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SCHOLARSHIP EXEMPLAR



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Scholarship 2022 Agricultural and Horticultural Science

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 THREE questions from Question Booklet 93105Q and 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.

Do not write in any cross-hatched area (☒). This area may be cut off when the booklet is marked.

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

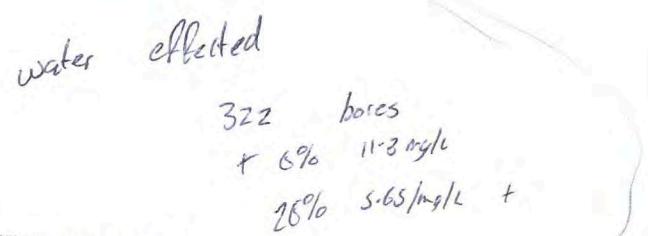
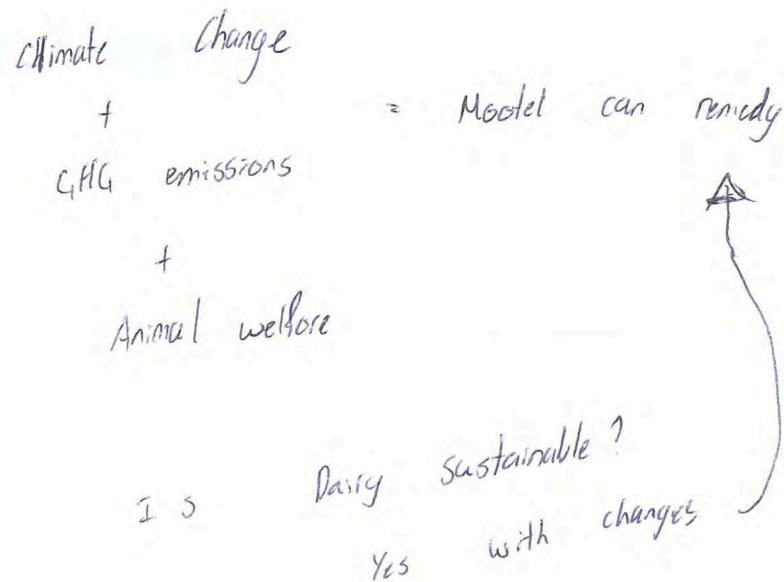
Question	Score
ONE	
TWO	
THREE	
TOTAL	

QUESTION ONE: Factors impacting the sustainability of New Zealand agriculture

Primary production system: Dairy Farming

PLANNING

- Dairy farms are intensive
- Environmentally not particularly sustainable
- Economically they are
- Socially they aren't (blue bottle)
- opportunity to do something cool with Model



Begin your answer to Question One here:

Dairy Farming is responsible for being New Zealand's biggest export earner, contributing \$21.6 billion to the New Zealand economy for the 2021/2022 dairy season. However, if dairy farmers want to continue farming sustainably into the future they are going to have to make some serious changes and this provides opportunity for the farmers to do better.

Dairy farming is a very intensive process which requires a large amount of inputs to produce the desired amount of outputs. This results in dairy farmers putting on large amounts of fertiliser and water in the form of irrigation. We have seen an increase of 62% in the amount of N fertiliser being put on between 1991-2019 (Stats NZ), with Canterbury alone putting on 306% more N fertiliser between (2002-2014). Not only has there been large increases in fertiliser usage but in the amount of irrigation as well. Irrigated land has almost doubled from 1991-2014, with an increase of 91%. Canterbury alone had an increase of 69% in irrigated land. With these large volumes of water are causing the nitrogen to leach through the soil as the soil is too saturated to hold anymore nutrients. This has resulted in the quality of the water decreasing significantly (one of the issues highlighted in the diagram) as seen in a survey conducted by ECANZ in Canterbury. This survey monitored 322 wells and found that 6% exceeded the safe drinking level of 11.3 mg N/L, with 26% of wells having levels of 5.65 mg N/L - 11.3 mg N/L and it may not take long for some of the wells to exceed the limit.

This not only having a huge impact on the environment but also socially. One woman in the Waikato reported her baby having blue bottle syndrome. This is caused the nitrogen levels in the water being too high and ~~the~~ the water was fixed with the milk formula. This was a private ^{in Waikato} box and ECANZ only monitor 322 boxes in Canterbury so imagine how many more private boxes exceed the limit. The intensive nature of dairy farming provides a serious threat as to whether it can be sustainable into the future.

With such threats to the future of dairy farming change is required which creates opportunity for the dairy farmers to do better. I suggest that getting the cows off pasture is a way to do this. To get the cows off pasture a composting model would be used. A composting model is a place for the cows to feed, sleep, urinate and excrete. In the wetter months between May and August the Model would be used more. The cows would be outdoors 4 hours a day said the 2021 Agri report, during these wet months and outside longer when the soils are drier.

If the soil is wet it can't hold any more nutrients from the cow's urine. It is projected that the urine of cow's is ~~is~~ ^{concentration} 1000-1200 kg N/ha if it was spread across the paddock. When the soil is wet these nutrients leach through the soil and into the water causing the array of problems I mentioned. Having the cows in the model would allow this urine to be caught in amongst

the rest of the compost.

The compost would be aerated twice a day to encourage respiration. The compost is then moved out of the model twice a year and is applied to the soil in the dryer months when the soil is less saturated and able to hold more nutrients. The Allcock farm who have a model found that they used 50% less fertiliser by applying the compost to there land.

Animal welfare has also been a hot topic of late and I believe a model would help to meet this issue. In the wet months of the year soils are wetter and heavier and there is more pugging. A survey in the Agri report found that when the cows were ~~in~~ in a Model the number of lame cows decreased from 30 to 0 on one farm. Not only did lameness decrease but it was found the cow's were ^{suspectedly} happier inside on the warm compostable bed. Having a model provides dairy farmers with the opportunity to improve the welfare of there cattle.

The two biggest concerns shown in the survey in the resource sheet are climate change and GHG emissions. Dairy is responsible for a lot of emissions to our environment. There is technology being developed currently for models that aims to catch the emissions in vents within the Model. Having the cows off pasture & inside would allow for this to happen. The gases would then be processed so that they are able to be used in the environment before being released. Fertiliser production also emits a huge amount of GHG into the environment and as we can see having a Model decreased fertiliser use

by 50% as its own compost is produced.

Dairy has the real potential to be an industry that does change in the future with it having a lot of negative impact on the environment. Not only is dairy farming's impact on the environment poor but many consumers are looking for alternative products due to their values, morals and ethics. These ethics may include animal welfare, climate change or water quality which are all currently huge issues with dairy farming. They are issues that threaten dairy to no longer be able to be sustainable into the future. Dairy farmers need to embrace the regulations and accept that they will have to endure some change if they are going to be sustainable into the future. This is an exciting time for dairy and provides real opportunity to turn the threats of climate change, GHG emissions and animal welfare into reasons why the dairy industry ~~are~~ should still be sustainable into the future.

QUESTION TWO: Labour issues in the primary production sector

Primary production system: Apples production

PLANNING

- Labour shortages is huge
- However variety of other factors
- NZ workers don't want to do hard physical labour
- R.S.E workers are faster
- R.S.E issues

fair pay agreements = ↓ Productivity

piece pay currently

Kiwi's slower than R.S.E - MSD
2.5 bins to 7

Now shortages force change to
Automation which increase
productivity

↓
40 staff

↓
2 staff +

ultra view spec
machine

↓
25 tractors

↓
Helicopter

Begin your answer to Question Two here:

Labour issues are one of the biggest issues in the world right now. All around the world people are crying out for labour, particularly in the labour intensive apple industry. The apple industry requires huge amounts of labour but for only short periods of time. Covid is certainly a cause of the labour shortages but there are a variety of other issues in the Apple production system with labour that will affect our productivity in the future.

The apple production system being so labour intensive New Zealand is very fortunate to be a part of the R.S.E scheme which allows 19,000 workers into the country for 72 months of the year with these them returning home for the remaining five months. However, employers have to meet requirements before they are able to employ R.S.E's. Nick Bibby from Thornhill (NZ's largest labour employing company) says that they have to prove to the ministry of social development (MSD) that they have tried to employ Kiwi workers before they can employ R.S.E. The issue with this is that the quality of the New Zealand labour is relatively poor. Nick said that Kiwis will pick 2.5 bins of apples a day whereas an R.S.E worker will pick up to 6 bins of apple per day on average. This has a huge impact on growers as they can not get their fruit of the trees fast enough and into market early. The low productivity of Kiwi workers also costs the growers more per bin as they have to top up the Kiwi's wages to minimum wage. If the trend of lazy Kiwi workers continues then the industry will have to look to automate as to make up for the lack of apples coming off

the trees. The automation would help to increase the growers productivity in the future if they can develop something that picks fast enough, but for growers are going to have to catch up the low productivity of Kiwi workers as no such technology has been developed.

Nick also has there is the worry of fair pay agreements reaching New Zealand. Fair pay agreements already are happening in Australia, which is where all workers receive the same hourly pay rate. For a fair pay agreement to be reached then 10% of the workers must sign a petition. Labour are looking to implement these agreements in the apple sector & production system and other primary industries as well. This is causing worry among the growers but why? Currently R.S.E workers are on piece pay rates where they get payed by the amount of bins of apples they pick. With good workers picking 6-7 bin a day & earning rates of upto \$35 per hour. Piece pay rates encourage these R.S.E workers to be productive and work harder as they get payed more. But if the fair pay agreement is brought in then R.S.E workers will be payed the same rate as a Kiwi picking less half the fruit they do. This would mean there is no longer any incentive for the R.S.E workers to pick fast and would mean that there productivity will decrease significantly. These fair pay agreements are something that will be watched closely by growers because if implemented it could spell disaster for the apple industry with the fruit being picked at a much slower

rate, decreasing productivity significantly.

Covid 19 was the cause of huge labour shortages as we couldn't get our full quota of R.S.E workers. In Cam Taylor from Taylor Corps cause he couldn't get tractor drivers from overseas. Cam said he would normally have 25 tractors with 25 drivers spraying the orchards but with the borders shut they couldn't get the number of workers they needed. This meant that Cam had to be creative and try something else to ensure his fruit got sprayed. He decided to use a helicopter which we know have incredibly high running cost. But after the labour shortages this was the only way that Cam would be able to spray his crop of Apples. Using 1 helicopter saved Cam labour but it actually saved him cost as well because it ended up being cheaper to run a helicopter than 25 tractors. He also found that the helicopter was far more productive as it could spray four rows at a time compared to the tractor one. In this case the shortages of labour was actually a positive thing for Cam Taylor as he tried something he never would have if we didn't have the borders shut and enforced labour shortages. Sometimes the issues of labour can force people in creative change and this was the case for Cam who is now more productive at spraying his orchards and can do it cheaper.

The labour shortages are also felt around packhouses in Hawke's Bay. With many packhouses relying on lots of labour

units to pack boxes of Apples. This was also the case for Cam Taylor. But he was again able to see the light in this and he looked to automate his packhouse. As we walked through the packhouse we could see the effect of the automation. He had brought a ~~spectacular~~ ultra view grading machine which could grade the fruit better than the human labour and faster. This machine was grading 5000 fruit per minute and there were only two staff required to run this ~~part~~ machine, where Cam had previously needed 40 people in this section of the packhouse. Again the labour shortages meant that Cam had to automate, but it has resulted in him being able to be more productive and grade the fruit at a quicker rate. Not only is the machine more productive but it is able to see the inside of the fruit. This is a huge benefit as Cam longer has to train up staff, (~~which~~ it is hard to find good quality staff who know what they are doing), and instead can use the machine. The lack of labour has actually resulted in Cam's Packhouse becoming more productive and as we see more advanced machines developed in the future he will be able to become even more productive hopefully.

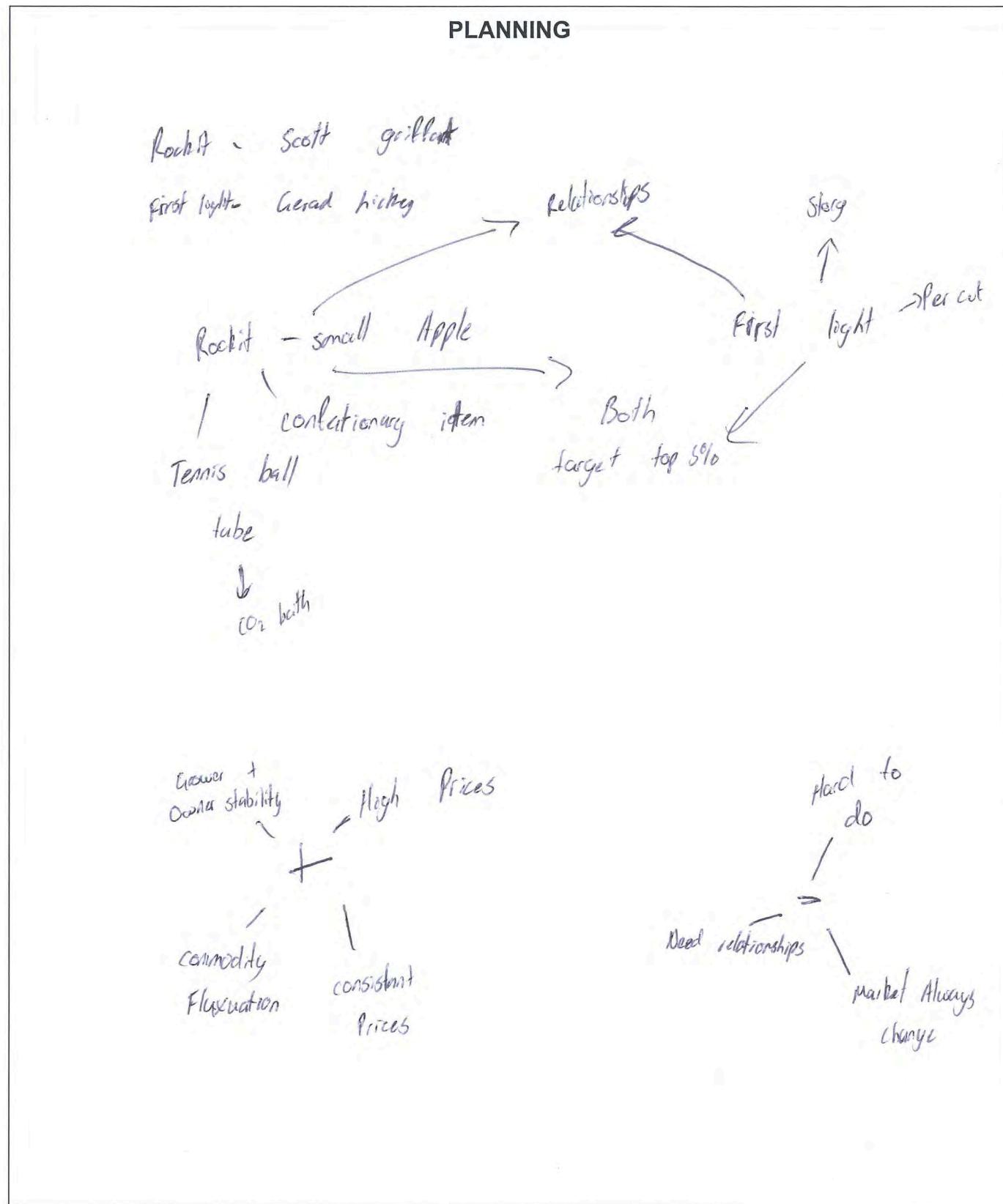
It is clear that going forward we will have to ~~with~~ monitor the productivity of our R.S.E & New Zealand workers as fair pay agreements may come in, and Kiwis become less inclined to do the physical apple picking jobs. As our orchard sizes continue to increase we have to keep up and be more

productive than ever. With poor quality R.S.E & lack labour continuing to be an issue in the future growers will have to look at automating if they wish to stay productive.

QUESTION THREE: Producing for niche markets

Primary production system 1: Beef production

Primary production system 2: Apples production



Begin your answer to Question Three here:

Niche markets are crucial for New Zealand Apple growers & Beef producers. A niche is a targeted audience, and the product's features and price are determined by the consumer. It takes a lot more work to exploit a niche but the higher returns for the Apple & beef producers make it worth it. First light meats and rocket Apples both target niche markets to receive these higher premium prices, rather than the commodity market which is driven by low prices.

Rockit Apples are a world first and are producing snack sized Apples. They are competing in the confectionary part of a super market with chocolates, lollies, etc. Rockit have differentiated their apple hugely compared to other growers. To do this they purchased the growers rights to a snack sized Apple and with a normal apple being twice the size. Rockit also market their apples extremely different to most growers. Their target market is the rich-mum and they want to sell her and her two kids healthy apples as snacks as opposed to chocolate bars. Rockit also differentiate their product through the way they package there fruit. Rockit Apples are stored in tennis ball tubes in packs of two or four. This allows for the apples to target that niche in the confectionary area of the supermarket. Confectionary goods like chocolate bars aren't perishable either so rockit has to compete with this. The tennis ball tube acts like a CO₂ bath says Scott griffet (the operations manager at rockit) which gives the apples a longer shelf life than your traditional

bagged apples. This allows rocket to target the confectionery niche further.

First light meats like rocket apples are also into targeting there niche. There beef is very different to the apples as first light isn't about creating a completely different cow or cut of meat like how rocket has created a completely different apple. First light differentiates there beef by the way they produce and sell it. In the commodity market a cow is sent to the works, the carcass is cut up in the general cuts of steaks, roast, etc. First light makes themselves niche by actually producing cuts of meat the consumer wants. They survey there customers and produce the cuts of meat accordingly. First light are also able to add value to there meat and differentiate themselves by not following the normal commodity supply chain. First light know there farmers personally and then they ^{process} ~~process~~ the meat through a company before marketing themselves. This means they can show there consumers the story of the beef from the farm to the plate. Whereas in the commodity you have no idea where your meat has come from or how it has been produced. This is where first light is able to add value to there beef and differentiate it from other companies beef.

Both Rocket and First light are able to differentiate themselves from other brands which results in a lot of positive outcomes for them both. Both rocket and First light are targeting the top 5% in there markets which returns a lot higher price. An example of this is

First light's steak club which has an exclusive 1200 members who \$2500 a year to receive more 4 steaks per month, this works out to be \$52 per piece. This is where First light are able to further differentiate themselves as they sell the meat per piece and not per kilo. Another positive outcome for both rocket and First light is that there prices are relatively fixed. This is because they are targeting the top 5% of the population in there chosen markets (rocket's being China & the middleeast, First light's being the U.S.). These top 5% of people are very wealthy and will normally always have disposable income to spend on the apples and beef. This means that the growers of the beef and apples, right through to the ^{shareholders} ~~owners~~ of the companies have financial certainty and will know there apples and beef will collect good prices. This is very different to the commodity market where the price is always fluctuating, particularly recently with everyone having less disposable income due to covid. As a result of this ^{small business owners} ~~growers~~ and owner's of business's who target the commodity markets, the middle class of people, are uncertain on the prices they will receive for there apples or beef which causes stress for some people.

Niche market's also provide the chance for Rocket and First light to create relationships with there customers. Cam Taylor from Taylor Corp said that he used to sell to the commodity market, & and he found that every couple of years you would get moved on to a new buyer as they don't want to form relationships. These niche markets mean that rocket & First light create relationships and allows them to feel like

they are making a difference for the consumer.

It isn't always positive when targeting a niche. Gerard Hickey from First light says "what they do is hard." In a niche market you have to ensure that your product is top quality to receive the premium. This is the same with rockit as they have to ensure that their apples are of a top quality otherwise consumers won't be willing to pay that premium again. Targeting very specific markets also means there isn't huge room for growth in these businesses. Gerard Hickey said that "they can't afford to grow, otherwise it will compromise what they do". What he means here is that they are a start if they grow they won't be able to target them produce their beef to as high a level. Rockit and First light are both start up companies and it is two different things for a company to act like a start up and behalf like one says Hickey. What he means by this is that if they get to big they will still have to act like a start up company but ultimately they won't be as they sacrifice their quality for growth. Instead he wants to behalf like a start up company and put quality above the quantity.

Apples

We know producing fruit and beef for a niche is hard but it is also important that rockit and first light know there market. The market is forever changing and consumers beliefs are always changing. This provides the challenge of knowing what to market it on.

First light surveyed there US customers and found carbon zero environmental footprint to be there biggest reason to pay a premium for First light beef. First light have the challenge of meeting these demands by showing the consumer the beef is produced in an environmentally friendly way. Whereas rockit export their apples to China and food safety is a big factor for them paying a premium for their rockit apples. That's why they produce their apples in plastic tennis ball tubes as it seals the apples from the pollution in the air. But if rockit were selling these apples to the U.S then they wouldn't take them as they are in plastic containers which aren't environmentally friendly. There a huge challenge for New Zealand producers is knowing there market especially when producing for a niche.

Rockit Apples and First light meats are both prime examples of how you can differentiate your product to target a niche market. There are some challenges involved in producing for a niche market with consumers demanding higher standards in a niche market compared to a commodity. However, our new zealand producers find a way to exploit the niche markets and thrive on the challenge of doing so.

Scholarship Exemplar 2022

Subject	Agricultural and Horticultural Science		Standard	91305	Score	17
Q	Grade score	Annotation				
1	4	The answer focusses on the intensification of dairying and its environmental impacts. While these have been well discussed, there is little discussion of the threats and opportunities that the environmental issues pose to the future sustainability of dairying. Rather, the discussion tends to look at the options (courses of action) farmers can take to overcome the environmental impacts of dairying – essentially a 3.5 style answer.				
2	7	Here the candidate has presented a perceptive, articulate, and insightful response on the labour issues faced by the apple industry and the productivity impacts of these issues. Perceptive and insightful discussion on things like the RSE scheme, the seasonal nature of the labour requirements, local (NZ) labour issues, and the implications of fair pay agreements and automation on future productivity, all combine to provide an 'outstanding' well-structured answer.				
3	6	This answer, on beef and apple producers targeting niche markets, is a clear Scholarship level response. The differentiation and marketing of Rockit apples to the top end of consumers and the implications in terms of price / risk is evidence of real critical thinking, as is the discussion around First Light beef and the issues they face when maintaining their quality and consumer base. Both positives and negatives / challenges and opportunities have been discussed.				