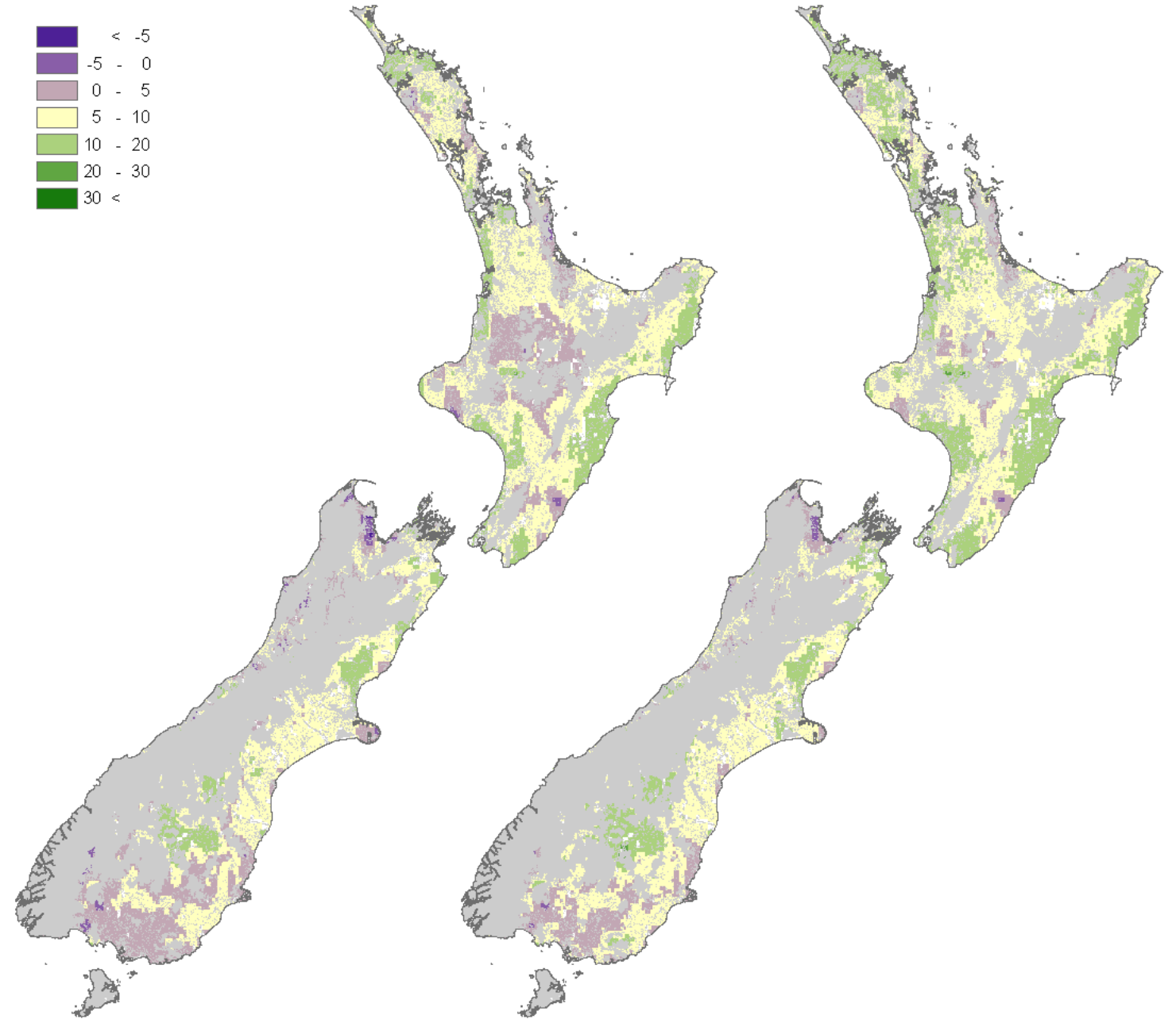
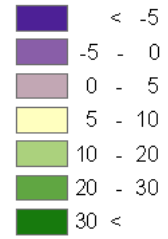


SSP 3 commodity prices



- “Fragmented world”
 - Barriers to trade
 - High inequality
 - High population
- Projections:
 - MPI
 - CLiMAT-DGE
- Pastoral vs forestry price paths

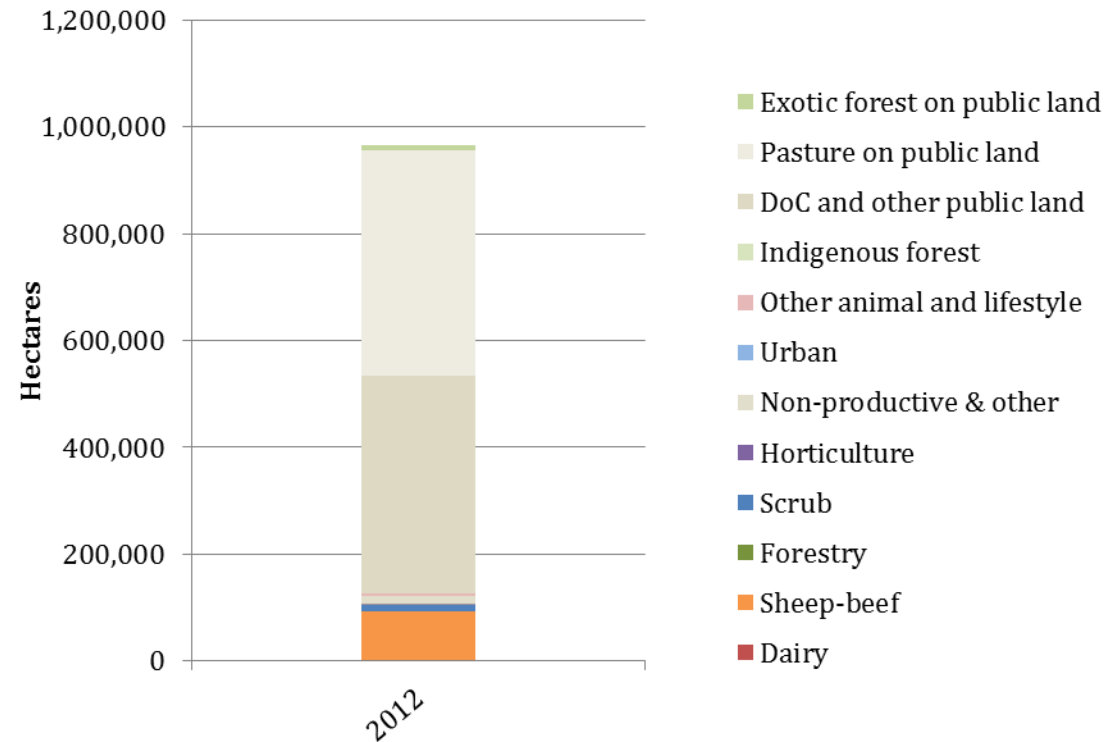
RCP 8.5 yield changes



- End of century
- Model ensemble
- Sheep-beef / dairy

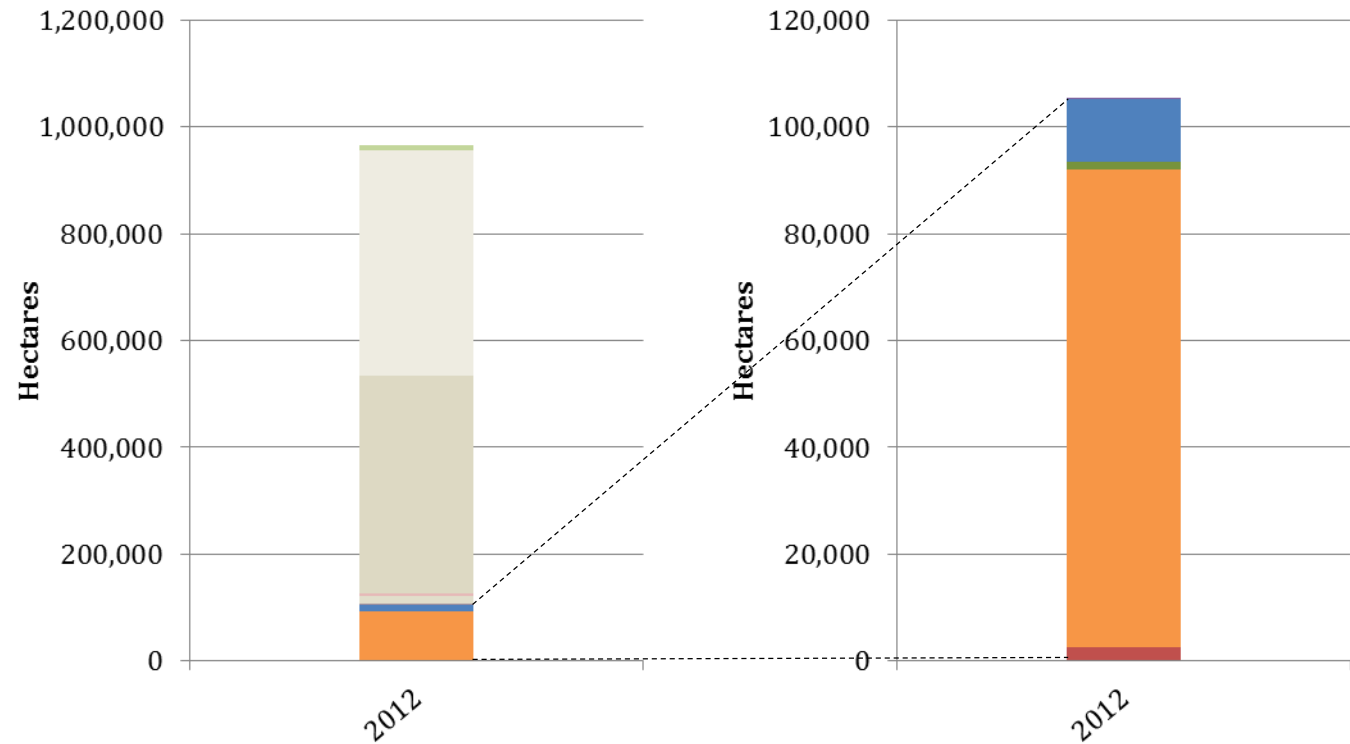
Caveats

- General
 - SSP 3 prices far beyond historical range – speculative
 - Modelling changes in mean climate only
 - No adaptation other than land-use change
 - Irrigation potential is not modelled
- Upper Waitaki
 - Only small fraction of catchment is modelled

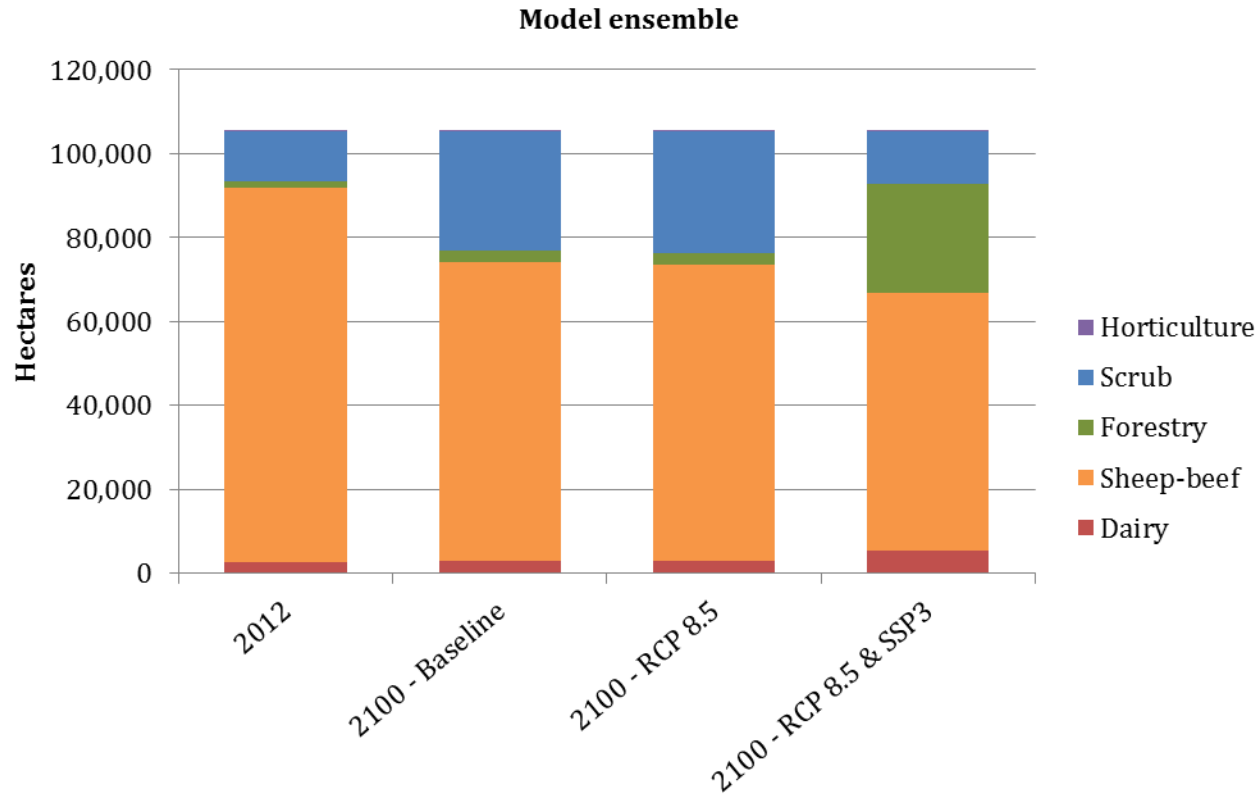


Caveats

- General
 - SSP 3 prices far beyond historical range – speculative
 - Modelling changes in mean climate only
 - No adaptation other than land-use change
 - Irrigation potential is not modelled
- Upper Waitaki
 - Only small fraction of catchment is modelled

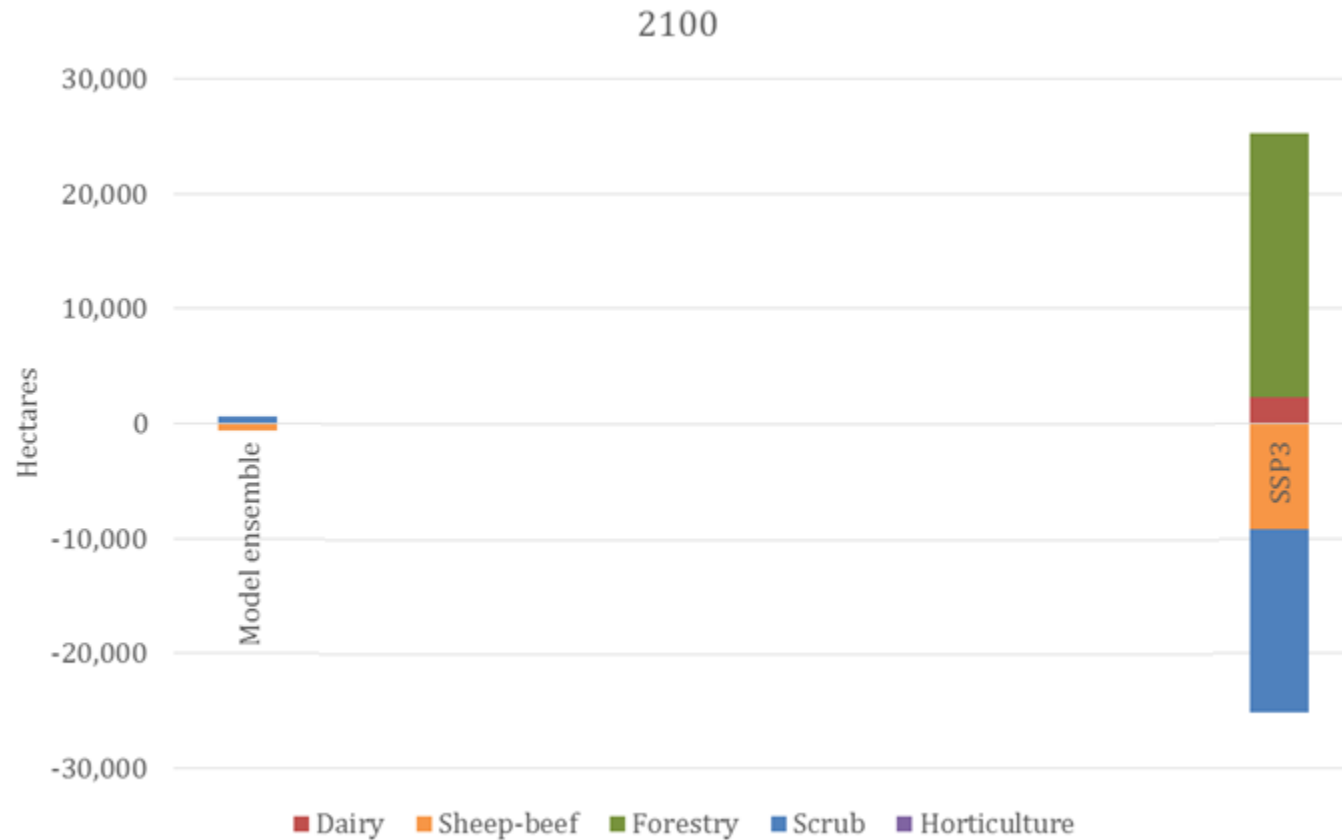


Land use – Upper Waitaki



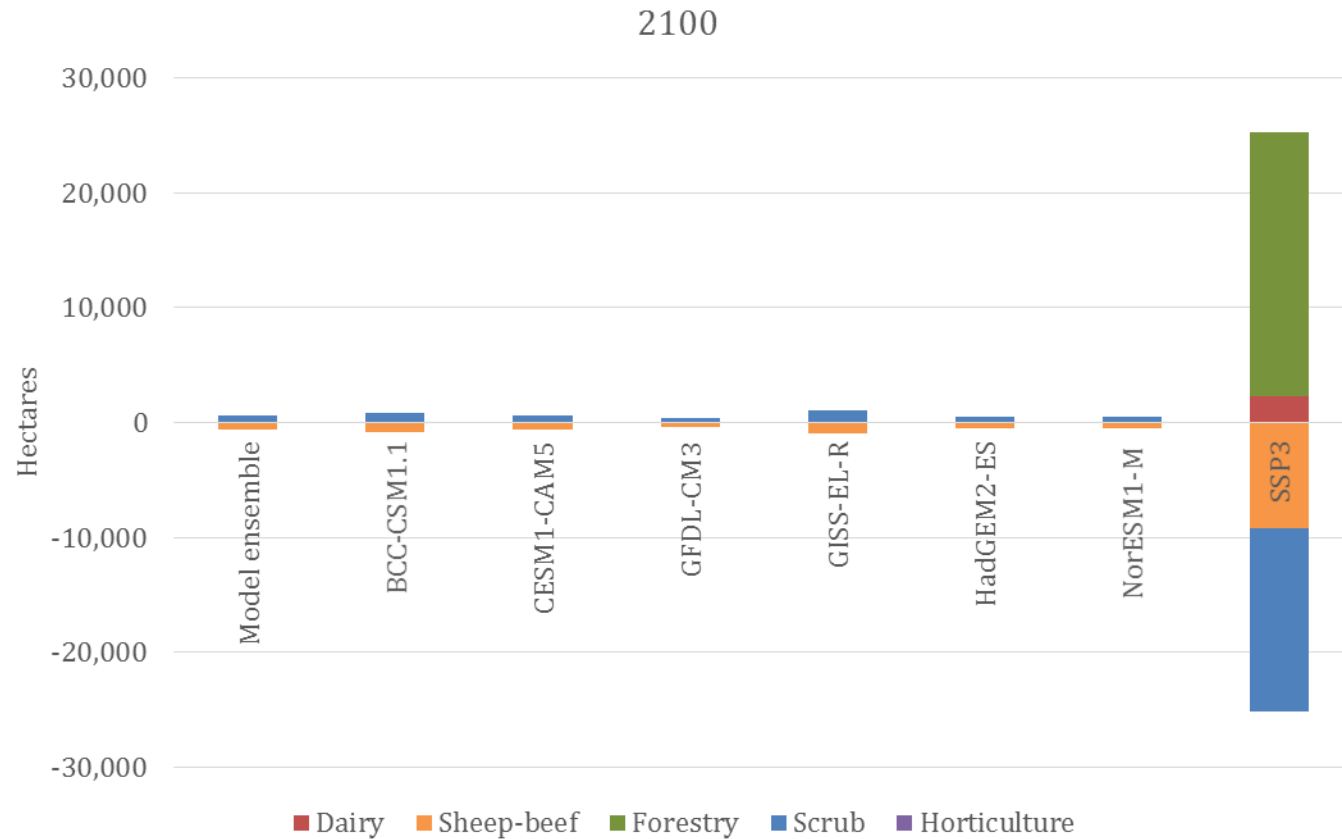
- Baseline: some abandonment of sheep-beef (-20%)
- Climate effect: almost none
 - Similar for rest of catchment?
- Price effect:
 - Large increase in forestry
 - Some increase in dairy
 - Fall in sheep-beef and scrub
- At SSP3 prices: plausible but...

Land-use change – Upper Waitaki



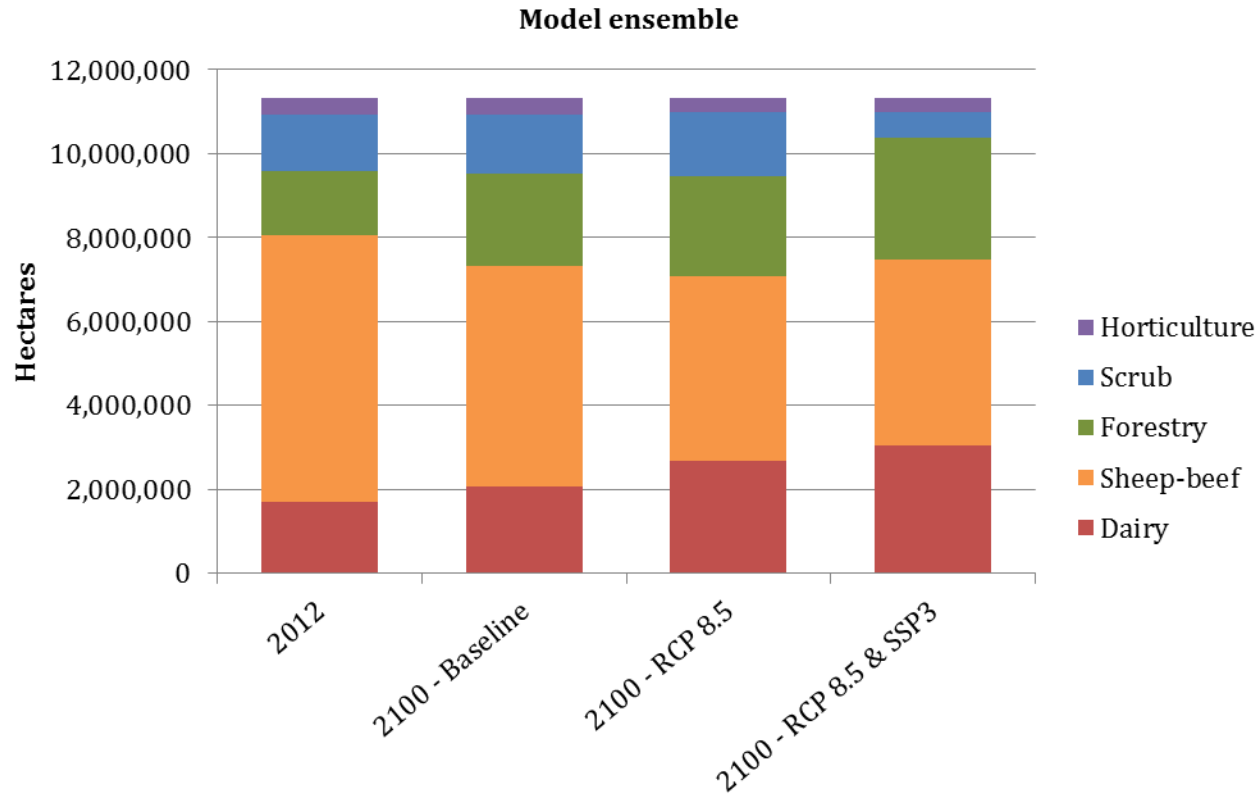
- Shows changes only
- Very little effect from climate change

Land-use change – Upper Waitaki



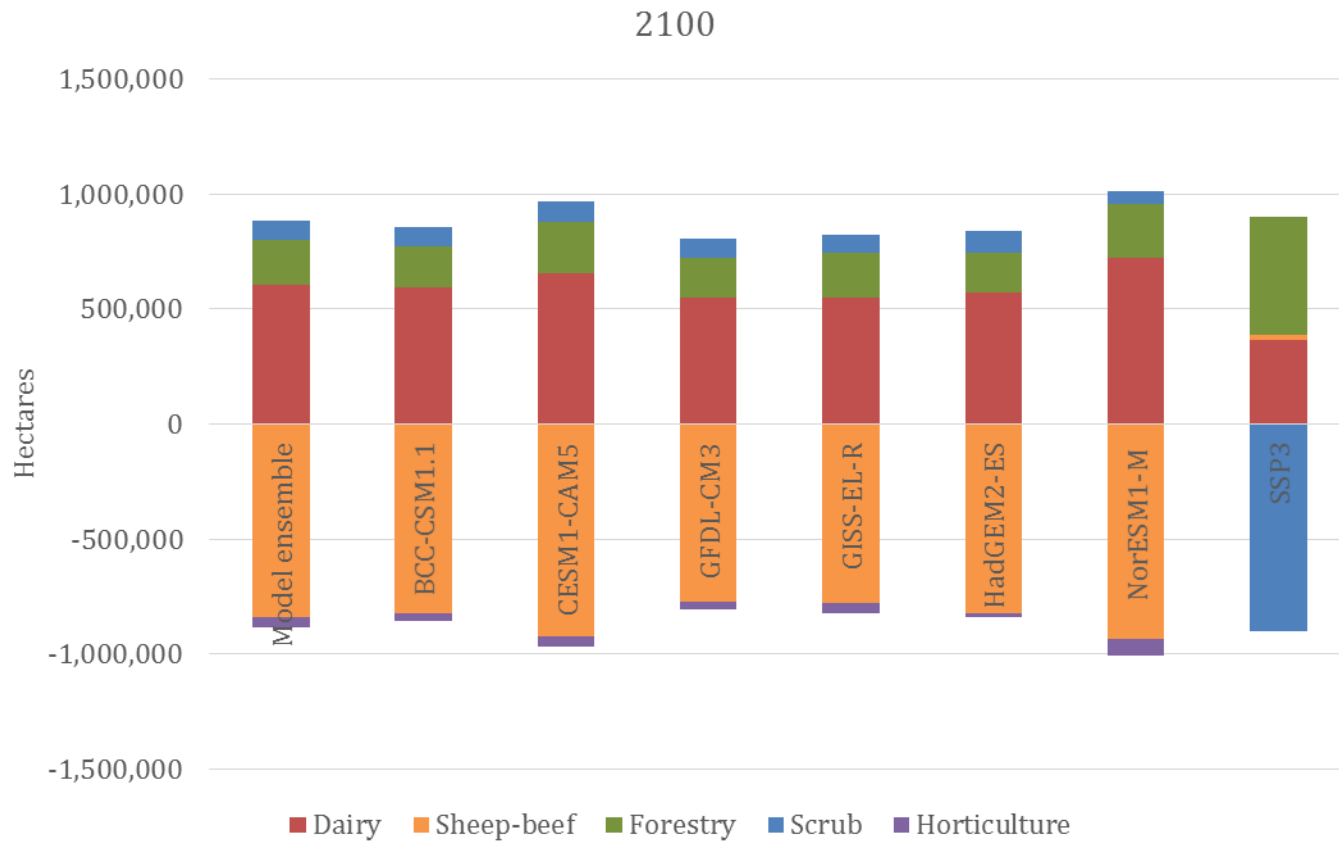
- Shows changes only
- Very little effect from climate change
- Consistency across climate models (6+1)

Land use – New Zealand



- Baseline: sheep-beef to dairy & forestry
- Climate effect:
 - dairy +18%
 - sheep-beef -11%
 - others small +
- Price effect:
 - large increase in forestry
 - also increase in dairy
 - little effect on sheep-beef
- At SSP3 prices: plausible but...

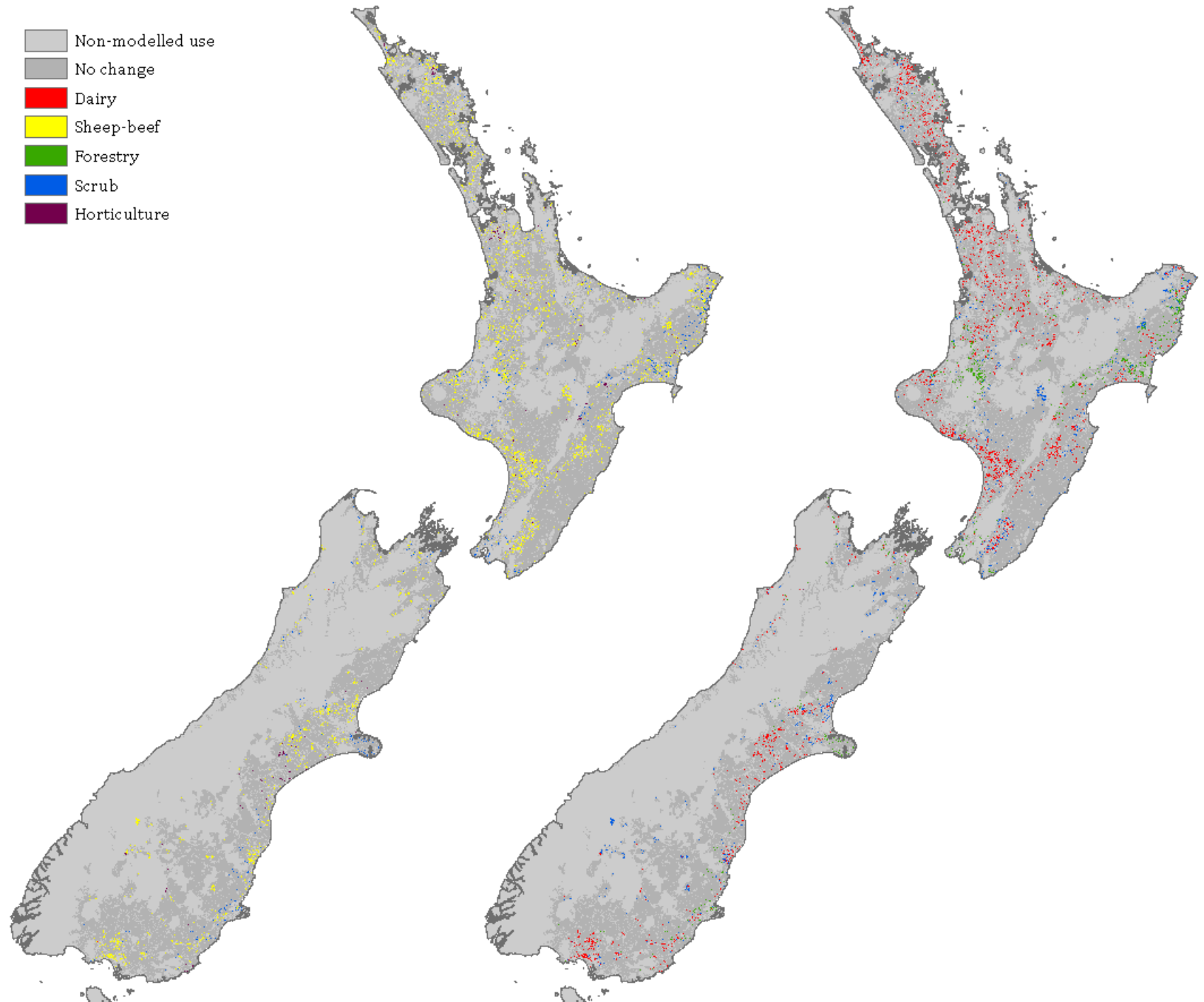
Land-use change – New Zealand



- Results largely consistent across climate models

Land-use impact

- End of century
- Yield effect only
- Converting from / converting to



Conclusion

- Rate of land-use change not high in historical context
- Climate effect (RCP 8.5)
 - Potentially further pressure on New Zealand's water resources
 - Forestry may offset some of the increase in GHG emissions
 - Consistent across climate models
 - Changes in mean climate only, no adaptation
- Price effect (SSP 3): plausible but highly volatile given extreme prices
- Upper Waitaki
 - Modelling small fraction of catchment area (but...)
 - Very little effect from climate change
 - Potentially much larger effect from price changes (forestry from scrub and sheep-beef)