Assessment Schedule – 2021

Agricultural and Horticultural Science: Analyse a New Zealand primary production environmental issue (91532)

Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
Analysing *an environmental issue* involves explaining environmental issue arising from primary production management practices, potential courses of action as well as recommending courses of action.	***Critically analysing*** *an environmental issue* involves explaining in detail an issue arising from primary production management practices, evaluating courses of action to mitigate negative impacts and recommending action to support sustainable management practices.	***Comprehensively analyse*** *an environmental issue* involves justifying one or more courses of action to support sustainable production management practice, which include environmental, economic, political, and / or social considerations.

Evidence

N1	N2	A3	A4	M5	M6	E7	E8
Partially explains the negative impact on freshwater from producing their chosen primary product.	**Partially explains** the negative impact on freshwater AND social impacts from producing their chosen primary product.	**Explains** the negative impact on freshwater AND partially explains the social impacts from producing their chosen primary product. *AND* **Explains** a realistic course of action the grower could take. Discusses some reduction of negative environmental impacts.	**Explains** the negative impact on freshwater AND social impacts from producing their chosen primary product. *AND* **Explains** a realistic course of action the grower could take. Discusses the reduction of negative environmental impacts discussed.	**Explains in detail** the negative impact on freshwater AND **explains** social impacts from producing their chosen primary product. *AND* **Explains in detail** a realistic course of action the grower could take to allow for sustainable production. Discusses the reduction of negative environmental impacts.	**Explains in detail** the negative impact on freshwater AND social impacts from producing their chosen primary product. *AND* **Explains in detail** a realistic course of action the grower could take to allow for sustainable production. Discusses the reduction of negative environmental impacts.	**Explains in detail** the negative impact on freshwater AND social impacts from producing their chosen primary product. *AND* **Recommends** a course of action to reduce the negative impact on freshwater *AND* **Justifies** a realistic course of action the grower could take to allow for sustainable production. Discusses the reduction of negative environmental impacts, as well as some discussion on social and economic impacts.	**Explains in detail** the negative impact on freshwater AND social impacts from producing their chosen primary product. *AND* **Recommends** a course of action to reduce the negative impact on freshwater *AND* **Comprehensively justifies** a realistic course of action the grower could take to allow for sustainable production. The course of action justified should be on-farm but will have benefits off-farm to the wider community of New Zealand. The course of action needs to be able to be carried out into the future, so there can be expected interruptions in the short term in the production system to move to sustainable production. Discusses in detail the reduction of negative environmental impacts as well as discussion on social and economic impacts.

	Sample evidence
(a)	**Environmental impact** *Effects on freshwater* Increased nutrient levels in groundwater. • 44 per cent of monitored sites had elevated nitrate levels above what is expected under natural conditions (Statistics NZ). • Nitrate levels in Central Hawkes Bay groundwater are increasing. Reduced flow levels in surface water reducing their life-supporting capacity. • Ministry for the Environment (MfE) publication states: For 2017/18, taking water for irrigation was predicted to have the greatest potential to cause widespread reductions in river flows across the country when compared with other uses. • Lower flows and seasonal variations can affect whitebait species because their reproduction is closely tied to water levels. Īnanga lay eggs in the vegetation beside rivers and streams during the highest (or king) tides in late summer and autumn (Goodman, 2018) but the eggs must be submerged on the next king tide to stimulate hatching (McDowall, 2000). In braided rivers, lower flows can reduce the number of channels and consequently the amount of habitat available for threatened birds like wrybill and black stilt (kakī) (O'Donnell et al, 2016). Destruction of marine habitat from changing natural watercourses. • Farmers who change water courses, such as straightening rivers or streams, change the natural ecosystems within the water course. The waterway loses its deeper pools, faster braided rapids, rocks and bank vegetation. These are important for a variety of organisms in the marine environment from insect species through to fish species. Increased nuisance weed growth in waterways contributes to fluctuating dissolved oxygen (DO) levels. • 80 per cent (DO) saturation is recommended to protect aquatic ecosystems, while 98–105 per cent is recognised as necessary for a healthy ecosystem. Some streams in dairy catchments were measured at around 40 per cent, but as low as 10 per cent. This is very low, making it unfavourable for living organisms. Increased levels of pathogens in waterways. • NIWA states that waterways can easily become contaminated by pathogens when effluent is discharged nearby. Pathogens are commonly found in farm-animal waste. Surface and groundwater can easily become contaminated by pathogens when effluent is discharged to a waterway, or is discharged or deposited onto land near waterways.

(b)	**Social impacts** Increased incidence of human illness from drinking water with increased levels of pathogens. • Half of the notifiable diseases in New Zealand are zoonoses, which means they are transmitted from livestock to humans. In 2018, there were 141 leptospirosis cases reported, which is three times the number of cases as in 2017. • A report produced after the Havelock North water incident stated nearly 800,000 New Zealanders – or 20 per cent of people on town supply – are drinking water that is "not demonstrably safe". Of these, 92,000 are at risk of bacterial infection, 681,000 of protozoal infection. Unsafe drinking water from bores due to nitrate levels over the safe drinking standard. • 800,000 people, or 1 in 6 New Zealanders are consuming water with elevated levels of nitrate at a rate which has been identified by a Danish study to contribute to colorectal cancer. Reduction in enjoyment from downstream users due to lower river / stream flows. • Lower water levels would result in lower water quality, reducing enjoyment of these waterways. From swimming to fishing to bathing to boating, lower water levels equally reduce the ability to carry out these activities during summer months. Increased number of days when people are instructed by councils not to come in contact with waterways because of safety concerns. • Many regional councils now monitor surface water quality and give advice about water use over the summer period. *E. coli* and toxic algae are two of the contaminants that have the potential to cause serious human illness. Councils serve notices about waterways that are to be avoided due to elevated contaminate levels, reducing the availability of waterways for recreation over the hot summer months in some parts of the country.

(c)	**Course of action to gain sustainable production** *Courses of Action* Nutrient loss (nitrate leaching) kept below a certain level due to less, or managed, fertiliser input • Match fertiliser nitrate (N) inputs to feed supply to reduce the farm N surplus. Applying N to replace N being utilised by pasture, rather than applying large quantities of N fertiliser. DairyNZ recommends fertiliser applications to be no greater than 50 kg N/ha. Over application of fertiliser results in more N available for loss. Animals such as cows kept off pasture for times of the year to reduce loss of nitrates from urine. • Use herd homes or concrete stand pads to collect effluent from animals for either part of, or all of the year, depending on the area of New Zealand where the farming occurs. Keeping animals off pasture reduces N leaching into groundwater or surface water. Urine patches are the biggest loss of N from dairy farm systems. Studies have found that up to 95 per cent of the N ingested by cows ends up being urinated back onto the ground. Animals excluded from all waterways at all times, with riparian fencing and planting with substantial permeant set back. • 10-metre setbacks and fencing are required to reduce 80 per cent of sediment and pesticides, 70 per cent of nitrogen and phosphorus from overland flow. In land over 10 degrees, a 20-metre setback is required. The riparian zone reduces erosion, animal trampling and dung, buffers nutrients entering from overland flow, buffers flood flows, provides habitat for terrestrial creatures. (Landcare Research 2020) Utilise on-farm water storage to reduce water takes from surface water or ground water. • Water stored on-farm by individuals will reduce the need to extract water for irrigation from surface water. That takes pressure off rivers and streams during summer when most water is taken for irrigation, when flow levels are already low because of low levels of rainfall during summer. This leaves flow levels higher in surface. Chose a production system to match the natural features, such as rainfall, sunshine, soil type, etc. • Dairy farming is carried out on-land that required less modification for dairy farming. Specifically, soil water-holding capacity, natural rainfall. Consents allocated by regional councils would take these factors into account in the application process for new conversions.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 2	3 – 4	5 – 6	7 – 8