

FACT SHEET

Climate change impacts on avocado



Climate change will affect where crops can be grown in the future.

We developed models to map how suitable areas around the country currently are, on a scale of 0 to 1. These combined several identified criteria based on their relative importance. We used simulated climate data as model inputs to forecast how suitability will change in the future, for two Representative Concentration Pathways (RCPs) which are scenarios for greenhouse gas (GHG) concentrations in the atmosphere:

1. RCP 2.6 (A low GHG concentration pathway consistent with significant emissions reductions)
2. RCP 8.5 (A high GHG concentration pathway consistent with unabated emissions).

Criteria considered	Importance	
Climate related		
Mean annual temperature	High	●
Low frost risk	High	●
Soil or land related		
Drainage	High	●
Potential rooting depth	Moderate	●
Land use capability class (LUC)	Moderate	●
pH	Moderate	●
Slope of land	Low	●

Please note irrigation is assumed to be available if needed and rainfall is not evaluated.

Criteria suitability scores

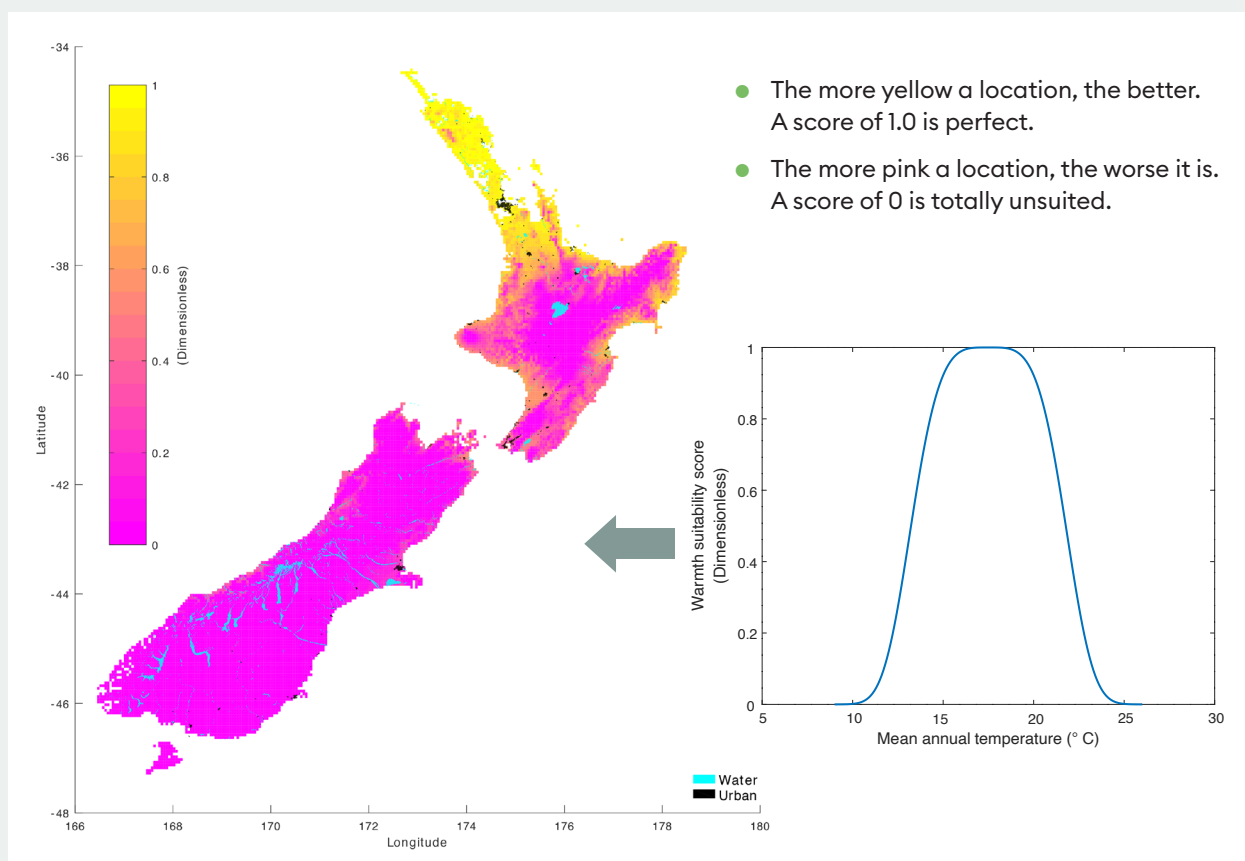
For each criterion we calculated a sliding-scale suitability score.

- Criteria were based on literature and expert knowledge.
- Scores were mapped and checked by experts for accuracy.
- Suitability scores calculated for each location across the country.
- Uses GIS databases with climate and land information.

Overall suitability scores

- Scores for criteria were combined, weighted by importance.
- Weighting was decided by experts.
- Allows locations to be ranked on relative merit.

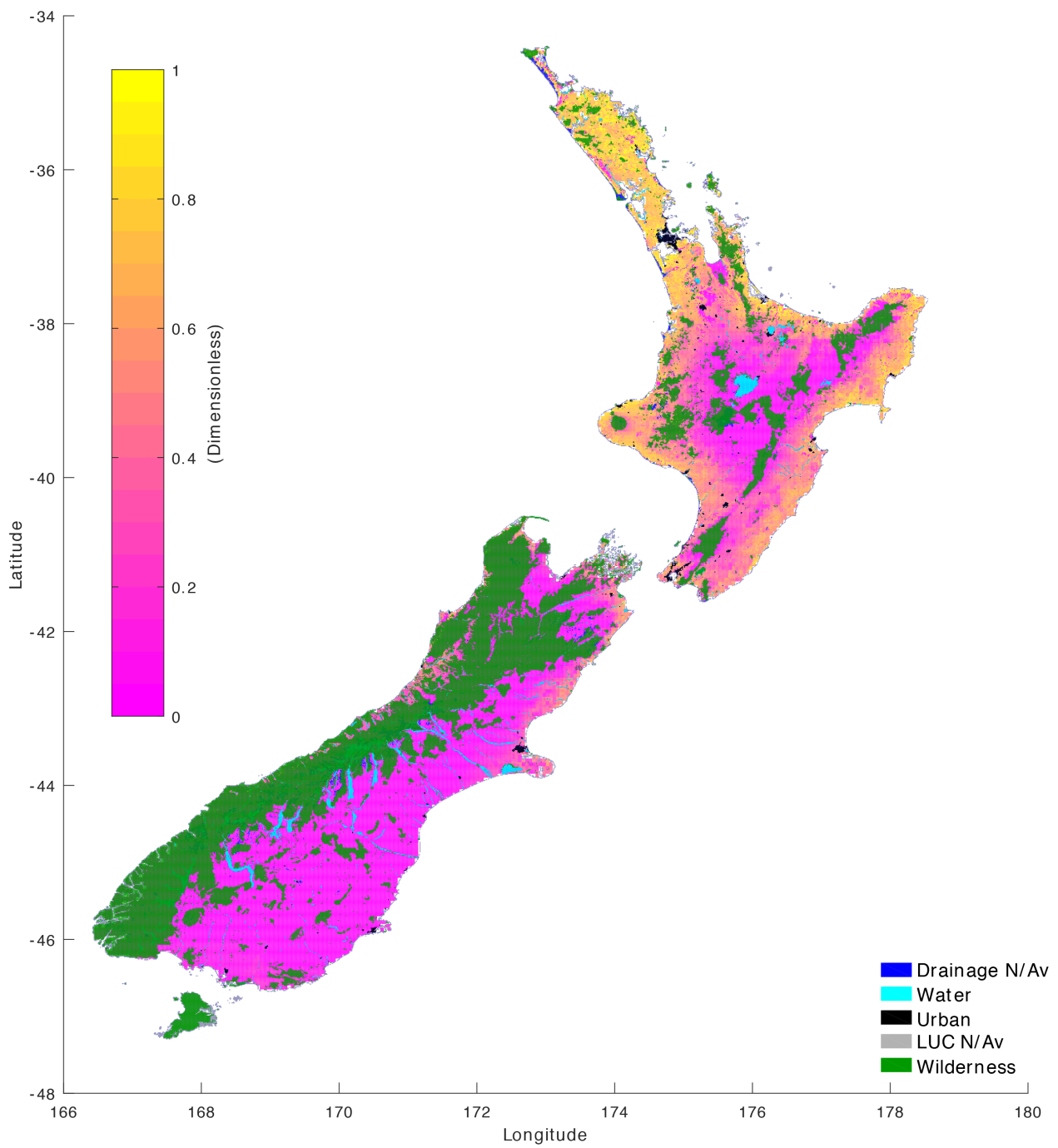
Example: warmth suitability score for avocado



Low scores indicate mitigation may be needed, e.g.

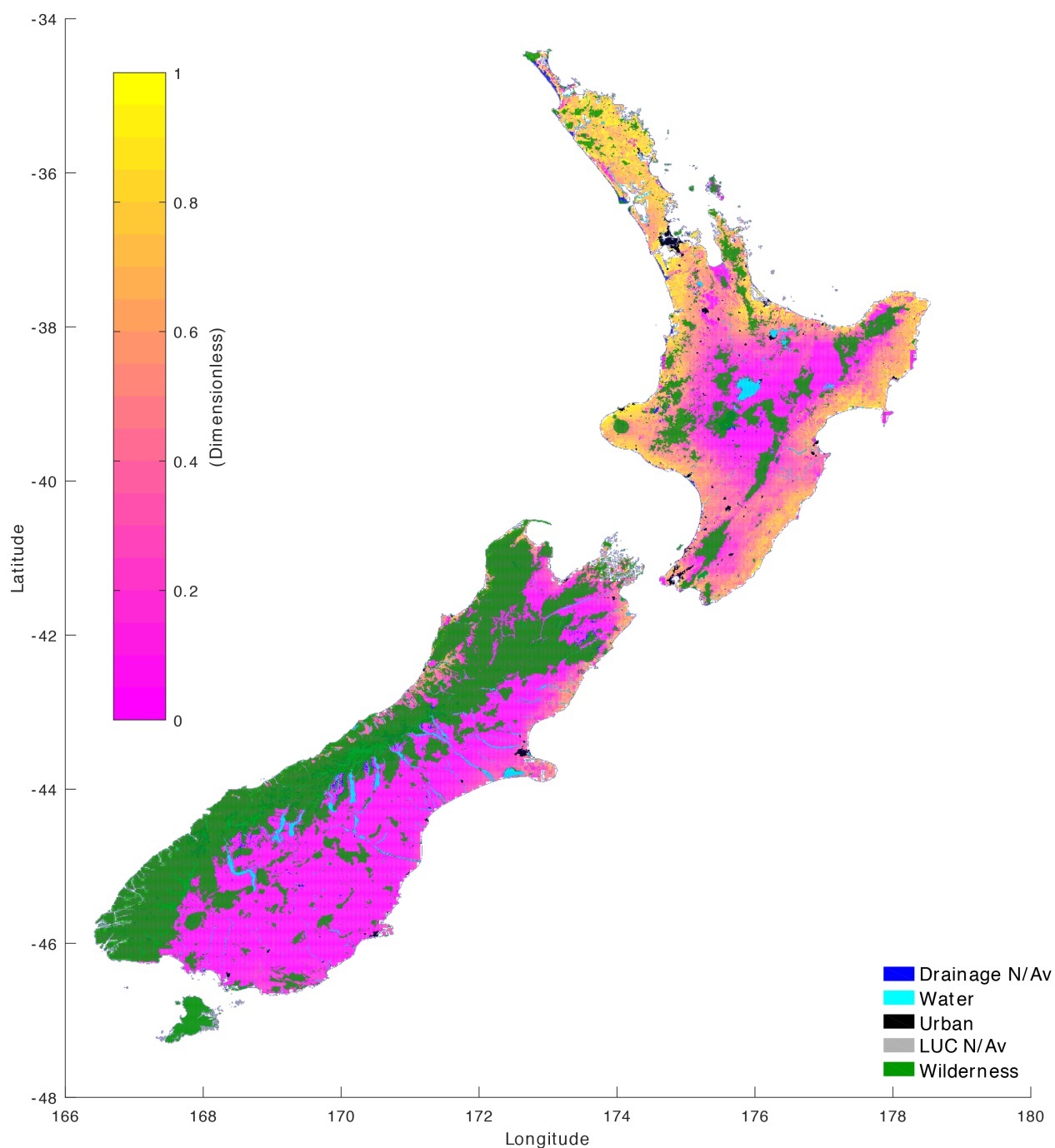
- Frost protection if frost suitability is low
- Drainage improvement if drainage suitability is low
- Soil amendments if pH suitability is low.

Overall suitability map from calibrated avocado rules



Our modelled suitability score is in agreement with current avocado-growing regions in Northland, the Bay of Plenty, Gisborne and Hawke's Bay.

Mid-century forecast for avocado under the low GHG concentration pathway (RCP 2.6)

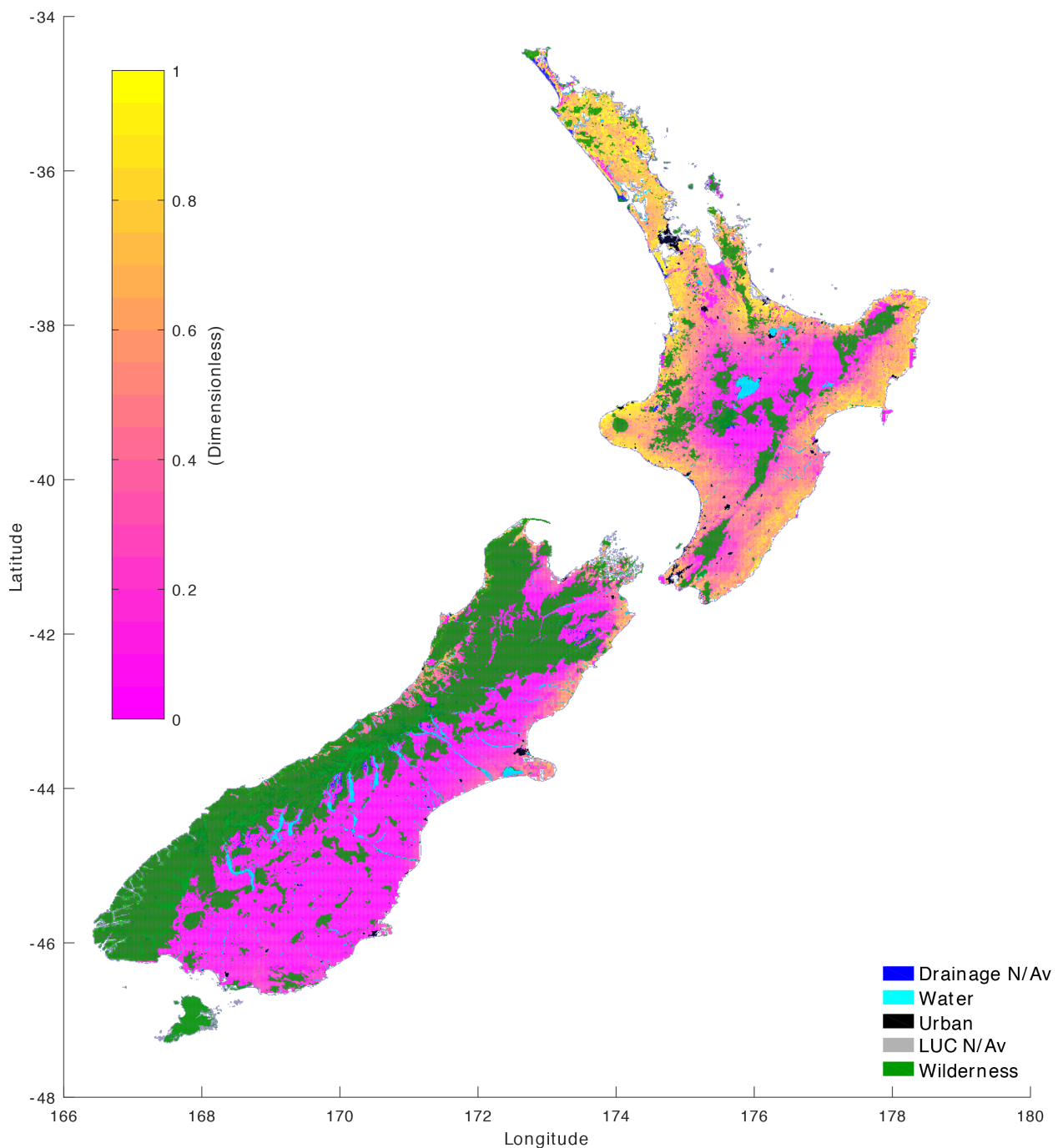


Land area (km²) of suitability ranges under the low GHG concentration pathway (RCP 2.6)

Suitability range	Historic (1972–2004)	Mid-century	Late-century
0.6–0.7	9,360	12,100 (10,300–13,500)	12,300 (10,500–13,800)
0.7–0.8	7,950	10,500 (9,140–11,300)	10,600 (9,360–11,500)
0.8–0.9	4,090	5,640 (4,670–6,970)	5,710 (4,680–6,990)
0.9–1.0	1,150	2,050 (1,690–2,820)	2,080 (1,700–2,880)

Ranges in brackets indicate prediction uncertainty

Mid-century forecast for avocado under the high GHG concentration pathway (RCP 8.5)



Land area (km²) of suitability ranges under the high GHG concentration pathway (RCP 8.5)

Suitability range	Historic (1972–2004)	Mid-century	Late-century
0.6–0.7	9,360	13,700 (12,300–15,300)	19,000 (17,900–20,100)
0.7–0.8	7,950	11,400 (10,600–12,700)	17,400 (16,100–18,900)
0.8–0.9	4,090	6,720 (5,630–7,830)	11,800 (10,400–13,000)
0.9–1.0	1,150	2,670 (2,230–3,340)	6,110 (5,360–7,340)

Ranges in brackets indicate prediction uncertainty

Summary: Climate change effects on avocado

Differences between climate change pathways are more pronounced by late-century (maps not shown) than by mid-century.

Under the low GHG concentration pathway (RCP 2.6)

- A modest increase in suitability is expected for most of the country by mid century.
 - Some marginal areas come into scope.
 - Little further increase in suitability by the end of the century.
- Areas with the highest suitability for avocado will continue to be predominantly in the Northland region.
 - Some change in land use from other crops to avocado could be expected in Northland.
- Overall, the areas of higher suitability will expand.
 - Particularly so in Taranaki, Bay of Plenty, Hawke's Bay and Waikato regions.

Under the high GHG concentration pathway (RCP 8.5)

- A modest increase in suitability is expected by mid-century for most of the country.
 - Some areas in Taranaki, Bay of Plenty, Hawke's Bay, Waikato, Wairarapa and Manawatu regions come into scope.
- Further improvements are forecast to occur by late-century.
 - More highly suitable areas develop in the above regions.
- Further and significant land-use change to avocado could be expected as warming temperatures disadvantage crops requiring winter chill.

Main climate factors affecting changes

- Improved warmth, particularly in Northland and the coastal regions around the North Island, will increase suitability.
- Reduced frost risk will also increase suitability.
- Breeding cultivars to improve frost-tolerance and/or protected cultivation will further enhance production opportunities.



For more information

This is one in a series of fact sheets about climate change impacts on the spatial footprint of horticultural crops that can be found at plantandfood.co.nz.

Prepared by The New Zealand Institute for Plant and Food Research Limited.

DISCLAIMER: While every effort has been made to ensure the information in this fact sheet is accurate, The New Zealand Institute for Plant and Food Research Limited (Plant & Food Research) cannot guarantee its accuracy and does not give any assurance as to the suitability of any such information for any particular use. Plant & Food Research will not be liable in any way for any loss, damages or costs which may be incurred by any person in relation to this information.

J009496

Acknowledgements

Research was completed under the Ministry for Primary Industries Sustainable Land Management and Climate Change (SLMACC) project 405421. Climate data were made available by the National Institute for Water and Atmospheric Research Limited (NIWA). Soil and slope data were reproduced with the permission of Manaaki Whenua – Landcare Research.