SUPERVISOR'S USE ONLY

3

91532

915320

Draw a cross through the box (☒) if you have NOT written in this booklet

+

NZQA

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 3 Agricultural and Horticultural Science 2025

91532 Analyse a New Zealand primary production environmental issue

Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Analyse a New Zealand primary production environmental issue.	Critically analyse a New Zealand primary production environmental issue.	Comprehensively analyse a New Zealand primary production environmental issue.

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 2–10 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 7

Page 1

INSTRUCTIONS

Carefully read ALL the instructions AND parts of the task before answering.

Answer the different parts using one primary production system.

Name your specific primary production system.

Primary production system: Dairy Farming.

PLANNING

59% of freshwater rivers contain excessive levels of nitorgen

Between 1996 and 2014 Dairy cow numbers increased by 61�tween 2002 and 2019 the amount of irrgated land has doubled

Biodiversity is worth 57b to NZ econeny

90% of wet lands have been lost since prehuman times.

Planting riparian zones can decrease nitrogen in waterways by up to 20%

Methane and nitrous oxide contribute to 52% of NZ gross emmions

NZ has 80,000 endemic speccies

Eutrophication is a prcoess whereby high tempratures combined with high nitrogen levels in freshwater causes toxic algae to bloom, which deoxygehates the water. The toxic algae is also harmfull to freshwater creatures.

Annual soil testing can reduce nitrogen use by 20m of soil takes 2000 years to be created

Gross production on regenrative farms in ussually 20% lower, however, this is ofset by lower costs

TASK: The impact of management practices on biodiversity

Primary producers carry out management practices to produce their products. Some of these management practices have negative impacts on the biodiversity of the environment.

(a) For your chosen primary production system, explain the **negative** impact its production can have on biodiversity. In your answer consider the management practices used, and how biodiversity is impacted.

Use data from within the past five years and other evidence to support your answer.

Intensive Dairy farming can lead to negative impacts on freshwater biodiversity. Specifically, the use of intensive winter grazing in areas such as Cantebury, where freshwater biodivertiy is being severely affected. Intensive winter grazing is a common manegment pratice used in the dairy industry, to feed and maintain cows over the winter. Brassica crops are often grown, such as fodder beet and kale. These crops often have high yeilds of up to 20ton per hectare, meaning large mobs of stock are kept in small confined areas, at high stocking rates. They are often 'strip grazed', allowing them a certain amount of feed each day. Therefore, intensive winter grazing is an efficient way to utlise the limited feed available over the winter. However, winters with high rainfall, combined with the stony and free draining soils of the cantebury plains often means that the paddocks in which winter grazing is utilised can become barren, pugged and muddy. This means that as cows discharge there urine, which contain nitrogen, it is allowed to seep into the soil. The lack of plants to utlise the nitrogen means it often leachs through the soil to critical source areas, such as creeks, rivers and lakes. This process of nitrogen leaching is a major problem of intensive winter grazing. As the nitrogen enters freshwater, it contaminates the water, and harms the freshwater biodiversty. Around New Zealand, 59% of freshwater rivers contain excessive levels of nitrogen, many of these in Cantebury. Moreover, as the dairy 'boom' has occoured, cow numbers have exploded, increasing by 61�tween 1996 and 2014, causing the usage of intensive winter grazing to also increase. Excessive levels of nitrogen in freshwater can cause a process called eutrophication. Eutrophication is a process whereby the excessive levels of nitrogen combined with high tempratures casues toxic algae to bloom, while also deoxygenating the water. This can have an affect of the biodiversity of waterway in multiple ways. For example, trout, along with most creatures require oxygen to live and exsist, however, the water is deoxygnated by the toxic algae. Fundementally, this can destroy the entire biodiversity of the river, as the wide range of living things cannot function. Moroever,the toxic algae can also be harmful towards them. Smaller creatures which live amogst the rocks of stony bottum rivers are also affected, as the toxic algae is a 'mat' like effect, carpetting the river rocks. This means the creatures which trout feed on lose there habitat, causing the whole ecosystem to be affected.

Many farmers understand that their production can have a negative impact on biodiversity and are using courses of action to mitigate the negative impacts or improve biodiversity.

(b) Explain how TWO courses of action, when used correctly, will **mitigate** the negative impacts or **improve** biodiversity for your chosen production system.

Use recent data from within the past five years and other evidence to support your answer.

Course of action (1): Planting Riparian Zones

Planting riparian zones beside critical source areas on dairy farms can both mitigate the negative impacts of diversity while also improving it. A riparian strip or zone is an area of land beside waterways such as creeks and rivers, which is set aside to allow for the planting of native plants such as flaxes and manuka trees. This is often a 'buffer' of 5-10 metres between the waterway and the farm land. Generally, these zones are fenced off, meaning stock cannot access them or the river. These zones can mitigate the impacts of intensive winter grazing. Has nitrogen leaching occours during winter grazing, the nitrogen will inevitably leach towards critical source areas such as rivers. If the farmer has chosen to plant a riparian zone, there will be a mulitude of native plants and trees, with deep roots, which will stand before the river. These plants will 'soak up' the nitrogen, utlising it for there own growth. This zones effecitvly act as a buffer or a filter for the nitrogen, meaning far less enters the waterway. A study by Dairy NZ found that riparian zones decrease nitrogen in waterways by up to 20%. Therefore, this could lead the negative affects of eutrophication, as explained above, far less likley to occour, mitgiating the effects intensive winter grazing. Moreover, planting riparian zones can improve a farms biodiverity. They can provide habitats for a wide range of creatures, such as Puhkekos. This addition of habbitats on farm is very imporatant, as 90% of NZ wetlands have been lost since prehuman times, meaning the area of land avaliable for ecosystems to exsist is very small. Moreover, NZ has 80,000 endemic specises, meaning providing habitats such as riparian zones that contain native plants is important to ensuring all of the creatures which are only found here contunie to thrive. Esstially, riparain zones can act as 'mini' wetlands.

Course of action (2): Regenative farming

Regenative farming is a style or type of farming which focuses on the holistic manegment of soil, plants and animals. There is no one way to define it, however there are many principals that can be attributed to regenrative farming. Essentially, regenative farming aims to decrease the intensity of a farming system, reducing inputs such as chemicals, fertliser, intensive culitvation and grazing etc. It can be in many ways similar to orgnaic farming. Regenative agriculture often aims to farm in a way which is self sustaining, or 'regenerating' has nature has done for many years. For example, instead of planting a monoculture of ryegrasses, which is common on all dairy farms, a wide range of grass species are planted. There could be 30 species of grass and clover, which all support each other, and regnerate. Farms often reduce there use of chemicals, which improves biodiversity, as many chemicals aim to kill all creatures such as bugs in some crops. Morever, these chemicals are costly, as they can often makeup 15% of a Dairy farms costs in one year. A reduction in nitorgen use will likley lead to a decrease in nitrogen leaching, which will mean less of our waterways are contaminated and the process of eutropication is less likley to occour. In a regenative system, farmers are more likley to rely on organic fertlisers such as manure to help fertliser pastures and crops. The biodiveristy for birds and bees improves, as the wide range of pasture mixes can mean they have more to feed on, and they can also help pollinate certain species. Farmers often reduce there intensive culitvation such as ploughing and powerharrowing, or stop it all togeather, and rely on direct drilling. This improves soil biodivesity in multiple ways. Firstly, intensive cultivation can deciamate soil strucutre, and the creaturess within such as worms. A sign of a healthy and biodiverse soil is one which contains many worms, which is uncommon when powerharrows destroy the soil. Morever, soil erosion decreases, due to a lack of cultivation. This is imporatant as 1cm of soil can take as much as 2000 years to generate, meaning continous cultivation can reduce the habitat for creatures such as worms, bugs and fungi within the soil.

Source: https://www.eeec.org.au/wp-content/uploads/2023/05/enviro-200x200.jpg

(c) Justify which of your two courses of action has the greatest positive impact on biodiversity, while ensuring the environmental, economic, and social sustainability of your production system.

Use recent data from within the past five years and other evidence to support your answer.

Both courses of action above, planting riparian zones and changing a farms system towards a more regentative style of production will improve biodiverity. It is clear that Regenative agriculture has the greatest postive impact on biodiversity of the two manegment practices. Regenative Ag compeltly transforms a farms production system, tilting it towards a complete focus on biodiveristy, from reducing chemical use such as nitrogen, using a wide range of speices in pasture and crop paddocks instead of a monoculture, and focusing on improving soil strrure and the organisms within it. On the other hand, while riparan zones are effective for reducing nitrgoen in waterways and providing habitats for biodiversty, they are less of a 'farm wide' change and will therefore have a smaller effect.

However, when all things are considered, such as the criteria above of envirometal, economic and social sustianabilty, it is clear that using riparian zones to improve biodiversity is a more effective manegment pratice. I have come to this conclusion for multiple reasons. Firstly, it may not be econmically viable for farms to switch to a regenative syle of farming. While input costs do decrease in areas such as chemicals and fertilisers, this inadvertantly comes with a decrease in production. Intensive dairy farms on the Cantebury plains will not be able to sustain there high cow numbers, or there grass production. In general, Regnerative AG can reduce a farms gross income by 20%, which may not be offset by lowering input costs. On the other hand, planting riparian zones allows farmers to contiue with there normal method of production, while using small amounts of land to also increase there biodiveristy. These means that farmers will contunue to be econmically sustaible, which is critical to the wider NZ econemy. Moreover, riparian zones signicantly improves the enviromental sustianabilty of a dairy farm, and therefore it's social lisece. The use of riparian zones improves biodiveity, meaning the overall envirometnal sustaibality of the dairy farm is increased, and into the future. Riparian zones are an enviromental and finanical asset to dairy farms. Morever, increasing biodiversity is a profitable venture for the country. Biodiversity is worth $57b to the NZ econemy, meaning improving it is desirable. The public are more likley to be supportive of dairy farmers if they are seen to be 'doing there bit' for biodiversty, and riparian zones are a very visible way to show this. Moreover, toursists are more likley to visit rural areas as they can appreciate the natural buety of riparian zones, and can also appreciate NZ farmers helping to improve biodiversity. Lastly, and perhaps most importantly, overseas consumers will be more likley to purchase our products if they can see that NZ farmers are helping to improve envioremtal sustaibality and biodiveristy, which is a postive for the whole country. Overall, planting riparian zones is the most effective way to improve biodiversity while also retaining an econimally sustaiably and profitable industry.

Excellence

Subject: Agricultural and Horticultural Science

Standard: 91532

Total score: 7

Q	Grade score	Marker commentary
One	E7	The candidate has explained in detail the impacts dairy farming can have on biodiversity. Specific focus was given to the effects on winter grazing in terms of nutrient leaching and runoff, and how this leads to eutrophication and habitat damage. They have explained in detail how both riparian zones and regenerative agriculture are courses of action that can help reduce the negative impacts of dairy farming on biodiversity. The candidate has justified how riparian zones allow for more economic and social sustainability. For a high Excellence the candidate could have provided more details as to why riparian zones also allow for greater environmental sustainability.