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SCHOLARSHIP EXEMPLAR

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
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QUALIFY FOR THE FUTURE WORLD
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Tick this box if there is no writing in this booklet

Scholarship 2020
Agricultural and Horticultural Science

2.00 p.m. Monday 16 November 2020
Time allowed: Three hours
Total score: 24

ANSWER BOOKLET

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

Answer ALL questions from Question Booklet 93105Q.

Start planning your answers to Questions One, Two and Three on pages 2, 8 and 14 respectively.

Write your answers 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 2–23 in the correct order and that none of these pages is blank.

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

QUESTION ONE: The future sustainability of primary production

PLANNING

Dairy farming

Economic sustainability

7% to NZ GDP

17.8 billion

export 95% of product

Social

rise in demand for alternate milks

social view on sustainability + water issues

Environmental

waterways

Global warming

biodiversity

Begin your answer to Question One here:

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Dairy farming is an industry that provides New Zealand with the majority of the country's economy. 7% of the national GDP is provided through dairy farming with a figure of 17.8 billion dollars contributed. This is an industry that has become heavily intensified ~~throughout the past years,~~ with an increase of 70% over the past 20 years. As well as this, 90% of New Zealand's wetlands have been converted to grazing land since 1990. With the earth's population heavily increasing, the need for more food increases with it. Because of this, it is likely that the intensification of dairy farming will continue to rise for a long time to come. Despite the fact that this industry plays an important part in New Zealand's economy, the future sustainability of the industry in terms of economic, social and environmental factors must be considered due to the many impacts that this industry has on these factors. In terms of economic sustainability, Dairy farming is likely to continue to provide a sense of future economic sustainability for New Zealand, provided that environmental and social implications of dairy farming are managed and overcome. 95% of New Zealand milk is exported overseas, and is very popular in overseas markets due to New Zealand's competitive advantage of having a 'clean green'

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Image. With the rising consumer demand for dairy products that are produced through often organic and grass fed practices, New Zealand can take advantage of this as we are one of few Dairy producing countries who feed majority grass. Upon this, the demand for these products from a 'clean green' image creates future economic sustainability for dairy farming due to the fact that consumers are becoming much more interested in products that they believe will provide them with health benefits. For the economic sustainability of dairy farming for the future to be viable, the social and environmental factors must first be considered. With 30% of New Zealand's milk production being exported to the asian market, Producers and exporters must be aware of things such as the US-China trade war and the fact that 85% of Chinese people are lactose intolerant. Social factors are incredibly important when considering the future sustainability of dairy farming due to many reasons including; consumer preference, the growing demand for non-animal milks, views on the animal ~~welfare~~ welfare within dairying and also views on the environmental sustainability of dairying. With the production of non-animal milks such as oat milk, almond milk and coconut milk increasing steadily due to the increasing demand, the consumer preferences around milks may be changing with this. Not only is the growing demand

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of non-animal milks caused by social views on dairy farming from a conciencious consumer, but are also caused by health complications ~~and~~ and allergens. ~~The~~ The social viability of dairy farming has the potential to show consumers a different point of view of dairy production, such as Company 'Lewis road creamery' who actively show their involvement within environmental protection of waterways, communities and animal welfare programmes. Consumers that notice ~~see~~ these things become much more fond of the dairy industry and will therefore continue to purchase dairy products. In regards to the connection between social and environmental factors when considering the future sustainability of Dairy farming, A consumer is more likely to drink dairy products when they know that the industry is trying their best to ~~make~~ reduce their carbon footprint and make a positive impact upon the environment. Environmental factors are often considered the most important when discussing the future sustainability of Dairy farming. This is due to the massive impact that this industry has on the environment. If the dairy industry fails to regonise and act upon this impact, the likelyhood of the future sustainability of the industry is ~~their~~ strongly decreased. One of the biggest ~~ISSs~~ environmental issues caused by dairy farming is the pollution of waterways. With 41-49% of NZ lakes being too polluted for use and 76% of NZ native freshwater

fish being deemed threatened, the industry must recognise this to be able to gain future sustainability. Due to the fact that Dairy farming produces the most greenhouse gasses out of any NZ industry, Change must occur. 49% of New Zealand's total emissions are produced through agriculture, ~~which~~ Contributing to the total figure of 0.2% in which New Zealand contributes to the global emissions. The production of both Methane and Nitrous Oxide is a ~~key~~ key contributer to global warming. Methane (CH_4) is 28~~5~~ times more effective at trapping heat than CO_2, whereas Nitrous oxide (N_2O) is 289 times more effective at trapping heat than CO_2. The trapping of heat in the atmosphere due to these gasses contribute to the rising sea levels which pose a threat to dairy farming ~~to~~ due to the fact that the rising sea levels decrease the amount of effectively utilisable land for dairying, meaning that farmers must evaluate ways to maintain production rates whilst using the same amount of land. Increased synthetic fertiliser use also contributes to the environmental factors that pose a threat to the future sustainability of dairy farming. Fertiliser use in New Zealand has increased 300-600% over the past 25 years, meaning that the use of nitrate fertilisers is increased. With both effluent (containing nitrates through urine and

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phosphorus through faeces) and nitrates from fertiliser running into waterways, they become polluted and un ~~is~~ utilisable, as well as the fact that this issue causes a loss in biodiversity. Biodiversity is lost due to not only the loss of wetlands for grazing use but also due to algael blooms from pollution that kills ~~the~~ aquatic organisms and changed water flows due to increased and over allocation of irrigation. 59% of irrigated land in New Zealand is due to agriculture, meaning that dairying is a key contributer. For the future sustainability of dairy farming to be viable in terms of the environment, dairy farmers must implement management practices that will help to manage and overcome the issues caused. These practices could include riparian planting and fencing, decreased fertiliser use ~~and irrigation~~ as well as decreased irrigation. I believe the future sustainability is only likely if the industry decides to take action and manage the social and environmental factors before considering economic profitability, as this will only come once the key issues are solved or at least managed. This is also because for NZ's competitive advantage of having a 'clean green' image is one of the greatest assets to dairy farming, so for that asset to be utilised, it must be maintained.

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QUESTION TWO: Global trade disruptions / changes

PLANNING

Kiwifruit

Sent Overseas - Asian market

Dairy

exports

Donald trump protectionism views

China agreed to purchase $40m worth of US agri products

USA halve taxes

Begin your answer to Question Two here:

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Global trade disruptions have impacts upon the world as a whole, but for New Zealand particularly within kiwifruit production and the dairy industry, there are implications that global events' present. Brexit is one of the global events that is currently impacting New Zealand and global trade. Brexit ~~is~~ in summary is the UK's plan to leave the european union. This may cause a lot of political unrest within europe, and ~~New~~ globally, though luckily for New Zealand it may not have an incredibly devistating impact upon the production or profitability of kiwifruit and Dairy. The threats that brexit poses towards the production and profitability of kiwifruit are few and far, due to the fact that New Zealand's main kiwifruit ~~ex~~ export market is asia, despite this, it may cause temporary disruptions within exports and costs to export into the UK or europe. With 149million trays of kiwifruit being exported from New Zealand every year, with ~~a~~ the majority of that figure going to asia, Brexit is unlikely to pose extreme threats to ~~the~~ the kiwifruit market. Dairy on the other hand may see the threats more towards the profitability and production, though still not enough threats to make a huge disruption. Due to brexit, the european currencies may see changes for the worse, meaning that european consumers are less likely to purchase NZ produced dairy as it may be more expensive than ~~€~~EU

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produced dairy. This may lead to decreased sales but overall will not drastically impact profitability. The opportunities that Brexit may involve could be the potential for increased free trade agreements. The US-China trade war could potentially pose threats to the exportation of NZ kiwifruit and dairy into the USA, though this will not have a huge impact on these production systems profitability as the USA is not their target or main market. Because NZ has ~~of~~ free trade to China, exports into china are unlikely to be impacted despite their agreement to purchase $40 million dollars worth of USA agricultural products along with the USA's promise to halve tariffs into the USA for china. Effectively this is not a threat to NZ kiwifruit and dairy exports into China as NZ still has the competitive advantage of the 'clean green' image over the USA. The only recognisable threat towards NZ production and profitability of kiwifruit and dairy is the protectionism views of Donald trump that may decrease exports to the USA, though this is unlikely to be a great threat as as of 2021 he will no longer be the president of the USA. The CPTPP provides an opportunity for New Zealand to trade between many other countries, though it also poses ~~three~~ threats socially. With 30-1 of New Zealand's milk production being exported to China,

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the market is unlikely to change drastically due to any of these global events. New Zealand will most likely not be heavily impacted by these events due to free trade with australia, Hong Kong, Malaysia, ~~and~~ Singapore and China. These events also have implications that stabilise the global market, allowing New Zealand to avoid potential threats. So long as New ~~Zeal~~ Zealand remains in a position where pollitical unrest does not directly affect us, the profitability ~~of~~ and production of our primary production systems are likely to survive the threats that are posed. The New Zealand dairy industry is likely to stay stable throughout global events such as brexit and the USA-China trade war due to the fact that we have the competitive edge and the demand for NZ grass fed dairy products are ever-increasing. The kiwifruit industry will also remain stable as we still hold a free trade agreement with China who will likely always have a demand for kiwifruit, especially within golden week ~~when~~ in the first week of october where gold kiwifruit exports and demand skyrocket. Despite the fact that these global events have the potential to impact NZ primary production systems, the impacts have not been seen to pose a serious threat towards the short and long term exportation of Dairy or kiwifruit as well as other products produced in New

Zealand. If these events did happen to have an affect on New Zealand primary production systems and their profitability, it would likely just ~~cause~~ ~~Cause~~ mean that the industries make less profit than usual, though it is unlikely that it would pose a long ~~ter~~ term threat to the production process. Political unrest can cause many problems within global trade but it can also provide the opportunities to export into new markets as ~~the~~ agreements fall through often, but none the less the world is always going to need primary produced products.

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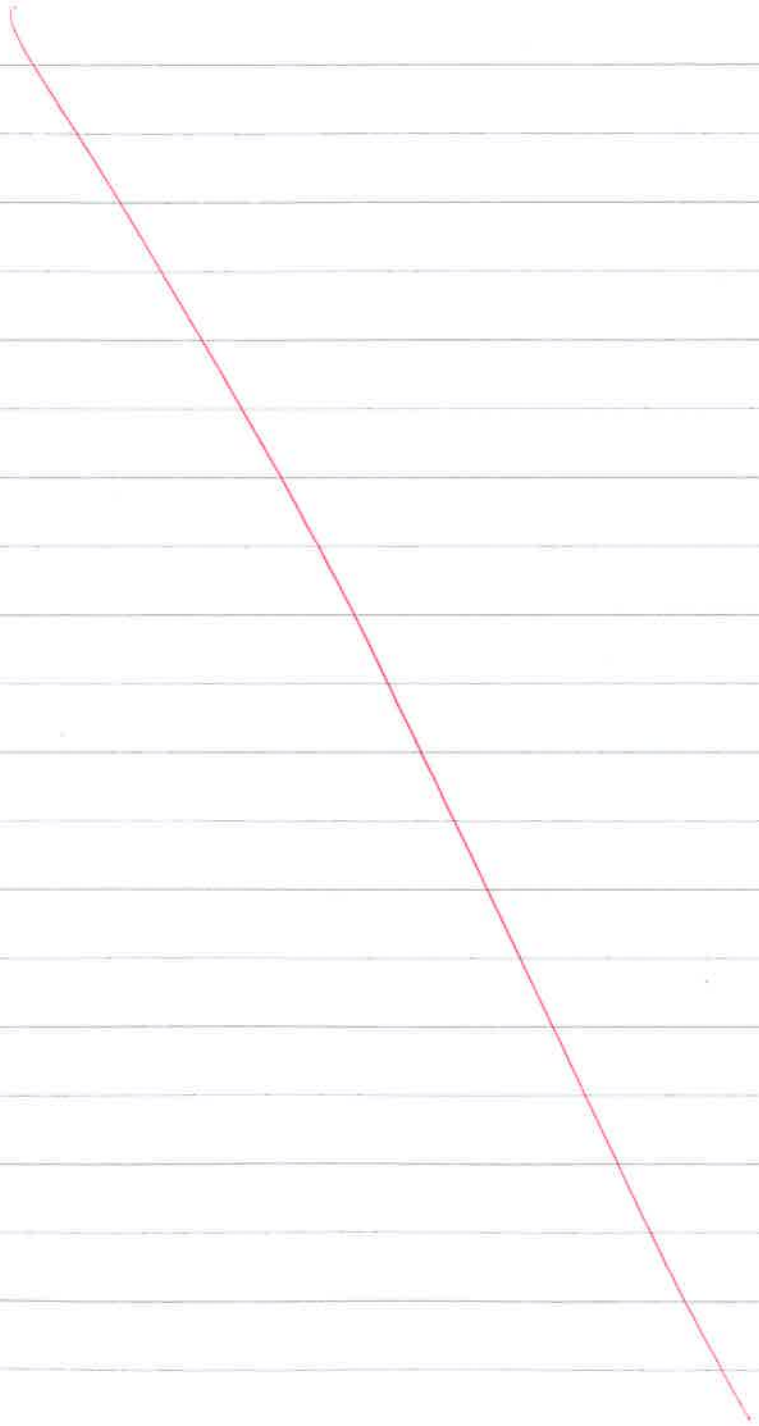

QUESTION THREE: The position of genetic modification in New Zealand's primary production sector

PLANNING

GMO

- S.B
- Transgenesis
- Cloning

> Increased yield
> health benefits (potential)
> decreased water need for production
> potential to aid hunger + malnutrition

challenges
> 3rd world countries cant afford technology
> Allergens
> Unknown health risks

> Not having GM = Competitive advantage

blight

Controversial - animals especially

Begin your answer to Question Three here:

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Genetic modification is the altering of the genome in an organism to produce or add desired characteristics. It can be argued that genetic modification involves selective breeding, transgenesis and cloning. Selective breeding is the process of taking a desirable characteristic from one species to another species to create a product that is greater than they could produce naturally. transgenesis is useful for when the trait is not in the population. GM is also considered genetic engineering or bio-technology. the main goals of GM ~~are~~ originally are to create higher yield (therefore increased ~~finance~~ potential income), health benefits, decreased water usage for production and the potential to aid world problems such as hunger and malnutrition. The opportunities that GM may offer or provide New Zealand include the chance to increase the yield of crops which may then lead to further income and increased sales. GM within New Zealand's primary production sector has the potential to provide industries such as dairy farming the opportunity to ~~breed~~ genetically modify dairy cows to have high milk production but low methane production. opportunities like this would allow New Zealand to solve issues within the environment and intensification. GM could also mean that an industry such as the kiwifruit industry is able to genetically modify fruit to include increased vitamin C or other things for health benefits. Due to NZ's

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issues within water usage and over irrigation, GM may also provide the opportunity for ~~the~~ the NZ primary production sector to decrease the amount of water needed to produce a product. GM may also offer NZ the opportunity to become a leader within global food production due to increased productivity. There are expansive opportunities provided by GM also involving the creation of plants with; Frost resistance, pesticide and herbicide resistance, Increased health benefits and much more, though despite these positive opportunities, there are also a wide range of challenges that it ~~pes~~ presents. Challenges ~~created~~ presented by GM can include the fact that because GM is a relatively new concept, there may be unknown or undiscovered health risks that come with the alteration of the DNA in a crop. As well as this, A challenge is that it may mean more plants contain allergens. For example, ~~if~~ if an allele from a peanut's DNA was inserted into an alternate plant, A person who is allergic to peanuts would then be unable to consume the new product. Despite the opportunity that GM creates to have the potential to solve world issues such as hunger and malnutrition, It may be that third world countries who would benefit from this are unable to afford the technology to carry it out. By not participating in GM, New Zealand maintains a competitive advantage

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over ~~countries~~ food-producing countries that do participate in GM. This means that our produce would be put in the same competitive market as other GM-using countries which means that we will have little variation in products. Being GMO free is something that New Zealand can be proud of and use to our advantage within the primary production sector as we are one of the only food-producing nations that can say we produce without GM. NZ's decision on whether or not to ~~stay~~ GM ~~free~~ free or not is crucial as once we make the decision to ~~go~~ ~~utilise~~ utilise GM, there is no reversing that decision and the priveledge of saying we are GM free is taken away. Another challenge that GM poses to the NZ primary production sector is that by using GM, fields of thousands of genetically identical plants are at risk of being wiped out entirely due to lack of variation. This can be showcased by the irish potato blight. GM is also a controversial topic especially as socially it is frowned against when used in animals as it is seen as unnatural and cruel as it can often cause health problems within the animal, for example the Pug which is a breed of dog has been genetically modified to look the way it does, though by doing this, it has created respiratory issues within the breed that lessens their lifespan significantly. The position of GM

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In New Zealand's primary production sector may potentially offer or provide opportunites that could increase yield and income, though a lot of the challenges that GM poses are often seen to outweigh th opportunities. One of the major challenges to do with genetic modification is that it can never come to a total agreement as there are many differing opinions on the subject. On the contrary, the already popular concept of GMO-free food and products will only become more popular and preferable to consumers on top of the fact that New Zealand is also nuclear free and pasture based. Another risk is that if scientists choose to ignore the potential risks and threats of GM and proceed regardless, they may find that the threats become very real and may quickly regret the decision to begin GM in New Zealand, which is something that once you allow to happen, cannot be reversed.

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Scholarship Exemplar 2020

Subject	Agricultural and Horticultural Science	Standard	93105	Total score	15

Q	Grade score	Annotation
1	05	The candidate has articulated a well-structured and insightful response to the question. Dairy has been chosen as the primary production system and all three sustainability aspects (economic, environmental and social) have been discussed with accurate and appropriate data. Consideration of the whole 'system' (e.g. discussion of the implications of dependence of exporting / transport / distribution considerations) would have allowed for higher mark to be awarded.
2	04	While the candidate has presented a relevant discussion / response, the answer lacks the depth and critical analysis that a higher mark would demand. Kiwifruit and Dairy are the two contexts that have been chosen, and while the threats and opportunities that trade disruption present to these two primary production systems have been considered, the responses do not consistently contain the sort of detailed discussion or analysis that a 'scholarship' level answer requires. The examples of potential disruption discussed have not ventured beyond those presented as stimulus in the question.
3	06	The explanation of genetic modification (GM) includes the range of definitions or positions that can be used or taken – not just the common / everyday perception. A balanced, considered discussion of the benefits or opportunities that GM presents to the dairy and kiwifruit industries is presented along with potential or valid concerns, risks and perspectives, e.g. the public's potential difference of perception of GM of plants versus that of animals and, New Zealand's unique position globally in terms of grass fed livestock systems and geographic isolation. In summary, a robust, scholarship level answer that effectively discusses the opportunities and challenges that GM presents to New Zealand's primary production sector and the wider society.