

93105A



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# OUTSTANDING SCHOLARSHIP EXEMPLAR



NEW ZEALAND QUALIFICATIONS AUTHORITY  
MANA TOHU MĀTAURANGA O AOTEAROA

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## Scholarship 2016 Agricultural and Horticultural Science

9.30 a.m. Wednesday 23 November 2016

Time allowed: Three hours

Total marks: 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.

Write your answers in this booklet.

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

If you need more room for any answer, use the extra space provided at the back of this booklet.

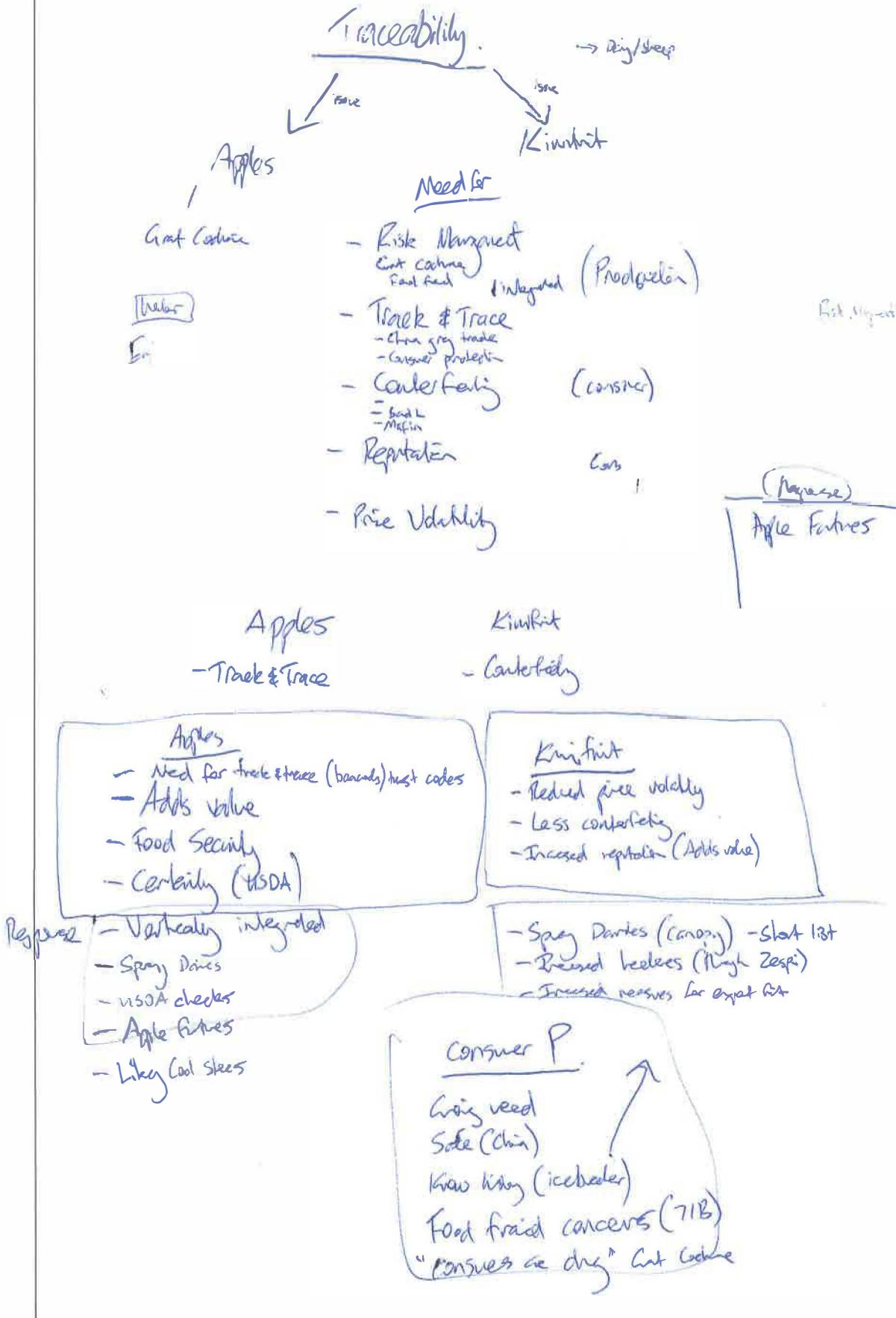
Check that this booklet has pages 2–24 in the correct order and that none of these pages is blank.

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

## QUESTION ONE: CONTEMPORARY ISSUES (8 marks)

### PLANNING

Use this space to plan your answer to Question One:



Begin your answer to Question One here:

- Agriculture and horticulture are evergreen and indefatigable industries; ones which bring prosperity for many groups in New Zealand, and are considered the backbone of our exporting sector. Such opportunities have both challenges and opportunities, with traceability concerns being at the forefront of many discussions nationwide. Consumers are driving the need for food authentication, and as such our producer sector has responded accordingly.
- Within the apple sector, the issue of traceability has impacted significantly on the production practices undertaken, and benefited the sector through premium returns due to the robust accountability system now in place. There has been a growing need/demand worldwide, and the apple industry is a prime example of an industry who has risen to the challenge. Due to the packaging and codes on all class 1 export fruit leaving NZ, the exporter can trace the carton across the sea, and into importers hands. However, the traceability system in place also accounts for concerns before the packhouse, including which orchard block and row it was picked, by which workers, how it was transported, and who worked on the grading process if manual labour was used. The development of a top-line traceability system which has resulted has effectively been driven by consumers demands.
- The above the concerns of traceability have impacted those on the apple industry in a positive way, as they can charge premium prices internationally when such traceability systems are in place. This also intersects with food safety, as consumers will pay more for products that can be traced to the source, and in recalling of

products can be undertaken if required. This has been the apple sector traceability has had a beneficial outcome.

- Within the kiwifruit sector of NZ, traceability concerns have led to increased grower/packer awareness, and as a result the industry has better traceability measures put in place. This has a multitude of impacts, the first being reduced price volatility in the markets, as by having traceability of products like kiwifruit, others are unable to replicate the process. In Guy Taes words (Pfiffit NZ) you are effectively removing the product from the commodity market, and as such removing it from the inherent price volatility. As we can create unique products, which cannot be replicated, we have more stable demand and prices for growers. Furthermore, less counterfeiting is able to occur with the追溯 protocols, as it is harder for the illegal practice as boxes are labelled with 'trust' codes, or reading algorithm which produces QR codes that are different for every tray. It is estimated that food fraud costs the industry \$71B US a year, so improved traceability systems reduce the counterfeiting and impacts positively on the sector. The reputation of NZ is also enhanced, meaning we can charge premium prices overseas for both kiwifruit and apples.
- According to Grant Cochran (Managing Director of Oratani), "consumers are driving food authentication and transparency." This is true, as Chinese are known to pay in excess of 3x the price for milk powder made in NZ, with high levels of traceability and hence food safety levels attached. This perspective is developing

worldwide, and with it production systems are changing to meet the requirements are demands of consumers. Also regarding traceability, consumers like to know the history of the product and the origin of ingredients. This has led to Icebreaker's 'barcode', where the garments used can be traced back to a particular farm in NZ which aids in obtaining higher prices!

- Consumers also recognise food fraud, especially in China and Vietnam, occurs alarmingly frequently, which results in consumers demanding the traceability of the products they are using. There have been many instances for example in China where meat other than chicken is being used to make kebabs and stews.
- Consequently, the producer systems have changed with the evidence of consumers perspectives. For example within the apple industry, the apple futures program was launched in 2007/08 season, with the aim of greater traceability measures. Leon Stalford from Hort NZ recalls how instead of calendar spraying every 3 weeks for diseases and pests, sprays are now only applied when the pheromone traps return positive tests for insects like codling moth. Furthermore we produce apples which are 10% of the limits imposed by supermarkets, which in turn are 60-75% lower than government regulations. Low residue limits, classed as nil-detectable, are able to market effectively due to the traceability protocols of the industry. By knowing the block and row from which apples are produced, we also can take account of the spray dates and confirm the freshness of apples as nil-detectable. Tim Waller, from plant and feed research says, "the lowest possible residue limits ensure a premium position in international markets."

So by having greater traceability systems, due to analysing consumer perspectives, we can receive premium prices for our apples.

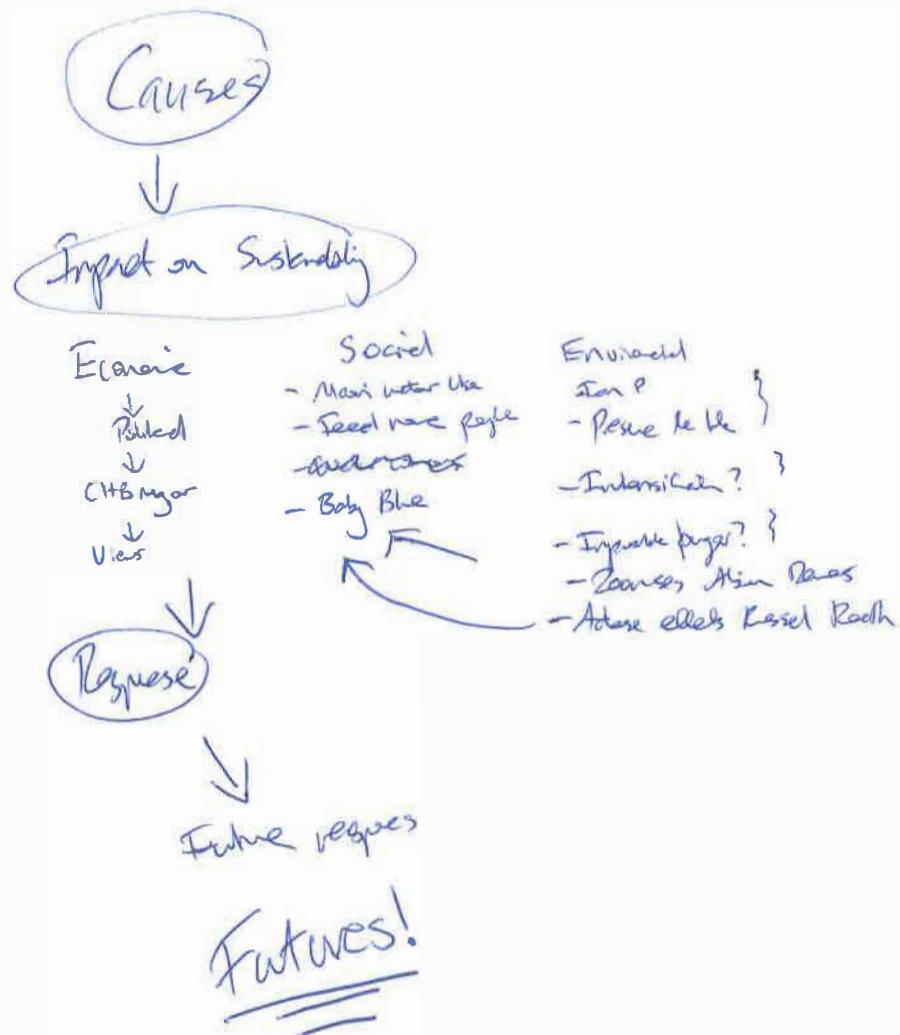
- Another traceability measure put in place is the storage of 'library fruit', which are kept in case of dispute between importers on the quality of the apples. As apples are a singular product, as opposed to milk powder, it is easier to have such high traceability systems in place.)
- As previously mentioned consumers are doing food authentically, and the apple industry has changed into a vertically integrated system since the deregulation of Enza. Packhouses such as Crasborns, are out of the STI within NZ, no longer just pick apples but have parts of their business throughout the entire industry. By this I mean they have diversified business operations, they both grow apples on their own land and grow apples on others land under lease. This can also be seen in Tunes and Goes, where they too both grow and manage fruit. This vertical integration by companies increases the flow of knowledge from one part of the seller to another, i.e. the marketers who require could see 70 Jazz apples can effectively communicate this to the growers in various orchards. Also the increased flow of information leads to better traceability systems, as one company is managing a large proportion of the process of apples. This is preferable than many small companies where such traceability measures would be considerably more difficult to achieve.

- The kiwifruit industry has also ended to meet the growing need of traceability from consumers, and have recently introduced an online chemical spraying diary which growers can fill out as they use specific chemicals. By doing so, Zespri (the sole buyer of kiwifruit for export purposes) has greater information about the fruit and a digital log of when sprays are produced. Furthermore some sprays cannot be used on kiwifruit in particular markets, with Europe for example having an extensive list of banned chemicals, which gets longer every year. Asia markets are the other lead producer of pests, and eat as worried by residue amounts. Due to the increased traceability schemes put in place, and technological advancements by Zespri, we can ensure the fruit is sent to markets where the sprays dictate.
- Another example from the agricultural sector is the development of 'beef codes' by Icebreaker, with Jeremy Moon (Maori) says are fundamental in its success. These traceability systems have evolved with consumer perspectives changing. Furthermore the NAIT scheme also ensures animals are treated effectively, and improves the traceability of the products we are exporting.
- In conclusion the issue of traceability has impacted significantly on both the kiwifruit and apple industry, and though changing consumer perspectives, the sectors have subsequently improved their traceability measures they have in place accordingly.

**QUESTION TWO: PRICE VOLATILITY AND PRIMARY PRODUCTION SYSTEMS  
(8 marks)**

**PLANNING**

Use this space to plan your answer to Question Two:



Begin your answer to Question Two here:

- Price Volatility of agricultural products impacts on the social, environmental and economic spheres of society, especially for the export oriented primary production system of dairy. The system has responded in a multitude of ways, however I believe further actions can be taken to reduce the risk of price volatility into the future. )
- Contrary to popular belief, the dynamics of the global dairy trade (GDT) auctioning system are not purely based around demand and supply, but may confounding variables which create price volatility in the market. As with any auction system, the prices will fluctuate, but other factors also come into play, which can be seen from a political perspective. For example in 2014, with rampant demand from China for dairy commodities, we became overly exposed in the market, and due to high prices many other countries increased supply. Most noticeably within the European Union when the caps were taken off and an increase bigger than NZ's total production was experienced. This political barrier and artificially equilibrium resulted in a large deal of price volatility, due to political reasons. So although the price can be correlated to demand and supply, the volatility can be linked to such factors as political boundaries. Also as economies move in cycles, most noticeably 3 year cycles, the demand and supply of food and the price consumers are prepared to pay will vary. This can be seen in 2008 where the global financial crisis, where the food price index peaked at 180, before falling to 120 some 6 months later. This price volatility was largely due to economic influences within the supply and demand model.
- The impacts of price volatility are wide felt within NZ, in many

different spheres of society, most noticeably in environmental, economic and social considerations. The environmental sustainability of the dairy industry is often discussed, due to the large degradation to the environment and nutrient runoff by farms through leaching.

When prices are low, Nick Dawson (Ballarat Farm ahead owner) says farmers are unable to look after the environment, and instead can only focus on profitability and remaining a going concern. Furthermore Ian Prodfoot from KPMG, says, "we must do what's right, not just because we have to, but because consumers expect us to." This emphasises that in order to be economically viable, we have to safeguard the environment and protect the life-sustaining capabilities. However, as David Davis from Despri alludes to, farmers do as you pay, not as you say. Within the dairy industry there is no incentive to look after the environment and experience increased costs, as this is directly affecting your profit. As streams and rivers are a public good and non-excludable, they have no property rights so owners cannot be held accountable for the damage. Farmers of dairy cows rightly point out that you get paid the same price for milk solids regardless of how environmentally friendly your farm is. This is in opposition to the apple sector where blocks with native trees receive premium prices when exported to Europe.

- So when prices are low, the environment often suffers as farmers believe they can only protect the environment when making a profit. This is why riparian plantings in 2014 were successful, as the payment of over \$8 extra could be spent on sustainability. However, for the last 2 years prices have been below the breakeven point of \$5.30 (as considered by banks) and water quality has suffered due

to the price volatility, with scientist Mike Joy from Massey University saying 90% of our farmed rivers are unsafe to swim in, and he questions whether we are truly green and free. Research from Dan Steele, an agricultural scholar in 2015 says 10% of farmers who visits his farm believe it didn't meet the 'free and green' slogan and that they had expected better. This degradation is largely the result of dairy, where intensification is measured to increase outputs. As farmers consider the environmental plan they're possible, there are significant negative effects when experiencing low payments.

Price volatility also impacts on the economic sustainability of many dairy farms in NZ, and the US Department of Agriculture notes that 46% of farms declared a crisis in the 2014/15 year, so inversely 54% had to borrow or work off-farm to support their income. Owing to low payments to farmers, they often need to borrow to stay in business which reduces the financial viability of the business not to fail. The economic effects from a higher payout are phenomenal, with the Fonterra forecast rising \$0.75 this month, the expected flow-on effects is in excess of \$6bn NZD. So dairy farmers are largely dependent on dairy payments to turn a profit. ~~The response~~ Fullhouse, Ian Prodlet mentions global disruptions frequently, and how the 'impossible burger', which cost \$325,000 to produce in 2013, now costs just \$11.36, could revolutionise traditional farming systems. Due to the volatility in many agricultural sectors, the disruption of meat breed in a laboratory may in fact become reality and leave traditional farming methods being obsolete.

### Farmers

- Farmers with irrigators have experienced lower cost structures in many farms, due to lower dairy cost and higher productivity and intensification. As a result,

They were able to remain financially viable in times of low pyrolysis as the milk produced is at a lower cost than standard dairy farms who have just 'brought in' such a scheme was proposed for Hauraki Bay, with 25,000ha of water being stored in the Rotorua dam. Irrigation and water is considered 'liquid gold' by many Canterbury farmers, and Canterbury Mayor Peter Butterfield refers to the Herald that, "Every 2nd farmer in Ashburton is a millionaire." Due to large irrigation schemes being in place, water is easily accessible.

- Social sustainability is also impacted on with high levels of price fluctuations, as from a flow on effect from the environmental damage caused by the dairy industry. Water quality is detrimentally affected which directly affects Maori users who consider water the essence of life and a vital part of pride for their whanau for food such as watercress and koura (crayfish). Alzen Davis, a vet and farm consultant also explains how the Waikato Region in NZ has the highest occurrences of zoonoses in the world, a disease caused by animals. (Giardia, campylobacter, E. coli) The water quality is so poor the general population suffers, and in intercultural cases of methemoglobinemia, or blue baby syndrome were reported due to the decreased oxygen carrying capabilities of the haemoglobin cells. The adverse effects of water quality are noted well before locally, warns Russell Beach, a freshwater ecologist. These the impacts on society are likely to last over the long term. The system has responded through the dairy dairy campaign in 2003 and the freshwater streams accord with local maintain water quality. The RMA also acts as an important environmental watchdog, although changes are being made currently to allow ventures which degrade the environment, as long as there is

enough financial benefit. Geoffrey Patvar, who first wrote the Bill says this is not the intended use)

- The goal is to reduce price volatility, and large farmers can budget more effectively and by doing so remain economically sustainable. This flows onto environmental and social sustainability, as if profits are maintained dairy farmers will endeavor to protect the environment. Nick Morris, NZX senior financial derivative manager says there is a growing need to develop risk management strategies for prices in NZ. By doing so you gain price certainty and future more losses are known. In Australia, grain farmers consider knowledge of the future market (one option of risk management) is important as doing otherwise. They believe it is ~~as~~ a fundamental requirement to be a farmer. So why don't NZ farmers undertake such initiatives? The minister of agriculture in Korea says it is due to, "a lack of tools and understanding of such financial instruments." Furthermore, an Australian agribusiness review paper notes the effectiveness of risk management strategies are limited by the farmers education, confidence and understanding.
- NZX listed this year both future contracts and options available for trading in May and June respectively. Such financial instruments (which include risk management strategies) is a form of hedging, which protects the value of a commodity such as milk. Such instruments are commonly used worldwide, but NZ farmers believe price is out of their control. It is not, and strategies can be implemented to gain price certainty over future price levels. This will be of benefit to all aspects of sustainability, and lead the path for dairy to continue being a key export earner.

### QUESTION THREE: GLOBAL FOOD TRENDS (8 marks)

#### PLANNING

Use this space to plan your answer to Question Three:

rehd, fresh, organic

##### Needs

- Food fraud (Zepri)
- less meat in NR.
- Freezer diet
- Run faster to shop skill
- World doesn't feed us (Fungi)

##### Opportunities

- Dairy - Higher Prices
- Apples ~~less~~
- Increased sustainability
- Melting Zepri - cool heat
- Asia markets (food security)

Begin your answer to Question Three here:

- Worldwide there has been an increase in the "natural, fresh and Organic" market. This leads to both opportunities and threats for many of our exported products, but in particular Kiwifruit and Dairy industries.
- "Change is happening at a pace we have never seen before", (Fiona McGregor) and as a result is shaping our vastly modernized contemporary society. There are many threats to the industry of both Kiwifruit and dairy, the most significant being increased food fraud of products trying to pass as organic, NZ becoming less of a secure nation with food safety at highest levels as worldwide production will become safer, and consequently the world may not demand our products without technological progressiveness by industries in the future.
- Firstly, food fraud is a large corrupt industry worldwide, and results in over \$71 B of losses annually to the sector. Even today, there is evidence of counterfeit lamb into China as there is more, 'NZ Lamb' being sold in China than imported. This means Chinese producers are labeling their products as NZ, to receive higher prices in local markets. Therefore the production and traceability of such products needs to be carefully evaluated, to consider how we can improve traceability measures and thus reduce counterfeiting. Within the Kiwifruit industry, 'trust' codes are already used, and as it is a reading algorithm to the barcode offsite the same. This prevents copying of our products, and increases food safety. In China, with more lamb being sold clandestinely then reported, it undermines the integrity of our product as the Chinese lambs will

inevitably not taste the same as NZ's. This threatens our market share, and unless controlled through better traceability systems, the impacts could be severe.)

- The Italian Mafia are believed to earn more from coke-fuel oil and ice, than from the sale/distribution of drugs in the country. This shows how lucrative this illegal business is, and why so many participate in it.
- There is also the risk that NZ will become less significant to international countries in terms of food safety as international primary production systems improve. I.e. if USA can grow organic apples it compromises our market share and the premiums we demand might have to reduce. This is also true in many other sectors such as kiwifruit, where Zespri currently exports organic green to markets who are prepared to pay a higher price (\$7.40 a kg at 2015). These premiums paid on such kiwifruit may diminish with other countries developing systems as good as ours. Ian Pradhan says, "NZ needs to run faster to stay still." This means in order to stop maintaining high prices we need innovation and new ideas, as the competition such as Chile are catching up for example within the apple sector, being 7 years in technology behind our production.
- NZ producers often believe that countries overseas demand our products due to their quality, but an alternate viewpoint suggests that Europe only buys our kiwifruit as we are considered and produce them when they cannot. It is somewhat

is granted to assure that consumers highly demand our product when the majority of Europe would rather buy local. This has been influenced through various marketing campaigns by the government, to promote buying local and support the farmers. Furthermore, advertising around carbon miles is significant in Europe, with consumers believing that NL food is extremely high in food miles and therefore is worse for the environment. However, the opposite may be true as even with transport pollution, our production systems are much more advanced.

- Together with the rise of 'natural, fresh and organic', it creates many threats for our exports sector, most notably in horticulture ~~and~~ such as Knutstik production.
- However, the slogan also creates unique marketing and production opportunities for both the dairy and knitstick industries. We are already well ahead of other countries in terms of organic production, and both products aforementioned have organic marketing sides ~~outlet~~ in Friesland and Zespri respectively. Due to the low payout for traditional milk producers at around \$4 per kg of milk solids, organic prices being received were around \$8, twice the price. While intensification is less on such day fairs, the returns gained are greater and less prone to price volatility as it is not a commodity, but more a unique product with strong demand. As such, the expansion into more organic dairy is plausible, which would mitigate some of the environmental effects ~~currently~~ expected through intensification and change of the natural environment.

- By producing organically the environmental effects will be considerably less, which is of benefit to all sectors of sustainability. Farmers can still remain profitable, while enjoying less price volatility, and lower cost structures. Therefore the rapid increase in demand for organic products may be of benefit to all sectors of our social structure. The 11% increase in 2015 in organic food sales is a strong indicator that the trend is likely to continue, and dairy farmers have an opportunity for a more sustainable way of production. In saying this there are certain limitations, which includes a period of 3 years before a farm can be organically certified. Therefore the financial viability of some may be limited.

- Marketing opportunities exist in both dairy and horticulture to fit under the label of natural, fresh and organic, but most predominantly within horticulture who have an extremely strong marketing division and market share with their plant variety rights of the gold G3 kiwiberry. As previously mentioned, the organic prices per kg are significantly higher for green, and more planting of ~~organic~~ the green for organic processes has been undertaken in recent years. However, due to varus limits and restrictions, the yield per hectare of fruit is substantially less, being 11,000t/ha for standard green and just 7,300t/ha for organic green. As a result, it is more difficult to compete with standard, unless intensification can occur with the organically produced fruit.

- Last year to date (2015-16) Lespin spent \$125m on marketing associated costs, as evidenced from their annual report, one of which a large portion was directed towards gold so called

Outstrips supply and prices remain high. Zepi plan on releasing 400 tonnes of gold in the start ton, of which some could be classified as organic to pick up on the increasing health conscious consumer. Kimchi already has significant health benefits so coupled with organic labelling the product may prove very desirable to customers, especially from the Asian region where sweet fruit and healthy flavours are dominant. It is interesting to note that Phil Olson, director/president of RockIT apparel concluded that 66% of the weekly grocery bill was on vegetables/fruits for a typical Chinese household. Therefore the market opportunity to a certain extent will continue growing. Producers may opportunity for Zepi, and they already have a well developed market strategy for Asia. Furthermore, food safety is a large concern for Asian consumers, so a product with entrances on the slogan of organic may prove successful.

- Fonterra also has major market opportunities into Asia with its organic production of milk, and being a monopoly with large market share and power could effectively capitalise on such a slogan. They recently introduced the slogan 'trust in goodness' into Asia, enthaing and amplifying the concerns of cheese consumers. A similar marketing initiative could be done for organic products, so the opportunity is large for the milk firm.
- So while there are many threats of the new movement, it also provides unique market opportunities for both dairy and kimchi producers, which is beneficial to the environment as such production systems are not as intensive and do not pollute. By effectively managing counter-intuitive,

Extra space if required.  
Write the question number(s) if applicable.

products through traceability systems and making NZ as a world wide leader in food safety, we should reap the benefits as a nation, which is crucial to the economic prosperity of our nation. As Dan Prophett says, "We need to run faster to stand still." //

QUESTION  
NUMBER

**Extra space if required.  
Write the question number(s) if applicable.**

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## Annotations

### Outstanding Scholarship exemplar 2016

Subject:		Agricultural and Horticultural Science	Standard:	93105	Total score:	20
Q	Grade score	Annotation				
1	6	<p>The candidate has chosen traceability within the apple and kiwifruit production systems as their contemporary issue, and has provided relevant evidence of their understanding of the issue as it pertains to the two selected primary production systems. The ability to discuss the impacts, consumer perspectives and system responses to the issue of traceability and to identify the critical elements within this discussion has allowed it to be awarded a Scholarship level mark.</p> <p><b>This answer is at the Scholarship level of performance.</b></p> <p>However, it lacks the necessary perception or insight within the discussion that would make it an “Outstanding” answer.</p>				
2	7	<p>The candidate has chosen dairying (milk production) as the specific primary production system around which this question on price volatility has been discussed. Clear understanding of the complex nature of price volatility and the factors that contribute to the volatility of the milk price paid to farmers has been shown throughout the answer (i.e., it is more than a basic supply / demand situation as discussed in the opening sections), and the critical factors that contribute to the price have been identified and effectively discussed. There is evidence of perception and in-depth understanding of the links between economic sustainability and its growing dependence on consumer perceptions, social and environmental sustainability. A range of quoted material / information sources adds to the quality of the essay.</p> <p>The answer is very well structured with no superfluous material.</p> <p><b>This answer is at the Outstanding level of performance.</b></p>				
3	7	<p>This question on global food trends has been answered using kiwifruit and dairy as the primary production systems under discussion. The candidate has identified and discussed a number of different threats that the identified global food trends pose. Food fraud, potential growth of organic production and the risk to NZ exports, and the fact that the demand / premiums for NZ produce may be more due to “counter-seasonal” reasons, rather than our superior quality, all add value to this answer.</p> <p>Balance to the answer is provided with the opportunities that increasing organic production may present, and is backed up with some nice data from the current dairy payout situation and the premium that organic producers receive. This has been contrasted with the kiwifruit industry</p>				

	<p>and its focus on expanding the gold kiwifruit sector while still having an organic green component. Perceptive, linked comments are evidenced throughout this answer.</p> <p>As with Question Two, there is evidence of “convincing communication” throughout this answer.</p> <p><b>This answer is at the Outstanding level of performance.</b></p>
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