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NZQA

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 2 Agricultural and Horticultural Science 2025

91297 Demonstrate understanding of land use for primary production in New Zealand

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of land use for primary production in New Zealand.	Demonstrate in-depth understanding of land use for primary production in New Zealand.	Demonstrate comprehensive understanding of land use for primary production in New Zealand.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–8 in the correct order and that none of these pages is blank.

Do not write in the margins (////). This area will be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Excellence

TOTAL 24

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QUESTION ONE: Irrigation

Identify a region in New Zealand that currently uses irrigation to support a chosen primary production land use.

Region: Bay of Plenty

Land use: Kiwifruit orchards

(a) With reference to your chosen region, explain how **environmental** and **economic** factors have influenced the decision to irrigate your chosen land use.

Kiwifruit orchards in the Bay of Plenty often use irrigation. Factors justifying using irrigation include environmental factors, and economic factors. From an economic point of view, irrigation helps mitigate frost damage on the vines (Bay of plenty has ~30 days of frost annually). This reduces the damage on the vines, leaving the plants un harmed and able to pruduce fruit at a much higher capacity. This means that orchadists in the Bay of Plenty with irrigation as frost protection can maximise profits from more exported/sold fruits in comparison growers that did not use irrigation as frost protection and has frost damaged plants. Also, kiwifruit vines need water to produce glucose (energy for the plant to grow) through photosynthesis, and in the odd case of a drought (not likely in the Bay of Plenty with ~1300-2000mm of rainfall annually), the plant needs water to grow and thrive. If there is no irrigation, it may limit the orchards production leading to less profit for the orchadist (an economic disadvantage).

Precision irrigation is the most commonly used irrigation on kiwifruit orchards, and is much more sustainable than some other traditional irrigation methods. Precision irrigation is much more efficient with its water use as it specifically focuses giving just the plant the water it needs. This saves a lot of water proving to be the better option environment wise when it comes to irrigation. Wasting water is not environmentally sustainable, however saving water is, proving to be an influence in the decision making of choosing to irrigate.

Irrigation can have some negative impacts on the environment. To remain a sustainable land use into the future, farmers / growers need to consider how to maintain production but also to protect the environment.

(b) Discuss whether irrigation of your chosen land use can continue sustainably into the future.

Consider **social** and **political** factors to support your discussion.

The precision irrigation often used on kiwifruit orchards is environmentally sustainable for a series of reasons, some of which are social and political factors. Some social factors may be the social acceptance of saving water. Socially, it is well praised to be environmentally friendly and save water, especially in the agribusiness industry. Precision irrigation is much more sustainable than some other traditional irrigation methods. Precision irrigation is much more efficient with its water use as it specifically focuses giving just the plant the water it needs. This means that the water saved by precision irrigation will be praised in the community, letting orchadists keep their social license, and be able to continue farming kiwifruit sustainably in the future, without dropping in production and keeping the community happy.

The government has rules and regulations to stop the leaching of fertilisers into waterways to stop algal blooms and eutrification. In a kiwifruit orchard, this is incredibly unlikely, however, the use of irrigation may cause this. If a kiwifruit orchard is close to a waterway and a fertiliser has just been applied, then the use of irrigation may cause some of this fertiliser to run off into the waterways, causing an algal bloom or eutrification. If this were to occur, the council/government may notice this and enforce these rules, possibly stopping the use of fertiliser on that orchard. This would limit the production of the orchard as fertilisers give the plant key nutrients to produce a healthy and plentiful crop. However, the chances of this are incredibly low, as kiwifruit fertiliers aren't heavily used in comparison to dairy farming. The chances that irrigation are the cause of this are also incredibly low, so the use of irrigation is still likely to be sustainably used in the future on kiwifruit orchards, still maintaining production and abiding to government rules and regulations.

Page 2

QUESTION TWO: Market gardens

The location of market gardens is determined by a range of factors. Identify a region in New Zealand used for market garden production.

Region: Northland

(a) Explain how your chosen region provides the **environmental** and **social** requirements for market garden production.

Market gardens are often a chosen land use in Northland due to a series of factors/requirements, including environmental and social. Here are some environmental requirements:
Market gardens can't survive well in frosts as it damages the plant, limiting production. In Northland, there is limited days with frost (~<5 annually), meaning market gardens can be grown with minimal worries about an environmental factor like a frost in comparison to other regions where frosts are much more common. Market gardens also require nutrient dense, arable land, which is in abundance in Northland due to the past volcanic activity that happened there long befor we started farming the land. This ensures that market gardens can be produced without being limited by a poor soil type and days with frost, as Northland provides the ideal environmental conditions for both of those.

Socially, market gardens provide many jobs for the local community. It provides seasonal work for harvesting crops and full time work for machinery operators having to fertilise, spray and other machinery jobs related to market gardens. This proves that market gardens are socially accepted, especially in Northland as it provides many jobs for the region. If market gardne production were to suddenly stop, many people in Northland would lose their job, placing a social burden on the Northland region. Northland also provides sufficient workers that are happy to work on a market garden, meaning that Northland also provides the correct social requirements for market gardens to be produced there.

(b) Justify why your chosen region should remain in market garden production, and why it should not be converted to an alternative land use.

Consider **economic** and **workforce** factors to support your justification.

In the Northland, market gardens are a key land use and it has been for many years. This is due to a series of factors, in which include economic and workforce factors. Economically, market gardens are a very productive use of land for the Northland, especially when environmental and social requirements are met. They produce around (depending on the garden) ~$30,000 - $80,000/ha. This means that if it were to be converted to another land use, it would have to be quite an intense use of land to compete with market garden's economic production/profit, likely placing a burden on another factor. e.g huge big factory likely earns more per hectare than market gardens, but would be less likely to be accpeted socially and also releases more greenhouse gases. This means that market gardens should remain in production in Northland. Also, switching land use takes time, money and effort. Economically, the time it takes to switch land use is profit to be missed out on from the existing market garden. This profit lost alone is an economic burden, and then there is also the cost of ripping out the market garden and setting up/purchasing the new land use. This means that Northland should continue with its market garden production from an economic point of view.

From a workforce point of view, market gardens provide many jobs for Northland, especially seasonal jobs. If market garden production were to be switched to some other land use, many people in Northland would lose their job. Also, workers who are specialised in the market garden industry may struggle to find a new job, placing another burden on the workforce in Northland. For example, someone is a qualified fertiliser applicator and runs a fertiliser business in Northland. If the gardens in Northland were to be switched, this would put him out of business and leave him unemployed for an extended period of time. His options are, either leave Northland, or switch his role in the workforce, which may take more time and effort, leaving him unemployed for longer. This means that Northland should continue with its market garden production, from a workforce point of view.

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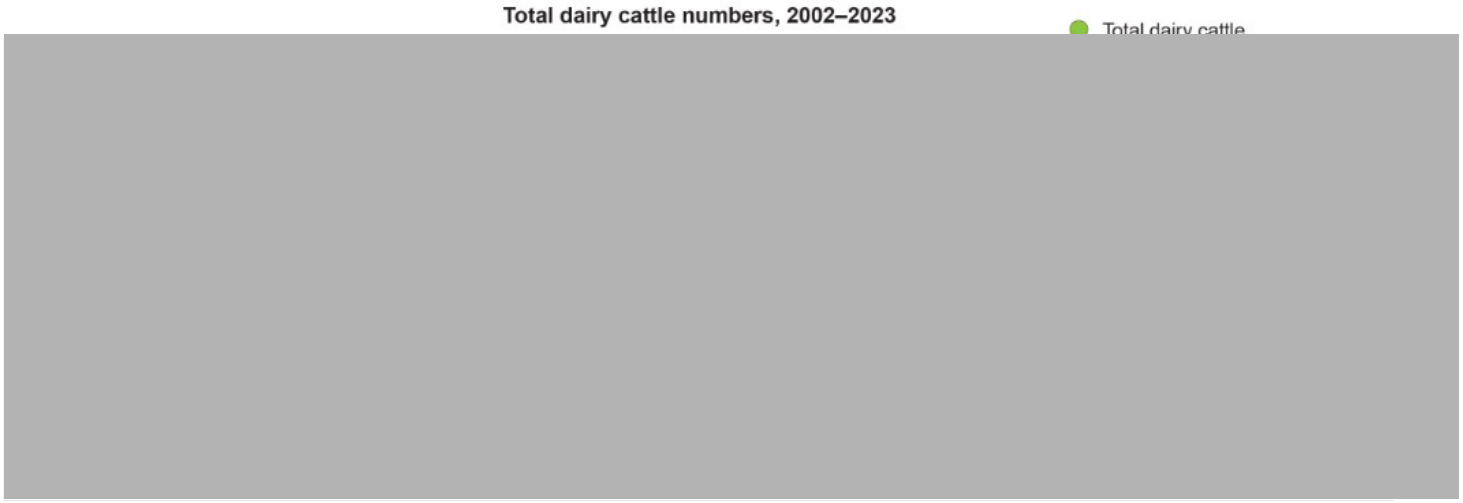
QUESTION THREE: The national dairy herd

The national dairy herd peaked in 2014, and it has slowly declined over the past 10 years.



Source (adapted): https://www.stats.govt.nz/information-releases/agricultural-production-statistics-year-to-june-2023-final/

(a) Explain how **political** and **technological** factors have led to the decline of dairy cattle numbers in New Zealand.

The decline of dairy cattle numbers over the past ten years in New Zealand have been caused by multiple reasons, these can include political and technoligical factors. Politically, New Zealand signed the Paris agreement in 2016, and has a nationwide goal to reduce greenhouse gas emissions to net zero by 2050. Cattle in New Zealand are a huge contributor to greenhouse gases as they release methane into the atmosphere. The less cattle there is in New Zealand, the less methane there is in the atmosphere, the closer New Zealand is to its signed Paris agreement. This politcal factor has led to the slow decline of dairy cattle numbers in New Zealand, evidently shown on the graph above.

New technology, especially in the dairy industry, is always being introduced. Many of which are to ultimately help increase the production of milk solids per cow. For example, specified artificial insemination, combined with new cow tracking technologies (like eartags and halter) can be used to only breed high milk solid producing cows. These new technoligies mean that a dairy farm can have less dairy cattle numbers and still produce the same amount of milk solids. Because these technoligies have been quickly and widely adapted across New Zealand, many dairy farmers have reduced cattle number to maintain profit and reduce expenses, increasing their profit margin. This has ultimately led to a decline in cattle numbers, evidently shown in the graph above.

(b) Evaluate the impact that a reduction in dairy herd numbers would have on future land use.

Consider **economic** and **workforce** factors to support your evaluation.

Reduced cattle numbers across New Zealand can effect future land use through a series of factors, some of which include economic and workforce factors. Economically, reduced dairy cattle may reduce profitability of the land per hectare. This means that there may be other land uses suitable for that region environmentally, that can profit more than the existing dairy farm. For example, a dairy farm reduces cattle numbers, reducing its profitability per hectare. However kiwifruit market is booming, which it especially has this year with higher payouts meaning even some green orchards are making up to $160,000/ha (much more than any dairy farm could ever produce), therefore the land use being switched from dairy to kiwifruit to improve economic profitability for the land. Coming from an economic perspective, this means that a reduction in dairy herd numbers would likely lead to a diversification in future land use, specifically to one that would provide a greater economic benefit.

Also, especially with all the new technologies these days, dairy farming is relying on less and less workers. Reduced cattle numbers also will likely result in less needed workers for the dairy farms, meaning some people in the workforce lose their jobs. Due to this, the existing dairy farms may be switched to a land use that can provide more jobs for the workforce. The reduction in cattle would especially encourage this because less cattle will directly result in less work needed on the farm. If another land use can provide more jobs for the workforce than the declining (workforce wise) dairy industry, then it seems logical to switch the land use to another land use that can provide more jobs. This is because providing more jobs is much more beneficial to the workforce than leaving people unemployed. (Coming from a workforce point of view) Therefore, meaning reduction in dairy herd numbers can likely lead to a diversified land use, specifically one that would provide more jobs than the existing dairy farm.

Excellence

Subject: Agricultural and Horticultural Science

Standard: 91297

Total score: 24

Q	Grade score	Marker commentary
One	E8	The candidate has provided a full discussion of whether the irrigation of kiwifruit orchards in the Bay of Plenty can continue sustainably. Precision irrigation has been discussed as a socially acceptable alternative to traditional irrigation methods, and the government regulations around leaching is discussed in detailed. Both social and political factors are included and linked back to the named production type.
Two	E8	The candidate has justified why Northland should remain in market gardens by considering workforce and economic factors, and both strengths and weaknesses. Evidence has been given throughout the response to support ideas, and the seasonality of the workforce is discussed.
Three	E8	The candidate has evaluated the impact reduction of cow herds will have on future land use by considering positives and negatives that a reduced number of dairy cows could have. Workforce and economic factors have both been considered in some detail, although workforce factors are more detailed through the links to technological factors. A good level of understanding is shown with strong supporting evidence.