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TOP SCHOLAR



Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Scholarship 2023 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.

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.

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

QUESTION ONE: Reducing greenhouse gases in New Zealand's primary sector

Primary production system: _____

PLANNING

Question One:

Primary Production System: Dairy

To achieve future sustainability, New Zealand must first tackle its greenhouse gas (GHG) issue. We must recognize that greenhouse gases are a global issue and not a domestic one, and the global issue is rising in both popularity and severeness. Future trading partners and trade deals may demand a low emissions profile, supermarket chains are already starting to impose restrictions around the goods that they let into market and those they don't, and customers - especially high end customers - are becoming increasingly more aware of GHG's in the marketplace. We must recognize the future of GHG's for our economic, social and environmental prosperity and maintain our already established brand and reputation by quickly adopting to global needs.

One important note around the fact that GHG's is a global issue is the fact that New Zealand has signed into the "Paris Agreement." This agreement is a global one that attempts to stop the heating of the Earth by 2°C pre-industrial levels with an optimistic goal of 1.5°C. Following this, New Zealand has introduced its own targets, such as reducing our biogenic methane emissions by 10% on 2017 levels by 2030 and 24-47% decrease by 2050.

Additionally, it is important to recognize that New Zealand has a unique GHG emissions profile, in that 48% (Dairy NZ) of our emissions come from agriculture. This is incredibly high compared to other nations like China at 14%, or India at 10%. Since New Zealand is an exporting nation - in that we have to export to remain both economically and socially sustainable, and agriculture is our biggest export at 56 billion dollars, New Zealand has no choice but to reduce our emissions if we want to succeed into the future.

One of New Zealand's biggest agricultural exports is dairy with an export value of 25.1 billion dollars. Unlike apples or kiwifruit, that have very little emissions, agriculture - and dairy specifically - is often targeted with complaints around their high emissions. Out of our agricultural emissions, 44% are from carbon dioxide, 44% are from methane and 11% are from nitrous oxide. The dairy industry specifically has two key emitters; methane and nitrous oxide. Methane is produced via a process known as enteric fermentation. This is the process that occurs in ruminant digestion, and through the breaking down of cellulose methane is released as a byproduct. Nitrous oxide occurs in both nitrogen fertiliser and urine. Both compounds contain nitrogen, which through the nitrogen cycle and the role of denitrifying bacteria, is converted into nitrous oxide that is released into the atmosphere. These are the two main GHG that are emitted from dairy. This highlights a previous point, in that for New Zealand to meet its Paris targets we must do something about dairy (and agriculture more broadly). Where other nations may be able to solve their emissions by simple fixes to transport or infrastructure, New Zealand must work tirelessly at being inventive and coming up with new ways to constantly improve.

The first cost and challenge that comes with GHG and carbon mitigation is the simple fact that not every body will be on your side. This is because there will be different perspectives around the issue. We can look at the prime difference between Lake Hawea station, who have been very innovative on their farms and are well known for playing classical music to their sheep, and Groundswell, an organisation created by farmers to stand up against government regulation. Lake Hawea station are fully supportive of GHG's and making clear changes to reduce their emissions, where Groundswell are not as keen. Additionally, different governments have different viewpoints. Whilst Labour is opting for reduced emissions, and having agricultural emissions in the ETS by 2025, National is delaying the ETS introduction until 2030. Therefore because of the varied opinions and perspectives on the issue, when making attempts to reduce your GHG emissions there is backlash regardless. On this point however, is that Andrew Morrison has said that farmers can choose to be the "villain, victim or the hero." By this he means that if farmers do nothing, emissions will not slow down and farmers will be the villain. Farmers can also take a different approach and claim the 'victim' role, saying that they have had it tough, and that the regulations are too strict, or they can take the 'hero' role, and address the issue, and save the day for New Zealand's emissions profile. What we must recognize is that 95%

of Chinese citizens recognized the severity of GHG emissions (in 2017 and is likely to have risen since then). Regardless of our individual views and perspectives, our customers recognize it and want it from our products, therefore we must make a conscious effort to meet this if we want to demand high prices for our luxury boutique goods.

A second cost is the risk that can come to profits by attempting to reduce your GHG emissions and carbon mitigate. For dairy farmers at the moment, the two most mainstream ideas around reducing emissions on farm is better feed selection, and better breeding. Better feed selection involves using feeds like plantain or forage rape. Plantain is a crop that is being studied currently and is shown to decrease nitrous oxide emissions by 39-74% when fed as a sole feed (Dr J Luo). Forage rape has similar effects but to methane emissions, reducing methane by 30%. An additional note on this is the upcoming rise of *Asparagopsis*, a red seaweed that is shown to have reduced methane emissions by up to 98%. What has not been studied so extensively however, is the effect that this has on profits and quality of production. As previously mentioned, New Zealand must aim for those luxury markets - specifically in Asia, and this is largely due to our high costs such as labour and land and thus we must produce high value products. Our current methods seem to do this adequately, meeting customers expectations. However, we cannot be certain of the implications that different feed types have on the quality of milk produced. This is the same when looking at different cow breeds. A study conducted found that there is an 11% difference between a high and low emitting cow. If we take actions to use all low emitting cows, then sure our GHG emissions might decrease, but the effect on quality, and thus revenue, is uncertain. Another topical discussion is around once a day milking (AgMatters). It has been shown to reduce emissions by only milking your cows once a day, instead of a standard two times in day. Twice a day milking has been common because of the maximum amount of milk that can be produced, but once a day milking - although it may be beneficial in terms of emissions, could impact profits and thus poses a challenge to dairy farmers.

Furthermore however, another cost/challenge can be identified when looking at the future of emission reduction tools. Currently we have projects in place looking at methanogen inhibitors, vaccines, and GM. Bovaer is a tool that is being examined that can be used as a feed additive to reduce methane emissions by 30%. Vaccines are currently in development since 2019 to potentially reduce emissions, although numbers are not certain. And finally, the conversation for GM is open again. GM was banned from New Zealand in 1996, and has not been fully evaluated since. What is clear is that times have changed and that a new evaluation is needed. Christopher Luxon says that "it's like your phone from 1996," and admits that technology and perspectives have changed since then. Additionally, both Federated Farmers and Ian Proudfoot admit that it is time for "an adult conversation" around GM. Do overseas markets value our GM status? This is a question that needs to be investigated and certainly the conversation needs to be had. What becomes clear about all three future technologies is the very fact that they are futuristic. If farmers attempt to carry out them now then they may face huge costs, both in implementation and potential profits. Therefore, it is best these technologies go through research and development processes first before long term decisions are made.

If farmers do not like the proposed methods the easiest thing to do to reduce emissions is to simply hold good farm practices. This includes precision agriculture, in not using too much fertiliser but instead applying it to where it is needed, another note is around better feed quality. By using higher quality feeds than often emissions are able to be reduced. A study was carried out into this and found that simply adopting better farm practices can reduce emissions by 1% per year. Although these numbers are not as jaw dropping as those mentioned above, it still shows that there are things farmers, specifically dairy farmers, can be doing to reduce their emissions without costing anything to their profits.

A problem that New Zealand faces is that of "age of farmers." It was found that the average age of sheep and beef farmers was 56. And whilst this is not dairy, the same sentiment can be applied and assumed that the average age of dairy farmers is similar. What this means is that lots of these farmers are often just trying to "hold out" until retirement, and are not looking to adopt new technology or new feeds or anything. Since often the practices that these farmers have carried out have been done for generations, they are not inclined to change. Because of this, often lots of these farmers are not as inclined to change and adapt to new policies. What is needed in this regard is a new generation of farmers who are educated. At the moment there are over 300 farm emissions calculators online that farmers can use. By doing this farmers are more likely to make informed decisions and put practices in place to reduce their emissions. In a newspaper article, Mr Wan says that those who are informed "are likely to make changes more readily." Essentially, if we increase the education and concern around the issue then there is potentially more progress going forward from all different perspectives. This is not a cost to the industry, but could instead be looked at as a positive for the future.

The point that we must come back to time and time again is the cost for farmers if they do nothing. Increased GHG emissions can result in more extreme weather events, like Cyclone Gabrielle (which cost apple grower Cam Taylor 80% of his crop), changing weather patterns (such as more sunlight in different regions, this is why Rokit have now started growing apples in the South Island as they prepare for the future), but also economically, if farmers do not keep up to date and adopt new technology, such as feed types, breeding, or sustainable farm practices, then they will get charged what is assumed to be \$70 per tonne of carbon dioxide equivalent. At this rate the number of dairy farmers that are unprofitable will increase from 6% to 14% or above.

Farmers must look at the future. We must play what Simon Sinek calls "the infinite game" and look to farming to keep farming. We must adopt forward thinking farming techniques especially in the dairy industry to reduce our GHG emissions profile to achieve sustainability; economically, environmentally, and socially.

QUESTION TWO: Growing New Zealand's agri-food exports

Primary production system: _____

PLANNING

Question Two:

Primary Production System: Apples

New Zealand received 56 billion dollars in agricultural exports for the year ended June 2023. This is New Zealand's largest agricultural export. What is clear here is that New Zealand is an exporting nation. Mike Petersen says that in New Zealand we must trade, it is not a "nice to have." Therefore, to keep up with rising costs in the modern world, New Zealand must also increase the value of its agricultural exports.

The government are currently 33 billion dollars in debt (March, 2023), and so because of this are reluctant to spend more on infrastructure, healthcare and other issues and so because of this New Zealand citizens are experiencing a worse quality of life. Increasing the value of our agricultural exports will reduce this, which may promote a better quality of life for everyone. The industry wants to provide returns to its shareholders and its growers and therefore wants to maximise the value of its agricultural exports. And growers themselves want to maximise their profits.

The area that has shown the most growth, and has the potential for further growth is horticulture - specifically apples. New Zealand prides itself on its high quality luxury apples that can sell for high prices into Asian markets. In this sense, maximum gain can be made and maximum value can be added to each individual apple to maximise export revenue. Compare this to some agricultural exports that are commodity based production, less value can be added.

To achieve growth, the government has set some targets. As mentioned in the resource, the New Zealand government has set a target to double the value of agri-food exports between 2012 and 2025. Nathan Guy, minister of primary industries said that he wanted to double the value from \$32 billion to \$64 billion. Additionally, recently National party have addressed the goal to increase total exports in 10 years time. What this is showing is that New Zealand is constantly setting targets. We recognize that "there is no plan B" and we must keep producing, and by setting targets we give ourselves a clear direction to aim for.

In the past decade, New Zealand has done a great job at increasing the value of apple exports by predominantly doing two things, increasing product prices and increased physical production.

Looking first at increasing product prices, New Zealand apple growers must recognize that we cannot compete on commodity based production. This is a "red ocean strategy" which is bloody and we will constantly get undercut and outcompeted because of our high input costs. Therefore, we must aim for a "blue ocean strategy" to achieve economic success into the future.

The first way we have done this is by identifying the markets that we would like to aim for. Ian Proudfoot says that "there is no average customer" and that for growers to be truly successful they must aim for a market and meet their requirements. Most specifically, this has been to Asian markets like China and Taiwan, which have a very niche set of requirements. They would like big apples (countsize 70, 80, 90), that are sweet (high brix levels), red (75% + colouration) and are firm. New Zealand apple growers have done a great job at doing this and meeting these requirements through practices like rootstock selection, winter pruning, hand thinning...etc and by doing so can demand high prices for their fruit. Cam Taylor, CEO of Taylor Corp, said that he aims for the top 2% of customers. He recognizes that there is no point in trying to sell to everyone, and so aims for the certain boutique markets for his sales. Another note on this is that USA President John F Kennedy mentioned years ago the idea of "we do it because its hard not because its easy" and this same idea can be applied to New Zealand's apple production. By doing the things no one else wants to, we create high demand for our products, which results in scarcity, and therefore we can sell for high prices. This promotes economic sustainability for the growers but also promotes social sustainability in providing jobs and further spending on wider social projects. Mike Joy says "the more a farmer makes, the more a farmer spends" and thus economic success for farmers results in social

sustainability. This has produced success in the past ten years and will allow growers to keep growing into the future.

Another technique that New Zealand has done very well in the past decade the idea of "provenancing" that is talked about heavily in the book "The New Biological Economy." This is the idea of selling the product, but talking about where it came from, how it was produced, when, and by whom? This idea creates a closer and personal connection. Speaking with Mark Ericksen, a Hawke's Bay apple grower, he told me that he wanted to sell his "brand" and not his product. Similarly, Cam Taylor said that he and his father titled their firm "Taylor" as it was their name, and that when people bought his apples they are buying from him, and not some off market brand. Moreover, when Cam Taylor has his importers come and visit they stay at his house, not a hotel, to develop these connections with his family brand. This creates a selling point that differentiates growers from one another and in the past has helped add value to our exports. Once again, this idea fosters success in promoting healthy and consistent trade partnerships, especially in China, and in the global economy, to ensure economic and social sustainability.

A final quick note that has led to increased product prices, is the idea of a PVR variety. Cam Taylor grows Sassy and Dazzle varieties that he owns the rights to. Unlike Royal Gala, which anyone can grow, and because of this New Zealand gets outcompeted by Chile - who have minimal labour costs and thus can undercut our prices, Cam Taylor grows varieties unique to him. By doing this, he has ensured that his product is scarce and is constantly demanded. In this way, he can charge his apples for high prices, increasing the value of his agri exports.

In the past 10 years, New Zealand has done well to increase its total physical production. This has mainly been done through increases in productivity. One method that has been done is through establishing global demand for apples, such as in the form of trade deals. By doing this, and building connections with people that want to buy our apples we can develop unused grasslands into apple producing lands, to increase our total production. Secondly however, growers can use more niche ideas such as using dwarfing rootstocks, that include a higher pack out percentage, and thus produce more apples per hectare, to increase the amount of apples we export.

To increase the value of apple exports into the future there is a large amount of potential for New Zealand growers.

The first potential lies in trade deals as previously mentioned. At the moment New Zealand exports 19 billion worth of product to China, 5 billion to USA and 4 billion to Australia. What becomes clear here is that New Zealand is overly reliant on China. Cameron Bagrie, an independant economist, says that "we have too many eggs in the China basket." What has happened recently is that apple growers are suffering losses because of issues that China is facing. China is having a housing market collapse whilst at the same time suffering from 21.3% youth unemployment. Therefore, by being solely dependant on China we set ourselves up for potential failure in the future. The suggestion has been to look for a trade deal with India. Christopher Luxon says "we haven't even picked up the phone with India" and Bharat Joshi, author, writes "you ignore India at your own peril." We must recognize the need for wider trade partners to connect with the global economy in promoting our own economic and social sustainability. With India being the largest market at the moment, and the fact that Australia have established a trade deal, means that New Zealand has potential in the future to sell our apples into India. KPMG has "establishing high quality trade deals" at #2 for their top 10 goals for the year ahead in their Agribusiness Agenda. By doing this, New Zealand may be able to increase demand for apples, and when demand increases, we have the potential to plant more land in apples, to increase the value of our exports.

Second, for the future we must look at regulations. At the moment, large numbers of growers are unhappy with current regulations. They are viewed as meaningless tasks that suck up productivity, and cost large amounts to comply with, with no benefit to productivity. Christopher Luxon spoke with a local grower and asked how he felt about regulations, the local grower responded that the time spent doing "compliance stuff" has increased per week from "5% to 30%." Whilst growers recognize that some regulation may be important for people and their health, a large amount of it is not productive at all. For the future, with David Seymour just being announced as the Minister for Regulations, it will interesting to see what plays out. For export value to increase however it is important that we keep a close eye on regulations, and that they do not hinder growers and farmers too much.

Another potential in the future for increasing the value of apple exports is water. Growers need inputs and nutrients to grow their crops. One of the largest inputs in ensuring a healthy and sizeable crop is

water, and more specifically is irrigation. In 2016, irrigation was estimated conservatively to provide more than \$2 billion to our economy. I have no doubt that since then this value has increased dramatically. If we do not have enough water, it is a ceiling to our production. Simply, we need lots of water to grow. At the moment in Hawke's Bay water is allocated, and that if you need more water than it must come from somewhere. Projects like the Ruitaniwha water scheme, and other projects need to be carried out, to ensure we have water and irrigation for our growers. This will be a massive deciding point in where New Zealand's agricultural exports will reach for the future. No water is not sustainable.

Thirdly we must look at costs. Speaking to Cam Taylor he told me that in the last 3-4 years his labour costs had risen by 40%. Similarly, inflation rates have risen from 1-3% to now being 5-6%. What the increase in inflation rates mean is that now to make profit, your export revenue must increase by 5-6% each year, just to remain stationary. Additionally, with the costs increase added on it is clear that large amounts of revenue must be achieved, or we must find ways to work around this. Cam Taylor has solved large amounts of his labour issues by now incorporating a fully automated packhouse, and now only has one staff member at the end of the packing line to open the lid of the box and make sure that the product is good to go. This has cut down his costs severely, especially considering the fact that he estimates his automated machinery will pay itself off in under five years time. Similarly, Cam has now started using robotic forklifts that he describes as being better than humans. They constantly know where each other is, and do not fatigue over time, or have troubles with bad nights sleep - which are common human faults that lead to danger. By him using fully automated packhouse and forklifts sends a message to other growers as to the sort of technology that they could use for the future, to not only reduce their costs but increase their output (as the machines are more efficient and can run for 24 hours a day), ultimately increasing the value of our exports.

Another important factor that could dictate the growth of export value for apples in the future is the idea around grower confidence. This idea centres itself around the fact that you need to "spend money to make money" and to spend money you must have confidence. By this, I am referring to the fact that it is usually the risks that growers take that produce them with the most reward, and risk taking only occurs when farmers are confident. At the moment business confidence is varying. Cameron Bagrie writes that "business confidence has risen from -44 to -12, the highest since 2021." This was his writing a few months ago, when a National government looked likely. He goes on to say "business confidence is higher under a blue hue than a red one" but, "beware the snake oil in magic potions." Essentially, growers are more confident under a National government than they are under a Labour government, however, this does not necessarily mean that they will do better - hence the reference to "beware the snake oil in magic potions." Whilst the changing government is a promising sign (mostly in regulation) for growers, there are concerns around inflation, but also the OCR that has risen from 5.2 to 5.5. Varying numbers in this regard makes growers dubious at the prospect of the future. Being dubious does not equal confidence, and thus at the current moment - already with large losses from COVID and Cyclone Gabrielle, apple growers are not supremely confident. The success of growers in the next ten years or so, and future sustainability relies extensively on growers confidence. As Cameron Bagrie says, "real risk for real reward."

The future is bright for apple growers. With large technological and value improvements being made in the last decade, New Zealand apple growers have a sizeable platform to expand off of. Growers must keep in mind the idea that "we do it because its hard not because its easy" and search for the blue ocean strategy amongst the bloody seas that are the 21st century markets.

QUESTION THREE: Primary production profitability and rising costs

Primary production system (1): _____

Primary production system (2): _____

PLANNING

Question Three:

The apple and dairy industries are two of New Zealand's biggest exports. What this means is that the success and prosperity of New Zealand's agricultural exports is heavily reliant on the sustainability and profitability of these two industries. Economically, the success of these industries means that growers, industry and government are all happy and can keep going, due to maximum profit. Socially, small towns and wider communities will thrive because of the number of jobs that are available but also the increased spending around due to the farmers prosperity. Environmentally, it is important to look at the greenhouse gas (GHG) angle in the sense that if farmers are able to meet their GHG targets and reduce their emissions, then the world we live in will be more habitable, and breathable for the future.

To maintain profitability as an apple/dairy producer even in the face of rising input costs I think first comes a bit of honesty and courage. By this, I think apple and dairy farmers must accept the fact that costs are rising incredibly quickly and that they cannot control this so they shouldn't worry about it. Instead, farmers, especially in these industries, should focus on their long term future goals, of adding value and meeting their GHG emissions targets. I asked Cameron Bagrie over the phone how he thought New Zealand would survive under the worldwide cost of living crisis and our usual high value production, and that these two ideas would seemingly not mix. What he told me is that we must think long term. Think 20 years, or think 30 years, look at the future and just make sure we are doing what we can to keep increasing the value of our exports. I think this is the first discussion that farmers must front to.

Looking at profitable ideas however, I once again think that the sole idea of increasing profitability with rising input costs is to do the hard things that other people don't want to do.

For apples, this means looking at plant variety rights and growing varieties that others aren't. It means using new technology such as automation, to be different from others and demand high prices. It means working tirelessly to produce the best crop you can, focusing on one market and meeting their requirements. This means employing dwarfing or semi-dwarfing rootstocks (for Asian markets) and being extremely consistent. Morgan Rogers uses the term "Big Mac's" or "Coca-Cola" as a reference point. The thing with "Big Mac's" and "Coca-Cola" is that they are the same regardless of wherever you go in the world. Apple growers must strive to be like this, and when the consumer opens the lid of apples they are all the same. Additionally, for apples this means really trying to "get close to the customer" as Gerard Hickey says, and stress the idea of provenancing and building relationships. All of these ideas maximise profitability, whilst not changing input costs and thus profit increases, as shown in the diagram on page 3 of the resource booklet.

For dairy, I think large amounts of success of this industry in terms of profit are going to be around reducing emissions. As mentioned previously, markets are demanding low greenhouse gas emissions. Whilst farmers think that the governments are too strict, actually "supermarkets will move faster than government." What this means is that governments are just making you meet the bare minimum, but to actually remain competitive you must go above and beyond. Dairy growers must not settle for average, but instead really hone in on their emissions and tackle it head on so that they may create a point of difference. Most growers around the world won't do this, and instead sit back and be lazy. Therefore, a competitive edge may be gained by doing the hard things and adding value to dairy. The strategies I suggest going forward would be to look at different feed types, breeding, and simply good farm practices. I have narrowed it down to these three as all other practices seem to increase costs, or decrease income, comprising the farmers profit margins. Dairy farmers should look to trial different feeds, and the emissions gained from each of them, and different genetics, and the different emissions gained from them and look at the numbers. If income and costs remain relatively similar, and emissions decrease than this is a success, as profit is likely to be achieved in the future as consumers demand low emission goods more and more. In a similar vein, dairy farmers can simply start by adopting good farm practices to reduce their emissions in the short term.

Both these ideas promote sustainable production. With costs unchanging and income increasing, profit margins will increase, promoting economic and social sustainability. Interacting with the global issue of GHG's, and reducing emissions this way for dairy farmers will help keep a habitable planet, and thus meet environmental sustainability.

As mentioned in the previous question, another way that we may increase growers income is via trade deals, that do not affect costs. For apples this is the India market which we have not even "picked up the phone with" as Christopher Luxon says. A similar methodology could be applied to dairy farming. If we are able to tap into broader global economies then we diversify ourselves, spread risk but also create scarcity. When demand increases in this way, then we have the potential to grow to supply, maximising profit in this way.

Furthermore, another look can be had at regulations that seek to cut off farmers productivity. Like mentioned, "compliance stuff" has increased from 5% to 30% of growers weeks (according to Christopher Luxon's conversation with a local grower), and farmers are not happy with the current regulations. Speaking to Cam Taylor who lost his packhouse in Cyclone Gabrielle, he spoke about how he has now had to make new changes to his packhouse layout to meet regulations, including the width of walkways along his packhouse. All of these sorts of things he did not have before under previous regulations, but now he has to have them and this is costing him time, money and profitability. Ultimately this is more costs, with the same amount of income, reducing profit. A further look must be had at these regulations to help settle the storm of rising input costs.

Another brief point is about the the need for water, especially in apples and dairy. Water allows for irrigation, but also for grass to grow which cows can eat and is essential. Water acts as a ceiling to production and thus we must make sure for the future that for profit to be maximised we have large amounts of water available.

Finally, even though input costs are increasing, farmers may look to work around this by innovation. Cam Taylor now uses a helicopter and 1 staff member who flies the helicopter to spray his apples which makes up for 20 tractors. This idea of being inventive means that Cam has severely reduced his labour costs (in conjunction with his automated packhouse) and has set him apart from his competition. Given a bad growing season, he suffers less loss in profit than most other growers because of his lower costs. This idea of innovation, especially in apples, but also in dairy in regards to using new emission reducing technology, is important to note in the face of rising input costs.

In terms of future viability of both apples and dairy I think there is a large issue for New Zealand on this front.

Apples are often viewed as a high value product. Rockit apples sell to very niche market, and brand themselves as a snack food and thus can sell for high prices. Mark Ericksen and Cam Taylor talk about how they are aiming for the top 5% and top 2% of markets respectively. Because apples, (especially PVR varieties) are such a specialised, and market oriented product, there will always be demand for apples. With our specialist PVR varieties, and our ability to consistently meet market requirements New Zealand apple growers are in a good position for the future. Additionally, the worldwide cost of living crisis for consumers does not really affect apple growers and their target markets. The point here is that the rich will still be rich even after a crisis, however it is the middle class that struggle. An example here is that a \$5 million dollar house will still sell, as the rich still have money. The same thing applies to apples, as the wealthy families in China that are part of the top 2/5% will still buy our high value boutique apples. Because of all of these factors, and the fact that labour costs can be easily unaccounted for due to packhouse automation, New Zealand apples I think have the potential to be very viable in the future, given the current environment.

Dairy, I think, is a different story. The issue that dairy faces is that it is a commodity that other countries can produce. Because of this, dairy faces a "red ocean strategy" and a race to the bottom for prices ensues. This means that a low selling price, combined with the same number of quantity sold, with the same costs reduces profit. Furthermore however, these dairy prices are subject to change very much. Ten years ago the price for 1kg of milk solids was just over \$5 but now it is over \$8.50. This variance, which can be upto 40% in one year, means that dairy farmers future sustainability is never guaranteed and there is always risk involved. This is why I believe the only way for dairy from New Zealand to fully stand up as and differentiate itself from other countries is through a low emissions profile. Recognizing that customers, supermarkets and the global economy wants it, means that for us to stay competitive, growers must keep trying to meet targets and beyond. Dairy has low number of staff often, and so do not face as high a cost, however there will be a cost to pay if

dairy farmers do not meet their emissions. Not only this, but at our same rate of emissions we will see increasing frequency of greenhouse gas events and changing weather conditions, means that it is in the farmers best interest to keep reducing their emission. Dairy farmers must do this to remain viable* in the future and to achieve sustainability, economically in terms of profit, socially in terms of prospering communities and environmnetally in achieving a habitable planet.

In conclusion, there are many strategies that can be carried out to maintain and even increase profitability that include innovation, water security, securing trade deals, government sorting out regulation issues, and also meeting greenhouse gas targets. Whilst costs have increased, such as labour, innovative farmers can find ways to work around this, like automation. For the future, apple growers must continue to keep hammering away at their markets and producing high value goods. Dairy farmers must ensure they do everything they can to reduce their emissions and to stay viable in the global economy. By doing these things, growers set themselves up for a promising sustainable future, both economically, environmentally and socially.