



# Drought in a Changing Climate

**New Zealand's future climate will be different to the one we have experienced so far. Scientists expect wind and rainfall patterns to shift, bringing more rain to western regions, with the east becoming drier.**

**A 2011 study (see sidebar) highlighted the implications for primary producers, many of whom already have to deal with drought.**

## What's in store for farmers?

The most likely scenario sees farmers in most North Island regions, as well as those in eastern regions of the South Island – especially Canterbury and eastern Southland – spending 5-10 per cent more of the year in drought by the middle of this century. This means that if you spend an average of 10 per cent of your time in drought at the moment, by 2040, you might expect to spend as much as 20 per cent – although this figure will naturally vary from year to year.

Between 2070 and 2090, that overall trend will intensify to the point where most of the country – with the likely exception of the West Coast of the South Island – will experience more time in drought.

Even under very mild climate change, the Canterbury Plains will experience more frequent droughts.

### Less-likely scenarios

Drought scenarios for the period 2030 to 2050 range from small increases in the amount of time spent in drought in eastern regions, through to a much more arid climate over most of the country. Time spent in drought could double by the middle of the century, depending on the climate model and scenario considered.

#### Widespread severe change

Under the more extreme projections, New Zealand becomes more arid by the middle of the century, and all regions – except the West Coast of the South Island – spend well over 10 per cent more time in drought. While less likely, this nevertheless still-plausible scenario therefore represents at least a doubling of the time farmers would spend in drought.

#### Mild change in a few regions

Also less likely, but still apparent in the study's results, is a much milder scenario in which only the Canterbury Plains in the South Island, and Northland, parts of Waikato, and Hawkes Bay to northern Wairarapa in the North, experience an increase in drought. Even then, the increase is less than an extra ten per cent of time spent in drought. By the end of the century, these effects intensify and spread slightly, but stay constrained to these regions.

## How were these scenarios developed?

Climate scientists at the National Institute of Water and Atmospheric Research (NIWA) considered a range of different climate change projections for New Zealand. The results of their work is outlined in “Scenarios of Regional Drought Under Climate Change”, which examined the ways drought patterns and frequencies might change as our climate warms over the rest of this century. Using 19 different climate change models, they calculated the likelihood of any given area going into drought.

### Why a range of scenarios?

The planet has warmed by around 0.7° C over the past 100 years. Much of that warming is due to greenhouse gases emitted into the atmosphere from human activity. Scientists expect concentrations of those gases to rise well into the 21st century, so they have to take them into account when they make climate projections.

To do that, they factor in a range of what are known as emissions scenarios, in which greenhouse gases variously increase slightly, moderately, or significantly. But humans are not responsible for all changes in the climate: scientists also have to consider other, entirely natural, climate phenomena – such as La Niña and El Niño – that have an influence.

All these variables mean scientists cannot predict one definitive future scenario, nor pick exactly when a drought might occur – they can only offer a range of possible changes to the likelihood of that drought occurring.

Nevertheless, the critical finding remains: that all possibilities point to the same general warming trend, and scientists can say with some confidence which scenarios are more likely, and which ones are less so.

The full technical report, Scenarios of Regional Drought Under Climate Change, outlines the scientific methodology in more detail. You can download it here: <http://www.niwa.co.nz/our-science/climate/research-projects/risk-of-drought-and-extreme-winds-under-climate-change>

## What farmers can do

Now is a good time to build more drought resilience into farming systems, with more efficient water management and storage. No report can prescribe the best response for any one individual or a given scenario: land managers should instead consider their particular circumstances, review their operations, then plan carefully and implement thoroughly. It's a good idea to closely monitor the rate at which your local climate changes, and respond accordingly. There are a great many theoretical and practical tools to guide such decisions, and best practice guidelines offer a sound basis for adaptive management.

Milder, drought scenarios might be dealt with simply by doing more of what you already do to manage your farm through drought: planning ahead, making good decisions early, with small modifications to current practices using tried and tested adaptations, especially around water management.

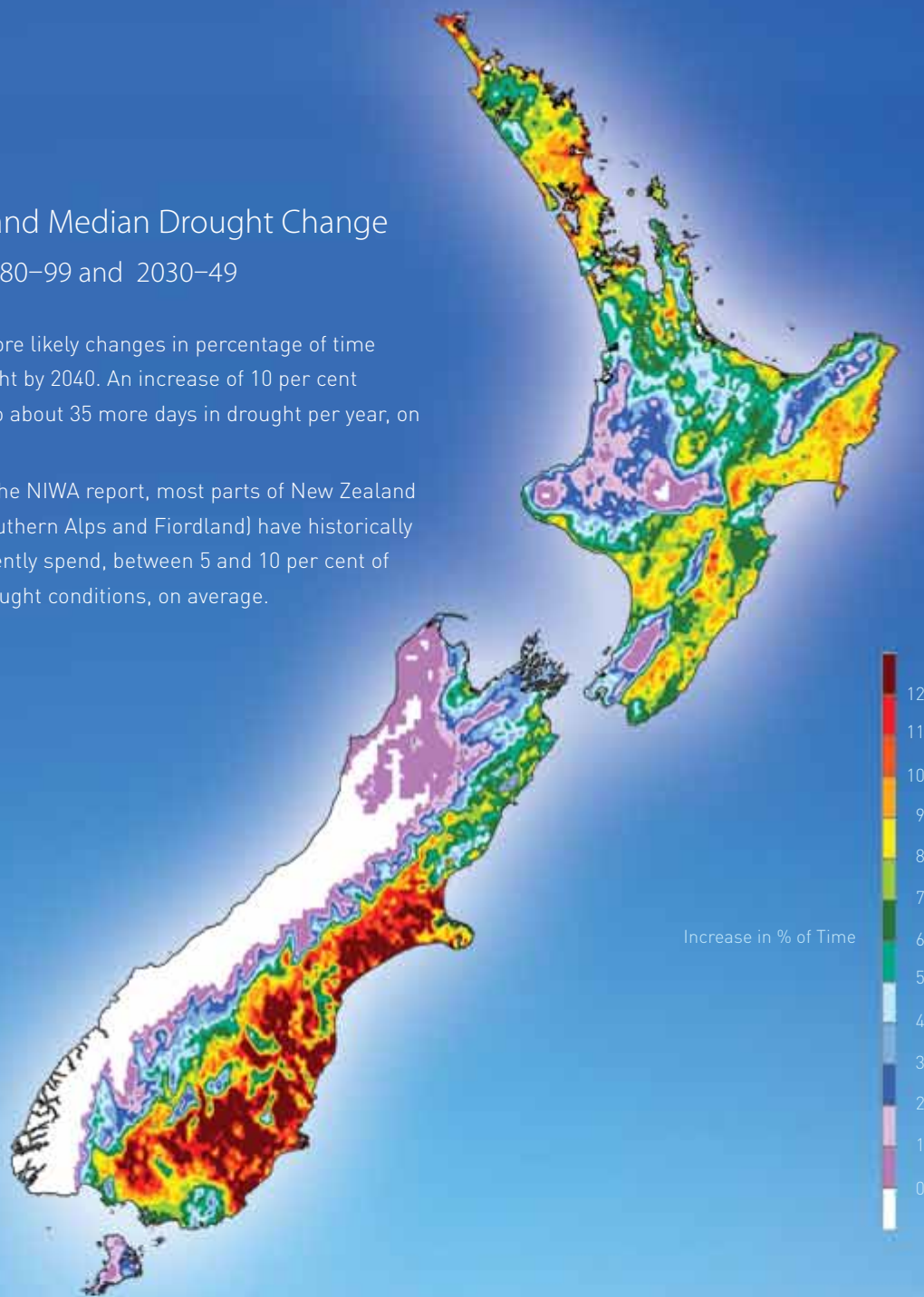
More severe scenarios – in which virtually all regions of New Zealand become more arid, with well over 10 per cent more time in drought – while also less likely, would nevertheless demand a comprehensive review of practices and management, and an innovative response. In some cases, farmers may consider more irrigation, or shifts in production timing, perhaps experimenting with different pasture species, forage crops or even moving operations to less severely-affected regions.



## New Zealand Median Drought Change between 1980–99 and 2030–49

Scenario of more likely changes in percentage of time spent in drought by 2040. An increase of 10 per cent corresponds to about 35 more days in drought per year, on average.

As defined in the NIWA report, most parts of New Zealand (except the Southern Alps and Fiordland) have historically spent, or currently spend, between 5 and 10 per cent of the year in drought conditions, on average.



## Where to go for more information

The full technical report, *Scenarios of Regional Drought Under Climate Change*, can be downloaded from [www.niwa.co.nz](http://www.niwa.co.nz), and [www.mpi.govt.nz](http://www.mpi.govt.nz)

## Planning for drought

[www.mpi.govt.nz/news-resources/publications.aspx](http://www.mpi.govt.nz/news-resources/publications.aspx). MPI has a range of reports, fact sheets and case studies here to help you plan for drought. They cover a wide range of sectors and farm types.

<http://www.mpi.govt.nz/environment-natural-resources/climate-change/resources-and-tools/adaptation-toolbox.aspx> This is a practical online adaptation toolbox to help guide you through key decisions.

<http://www.mpi.govt.nz/environment-natural-resources/climate-change/resources-and-tools/climate-change-resources-by-sector> A sector-by sector guide to adaptation.

## Climate change modelling

[www.niwa.co.nz/our-science/climate/information-and-resources/clivar](http://www.niwa.co.nz/our-science/climate/information-and-resources/clivar). How do scientists make projections about climate change? What degree of confidence do they have in those projections?

This page carries links explaining a wide range of climate research matters, including natural climate variability.

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