

ADAPTING TO A CHANGING CLIMATE: FACT SHEET 6

CROPPING
Managing in a changing climate

THE FUTURE OF CROPPING IN NEW ZEALAND

- A higher accumulation of heat units and earlier harvest dates.
- The potential for higher yields with sufficient moisture and nutrient availability.
- The requirement for irrigation in some areas.
- Wet weather challenges at harvest in other areas.
- New pest and disease challenges.
- Opportunities for new crops.

CLIMATE PROJECTIONS FOR NEW ZEALAND

- By the end of the century the whole of New Zealand is projected to be around 2°C warmer on average.
- Rainfall patterns are projected to change, becoming drier in the east and wetter in the west.
- Many areas will be windier.
- The country will experience more variability in extreme weather events such as storms, flooding and drought.

FOR MORE INFORMATION

- For more information on climate change projections for New Zealand visit the climate change section of the NIWA website **www.niwascience.co.nz**
- For more information on research into cropping, visit the Foundation for Arable Research website **www.far.org.nz**
- For more information on the MAF Sustainable Farming Fund project: *Developing a climate change strategy for the New Zealand Arable Industry*, visit the MAF website and search project C07/001 **www.maf.govt.nz**

This fact sheet explores the potential impact of a changing climate on arable cropping in New Zealand.

HEAT UNITS, MATURITY AND YIELD

One of the major effects of a warmer climate will be the increase in "thermal time" for all cropping regions. For example, by 2080 Lincoln may accumulate a similar amount of thermal time to what is experienced in Napier at present.

A faster accumulation of heat units will mean a potentially shorter cropping time and earlier harvest. Cereals require around 650 heat units from anthesis (flowering) until harvest. An average temperature increase of between 1°C and 2°C, reduces the number of days needed to achieve 650 heat units and brings harvest dates earlier. Some studies have shown that this reduction in maturity date may be around 10 days for spring-sown crops, and 15 days for winter-sown crops.

While this could potentially lead to a drop in yield, as the plant has fewer days between flowering and harvest to accumulate carbohydrates, the effect of higher atmospheric carbon dioxide (CO_2) may offset this effect.

Increases in atmospheric CO_2 levels can act like fertiliser and enable the plant to produce more carbohydrate each day. In modelling completed by Plant & Food Research, scientists found this growth boost due to extra CO_2 more than outweighs the reduction in yield brought about by increased temperature. Researchers have modelled the net effect on wheat grown in Canterbury to calculate a potential increase in yield of 2–3 tonnes per hectare if moisture and essential nutrients are not limiting.

WATER AVAILABILITY

The east coast and north of the North Island, coastal Canterbury and coastal Marlborough, are projected to receive less rainfall by the 2030s and an increase in evapo-transpiration. Many of New Zealand's crops are currently grown on non-irrigated land. Yields will be adversely affected if there is insufficient water during the growing period, even when heat accumulation is higher. This is particularly relevant for those crops planted in light soils.

Autumn and winter sown crops may be required on summer dry non-irrigated farms so crop cycles can be completed before the summer dry.

The cost of irrigation, especially for new infrastructure, is probably only economic for high value cropping such as vegetable seed production. Investment in new irrigation infrastructure needs to be carefully evaluated.

DROUGHTS AND EXTREME TEMPERATURES

In addition to a drier climate for some regions, the frequency of drought events is projected to increase. In areas prone to droughts, severe droughts which are currently a 1-in-20 year event, are forecast to increase in frequency so they occur every 2 or 3 years by 2080.

There is also an increased risk of extreme high temperatures (>32°C), which could affect pollination during the December flowering period and subsequent yield.

WET HARVEST

There is the potential for increased wet harvest periods both in Southland and in North Otago/South Canterbury. Affected areas may require additional grain drying facilities and machinery able to pick up crops, such as ryegrass seed, after it has been cut and then flattened by rain.

Heavy rainfall events also have the potential to turn well-aerated soils into "porridge" with subsequent potential soil losses and compaction issues. Minimum tillage and direct drilling techniques will help with this as will good soil husbandry practices. Machinery that is lighter and with greater tyre area will help minimise problems.

PESTS, DISEASES AND WEEDS

Some redistribution of pests can be expected, with those present in warmer northern areas expected to move south. This includes pests such as black beetle, green vegetable bug and clover root weevil. Changes in farming practise and the type of crops grown (e.g. more maize in Canterbury) will also encourage the build up of other pests (for example, cutworm, aphids). Warmer winters will encourage the spread of weed pests such as C4 grasses into areas further south. These incursions will need to be managed as part of good crop husbandry.

The prevalence of a number of rust diseases and wet weather fungal diseases is also expected to increase and will need to be managed through the use of resistant cultivars, pesticides and husbandry.

ESTABLISHMENT TECHNIQUES

In Hawke's Bay and coastal Canterbury where rainfall is projected to be lower through winter and spring, there will be greater need for soil moisture conserving practises such as direct drilling, minimum tillage and fallowing techniques. Other practises that could be adopted in drier areas include planting in wider rows and lower plant numbers within rows, in order to produce a plant population suited to the moisture resources available.

With higher winds forecast in some areas, soil erosion from wind may become more of a serious issue.

Spring sowing will be largely restricted to the reliable summer rainfall areas (as it tends to be now) as the drier areas try to get their harvest completed before the worst of summer dry takes a significant toll.

Key points

1. **Overall, New Zealand's climate is getting warmer. Projections are it will be drier in the east, wetter in the west and we will experience more extreme events such as floods, droughts and extreme high temperatures.**
2. **Higher temperatures and elevated CO_2 levels will influence season length, harvest dates and crop yields.**
3. **Lack of rainfall will increase crop variability in some regions and may require an investment in irrigation.**
4. **The extent to which improved potential in crop production in Canterbury is realised will depend on the future extent of irrigation and the capacity of surface and ground water resources to meet increased demand.**
5. **There will be a greater need for soil moisture conservation practices and autumn/winter sown crops.**
6. **Crop husbandry will have to deal with the arrival of new pests (such as black beetle and cutworm), fungal diseases in regions where moisture increases during summer and C4 grass weeds.**
7. **Some new crop options will be possible but these will need to be market-led.**

NEW CROPPING OPPORTUNITIES

A warmer climate will see the potential number and types of crops expand further south. Maize is one such crop. For areas that have drier spring weather there is a risk of increased spring frosts. So any change needs to be carefully evaluated including climatic risk, market demand and price, relative to the crops being grown now. Maize production will largely depend on demand, security of contracts and prices offered by the dairy industry.

THIS IS ONE IN A SERIES OF FACT SHEETS CALLED ADAPTING TO A CHANGING CLIMATE

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