

NZ Insight: Irrigation opportunities

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Contact

Susan Kilsby for more details.

Achieving more with less

Key points

- New Zealand is one of the few countries which is not expected to be impacted by a scarcity of water in the future
- The benefits of irrigation are not solely economic, as social, environmental, and welfare benefits are also derived from irrigation.
- An increase in irrigation can have positive environmental benefits providing any associated intensification is well managed.

Irrigation provides choices

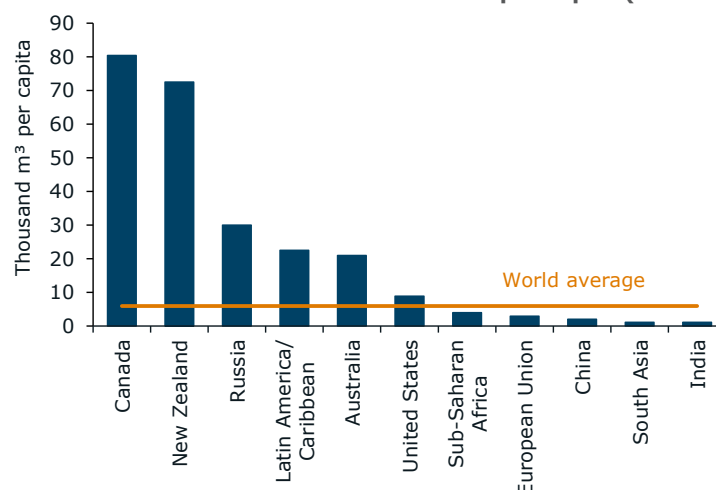
Irrigation provides an opportunity for a wider range of high-value land uses that would be too risky to invest in without a reliable water source. Increased irrigation has been associated with negative environmental outcomes due to the intensification of farming practices that has occurred on irrigated land. However, it is not so much irrigation that is to blame as a lack of understanding, and a lack of regulation of potential externalities.

Water shortages are beginning to occur across the globe, which will limit some countries' ability to feed their growing populations. New Zealand is lucky to have plenty of water available; we just don't always have water in the right places at the right times. Investing in irrigation can help mitigate the risks associated with both short-term weather events and longer term changes in climatic conditions.

New Zealand is not short of water, unlike most countries in the world. But we are short of infrastructure in which to store water so we can access this valuable resource where and when it is most needed.

On a per capita basis New Zealand has 72,510m³ of renewable freshwater available, compared to the world average of just 5,208m³. We have considerably more water available than most other major food-producing regions, including the United States, Australia and most parts of Europe and Asia. Countries with similar water resources to New Zealand include Canada, Chile and Peru, when measured on a per capita basis.

Renewable internal freshwater resources per capita (cubic meters)



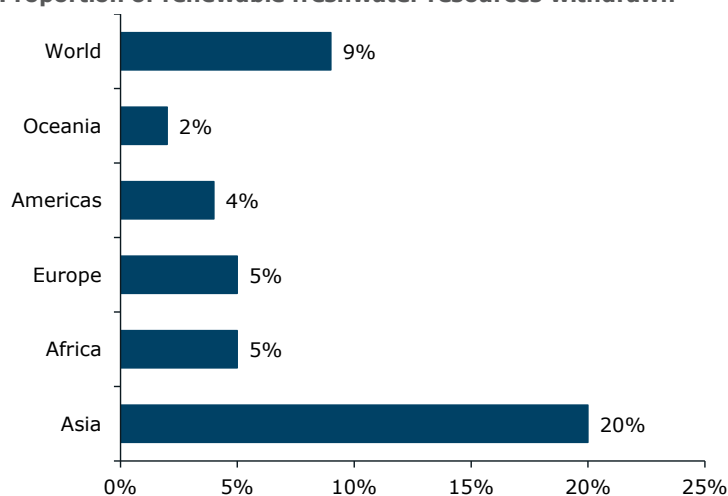
Source: Aquastat

Many other countries are using a much greater proportion of their available water for irrigation than New Zealand. In some cases the rate of use is unsustainable. The UN anticipates over half of the world's population will live in areas of water scarcity by 2050. Meanwhile the Global Water Institute estimates 700 million people could be displaced by intense water scarcity by 2030.¹

Agriculture uses 11% of the world's land surface for crop production, and accounts for 70% of all water withdrawn from aquifers, streams and lakes.²

Across the globe 40% of crop production comes from irrigated land, while just 20% of cultivated land is irrigated, indicating much greater yields are being achieved on irrigated land.

Proportion of renewable freshwater resources withdrawn



Source: FAO

China and India each have nearly 70 million hectares of land under irrigation. Asia also uses a much greater portion of its available water for irrigation. Many parts of Asia are expected to have water shortages in the future and will either have to become more efficient at using water, or will need to import more food.

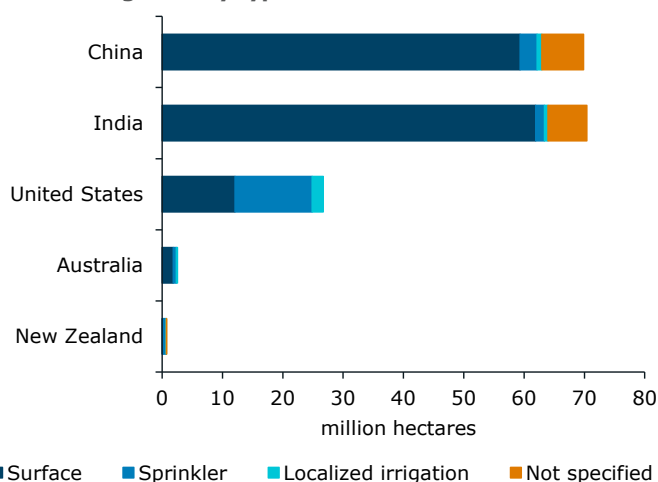
Global farming practices are unsustainable

Current farming practices will not sustain the world's future population. The FAO estimates China is already irrigating nearly all of the land it potentially can. India is only irrigating about 50% of the area of land that could be irrigated but water shortages are expected to limit further expansion. The majority of the irrigation in both countries is surface irrigation, which is less efficient than other methods of irrigation. Therefore both countries could potentially save water by investing in more efficient irrigation systems.

¹ Hameeteman, E., Future Water (In)security: Facts, Figures and Predictions, Global Water Institute, 2013

² FAO, The state of the world's land and water resources for food and agriculture (SOLAW) - Managing systems at risk, FAO & Earthscan, 2011

Land under irrigation by type



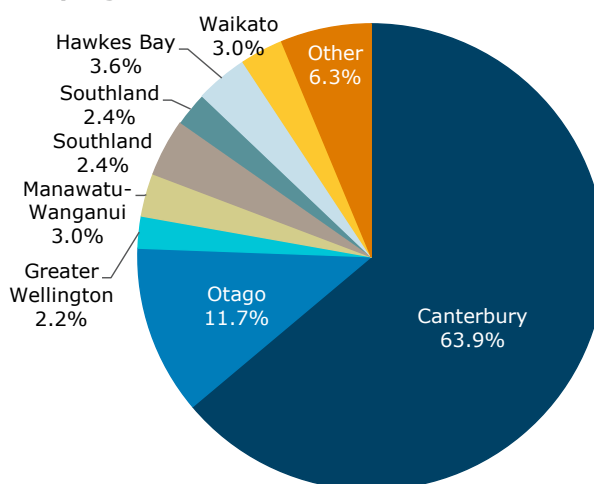
Source: FAO, ANZ Research

The 2020 United Nations World Water Development Report states: “Combining climate change adaptation and mitigation, through water, is a win-win proposal as improving the provision of water supply helps combat both the causes and impacts of climate change”.

Potential to increase irrigation in New Zealand

New Zealand has 747,000 hectares of land under irrigation, or approximately 3% of our total land area. The area under irrigation nearly doubled between 2002 and 2017. Approximately 45% of the land in New Zealand is used for farming, meaning just over 6% of our farm land is currently irrigated. Approximately 14.5% of New Zealand’s total land area is classified as land class 1–3 – a rough proxy for land most suited to irrigation. While this is only an approximation, it does indicate there is potential to apply water to much more land than is currently irrigated.

Irrigation by region



Source: Stats NZ

Canterbury and Otago collectively account for approximately 75% of the total area irrigated. Less than 17% of the land under irrigation is in the North Island. Of the land that is irrigated, 59% is used for dairy farming, while horticultural and arable uses collectively account for 24% of the irrigated land.

Irrigation allows for diversification

Irrigation provides an opportunity to increase productivity, allows more diverse uses of land, and is a tool that can be used to manage weather and climatic risks.

Producing more with less is becoming increasingly important as the agricultural sector faces limits and costs associated with greenhouse gas and nutrient emissions. Maintaining production and profitability, whilst reducing emissions, is a massive challenge for our primary sectors. Farming practices are starting to evolve to meet this challenge and irrigation will have a role to play.

Scientists are working on ways to reduce the methane that ruminants emit, but at this stage there is no silver bullet to fix the issue. We are all hopeful that the work being done by the science community in this area will eventually bear fruit, but in the interim what we can focus on to reduce methane emissions is improved productivity.

Productivity gains can be made through genetics and evolving farming practices. Traditionally genetic gains were targeted at improving milk production efficiency, growth rates, or improved rates for reproduction and longevity. But geneticists are now also targeting lower methane and nitrogen emissions.

Productivity gains can also be achieved by improved feeding. Having sufficient feed available to fully feed livestock means a greater portion of feed can be utilised for production versus maintenance. During feed shortages, growth rates for young livestock such as lambs and calves can be severely impacted if the quantity of feed available is only sufficient to cover maintenance requirements or the quality of feed is poor.

Irrigation reduces the risk of not being able to efficiently finish livestock, enables more flexible farming systems, and reduces the risk of having to off-load stock during dry periods when market prices are typically low, or cut short the milk production season.

Intensification of systems, whether due to irrigation or not, can result in a higher nutrient loading, coming either directly from the extra livestock being carried or from increased use of fertilisers. However, irrigation done well reduces nitrogen run-off, by ensuring that the water is delivered to dissolve the fertiliser at precisely the time that the plant requires it and is able to absorb it. If rain is forecast on dryland pasture, fertiliser is spread, but if the rain doesn't arrive, that fertiliser will dissolve at some later date which may not be the optimal time for the plant to adsorb it. Too much rain and/or a lack of uptake by the plant and the nutrients will leach through the soil into waterways.

Education is critical

Upskilling farmers about the optimal times and quantities at which to apply fertiliser to different pastures and other crops is therefore a win for not only reducing nutrient leakage, but also for maximising profit by not wasting fertiliser.

It is also important that any planned intensification occurs in the areas where soils are suited to intensive uses, to reduce the risk of nutrient losses to water ways. Tightening freshwater regulations will help ensure future intensification does not occur in regions which are already suffering from excess nutrient loadings.

Producing the same quantity of meat or milk from fewer stock, or finishing stock more quickly, will help to reduce total nutrient emissions, but it is not a simple linear relationship. Reduced stocking rates appear to be a simple answer to reduce both nutrient and greenhouse gas emissions, but emissions

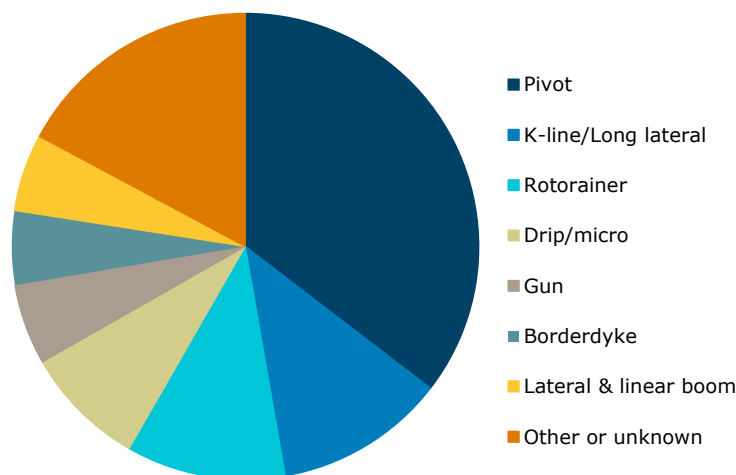
are also influenced by the quantity of feed consumed by each animal, and lower stocking rates can make it more difficult to control fluctuating pasture growth rates. Irrigation systems can help even out the quantity of feed available throughout the season.

Efficient production will minimise environmental impacts

To meet our environmental challenges there is a need to increase production in the areas which have soils that can handle higher stocking rates, without excessive leaching of nutrients, and limit stocking rates on more porous soils and steeper slopes.

Our farming and orchard management systems are becoming increasingly complex and sophisticated, including our irrigation systems. Water and nutrients are increasingly being applied in a more precise manner based on soil data readings and/or sophisticated modelling. The need to place water more efficiently onto the land, and in a more automated way, is reflected in the move away from flood irrigation to centre pivot irrigators.

Irrigation by type



Source: Stats NZ

Irrigation has a role to play in enabling alternative land uses. The ability to apply water when required means land can sustain a wider range of enterprises, particularly more intense arable and horticultural uses. Without access to water it would be too risky to invest in a number of these higher-value crops. Some crops don't require a large quantity of water, relative to pastures, but they do require water at strategic times.

Canterbury has the highest regional output of milk per cow and milk per hectare, with North Canterbury outperforming the national average by approximately 33%. Production in Canterbury also tends to be more consistent from season to season than other regions. It is no coincidence that Canterbury also has the most land under irrigation. Irrigation helps to ensure livestock are fully fed, which tends to equate to a consistently longer milking season. Lambs and cattle can also be finished more quickly.

Using irrigation solely as a risk management tool is rarely financially viable. Justifying the capital costs associated with accessing and reticulating water generally requires a higher-returning land use or more intensification of an existing land use. Strategic use of irrigation on part of a property can provide more management options and flexibility.

The cost to access and reticulate water varies considerably between water schemes. The reliability of access to water and the duration for which water access rights are granted are also important factors to weigh up when evaluating the financial benefits of irrigation.

Public benefits from irrigation

The benefits of irrigation are not solely economic, as social, environmental, and welfare benefits can also be derived from irrigation. Evaluating these benefits can be challenging, particularly when they apply to public goods rather than private goods. Welfare benefits include reducing stress on livestock during feed shortages and also reducing the mental stress farmers are subjected to during drought. Water storage facilities often have recreational uses as well, which provide public benefits to local residents.

Analysis of the value of any irrigation proposal, whether it be at the scheme level or the individual user level, requires analysis that takes into consideration both the immediate and future costs and benefits. These factors will vary considerably and in some areas are difficult to accurately quantify due to uncertainty as to how land will be able to be used in the future. Indirect costs and benefits are even harder to quantify and will be a highly subjective process. These challenges aside, at the macro level there are clear benefits from irrigation, and it is clear the world is going to require more food in the future.

New Zealand has an opportunity to continue to grow our role as a reliable supplier of high quality, ethically produced food. Used appropriately, irrigation can enable a wider range of crops to be grown, improve animal welfare, and reduce greenhouse gas and nutrient emissions, but used inappropriately it can enable negative environmental outcomes. We have to do this right.



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Sharon Zollner
Chief Economist

Follow Sharon on Twitter
[@sharon_zollner](#)

Telephone: +64 27 664 3554
Email: sharon.zollner@anz.com

General enquiries:
research@anz.com

Follow ANZ Research
[@ANZ_Research](#) (global)



David Croy
Senior Strategist

Market developments, interest rates, FX, unconventional monetary policy, liaison with market participants.

Telephone: +64 4 576 1022
Email: david.croy@anz.com



Susan Kilsby
Agricultural Economist

Primary industry developments and outlook, structural change and regulation, liaison with industry.

Telephone: +64 21 633 469
Email: susan.kilsby@anz.com



Liz Kendall
Senior Economist

Research co-ordinator, publication strategy, property market analysis, monetary and prudential policy.

Telephone: +64 27 240 9969
Email: elizabeth.kendall@anz.com



Miles Workman
Senior Economist

Macroeconomic forecast co-ordinator, fiscal policy, economic risk assessment and credit developments.

Telephone: +64 21 661 792
Email: miles.workman@anz.com



Kyle Uerata
Economic Statistician

Economic statistics, ANZ proprietary data (including ANZ Business Outlook), data capability and infrastructure.

Telephone: +64 21 633 894
Email: kyle.uerata@anz.com



Natalie Denne
PA / Desktop Publisher

Business management, general enquiries, mailing lists, publications, chief economist's diary.

Telephone: +64 21 253 6808
Email: natalie.denne@anz.com



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