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SCHOLARSHIP EXEMPLAR

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Scholarship 2014
Agricultural and Horticultural Science

9.30 am Thursday 20 November 2014
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.

0062

QUESTION ONE – NUTRIENT MANAGEMENT (8 marks)

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In a comment to Newstalk ZB on 21 November 2013, Jamie Falloon, President of the Federated Farmers Wairarapa, said, "There is a responsibility to resolve the water quality issues and we don't shy away from that, but the key bit is to make sure the decisions are sensible, and that they don't have unforeseen economic consequences for regional economies."

Nutrients are an important input into agricultural and horticultural systems. However, there is increasing concern over contamination of waterways (rivers, lakes, and groundwater) from fertiliser and animal effluent. In response, regional councils are proposing nutrient loss limits on agricultural land.

Discuss the likely impacts of these proposals on a specific primary production system, and the potential economic and social effects on the various stakeholders.

Plan your answer here. Begin your answer on page 3.

NZ intensive Dairy - N, P to increase yield, $

↓

Increased leaching & runoff → cost for farmers

↓

Envirn Impacts – Social

↙ Ground water
- social drink 11.3g/N/L
- Economic stock water

↘ Surface Waterways
- Algae – reduced N better for recreation

↘ Proposed nutrient loss limits by councils → fencing not ideal 80% from 20% for away.
- need to use all mapping & N budgets to ensure yields don't drop

Social 11.3g, will be safe. ↙
- Economic - Dairy price
- Social lost jobs
- Social benefit recreation
- Fencing, riparian - can't afford now long term
- economic

- Political - don't want NZ productivity to drop, but must sustain environment

→ Not just one solution, but will take variety & commitment

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Intensive farming of production systems in New Zealand such as Dairying, are having considerable negative impacts on the environment due to the high inputs of nutrients required to make farms economically viable. The proposal of Nutrient Loss Limits by regional councils aims to reduce these detrimental impacts on the environment, but in doing so will likely cause ~~impacts~~ negative economic impacts to farmers and the New Zealand economy. The dairy industry is New Zealand's largest primary sector, accounting for 29% of our primary merchandise export. The sector is expected to ~~exhaust~~ export over $16billion by in 2016. Dairy farms are reliant on high stocking rates and high inputs to maintain profitability. Nutrient inputs, notable Nitrogen and Phosphorous, are frequently applied to pastures in the form of effluent or fertilisers in order to increase grass growth and thus boost milk yields. However, over excessive fertiliser application and ~~irrigation~~ indiscriminate effluent application can result in leaching and runoff of nutrients into waterways. ~~Nitrogen~~ When Nitrogen is not taken up by plants, it is often leached into waterways and ground water aquifers, with irrigated soils and sandy soils being particularly prone to leaching. High concentrations of Nitrogen in ground water supplies mean the water may become unsuitable for human or even animal consumption, which has both economic and social impacts. Nitrogen can also enter surface waters via leaching or runoff.

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Runoff can also cause phosphorus and nitrogen to ~~enterwaters~~ enterwaterways. Phosphorus also binds to sediment, so also enters via erosion. This results in severe degradation of water quality. A build up of nutrients causes eutrophication, which leads to excessive plant growth and the formation of algae. Water is subject to many diverse users, and degraded water quality can lead to conflicts ~~among~~ between the farming sector and other water users. ~~Whilst~~ There is a vast array of solutions that have been suggested and investigated in order to solve this environmental issue, but it is difficult to find one that benefits all users, ~~and~~ ~~compromises on economics or social~~ and can balance both economic and social impacts effectively. In a nationwide trend of late, many regional councils ~~are been~~ are proposing to initiate nutrient loss limits as part of local Resource Management Acts (RMA). ~~However much~~ after abhorrence from the general public at our declining water quality, prompting political intervention. The key issue that these nutrient loss limits caused, is potential for reduced productivity of dairy farms. Jamie Falloon, president of ~~the~~ Federated Farmers Wairarapa, describes how farmers realise it is their "responsibility to resolve water quality issues," but ~~that it~~ but are concerned that reducing Nitrogen inputs could have significant "economic consequences for regional economies" and farmers. Reducing ~~Nitrogen~~ Proposed ~~fertiliser loss~~ nutrient loss limits

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will ~~see~~ mean farmers will ~~be~~ ~~able~~ have to reduce fertiliser inputs in order to meet these targets. ~~The~~ ~~the~~ ~~ofth~~ Many of the ~~propo~~ plans propose significant reductions, with the controversial Horizons One Plan in the Manawatu seeing nutrient loss limits set at 6-8kg N/Ha, while many farms currently have ~~nutrient~~ Nitrogen loss leaching levels of 15kg N/Ha. This would mean fertiliser inputs would drop significantly, ultimately resulting in reduced grass growth and yields, and thus reduced profitability. Louise Gilligan, Northland dairy farmer and writer for Farmers Weekly, describes how "fertiliser is the fuel for grass ~~/~~ grass and productivity" and with milk payout dropping below $5, farmers must ensure they continue to apply fertiliser, in order to ensure farms remain profitable. ~~The same~~ ~~For~~ A drop in productivity ~~in~~ ~~ea~~ of dairy farms in regions could ~~be~~ have serious economic impacts on local communities, as there will be less money in the local economy. Ultimately ~~f~~ farm workers could also face job losses if productivity were to drop significantly. Farmers would ~~a~~ rather look at alternative methods, that allow they to protect waterways without impacting significantly on farm production. Local service suppliers will all be detrimented financially as farmers will not be able to afford additional products and services. On the contrary, reducing fertiliser inputs could have significant

social benefits for other stakeholders and water users. Nutrient loss caps will mean less nutrients enter ground water. Currently the maximum allowable Nitrate levels for human consumption is 11g N/L, however bore across New Zealand currently vary from 5-21g N/L of water. This will have benefits for bore water users, and could potentially protect blue-baby syndrome, which can be fatal for young children if the consume high concentrates of Nitrogen. A reduction in Nitrogen and phosphorus levels in surface waterways will also have benefits for recreational uses and other economic activities. By reducing eutrophication, algae levels will decrease as will anaerobic activity due to an increased oxygen level. Biodiversity of aquatic species will once again increase and toxicity levels will reduces. This is particularly important for local communities, as they will be able to utilise these natural resources. It will also benefit Maori and local iwi, who currently see dairy farmers as destroying their 'taonga'. ~~Reduced~~ ~~limits~~ Nutrient loss limits could also have economic benefits for the farmer too. By ensuring waterways remain unpolluted, they will be able to ~~or~~ ensure farming is sustainable in the future, and could benefit from reduced fertiliser costs, saving $100-$300/Ha on lost fertiliser.

Local regional councils see nutrient loss limits as a good compromise for farmers and other stakeholders. Implementing these by laws along with the Governments initiative to purchase $100million dollars worth of sensitive land, will ultimately help to minimise leaching. The key benefit of nutrient loss limit is that it allows leaching to be stopped from the source. In order to allow nutrient loss limits to be effective farmers will need to look at ways to minimise nutrient loss and better utilise existing nutrients, such as pH mapping and variable limits to prevent excess N application in areas, utilising nutrient budgets such as OVERSEER and looking at alternative species of pasture, which is currently being trialled in Canterbury, with the aim being to maintain yields but also minimise leaching by 20%. leaching

Less limits will ultimately help NZ to maintain its pristine environmental image and make urban waterways to their natural state. This will benefit our exports as well as local communities who can make use of waterways for recreational purposes such as fishing. Long term, an improved global image will eventually see farmers achieve higher values, which is why nutrient loss limits have the potential to be effective. NZ New Zealand's goal is to produce quality products from a quality environment, and it will always be difficult to balance economics with social and environmental impacts. Ultimately, we must put the environment before economics,

QUESTION TWO – ADDING VALUE (8 marks)

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Adding value to a product is a key component of any primary production system.
With reference to TWO primary production systems:

- discuss how value is added to the primary products in their production systems
- evaluate the opportunities and challenges that adding value presents to the selected primary production systems.

Plan your answer here. Begin your answer on page 9.

value added

↓

reaching capacity
turn to quality rather
than quantity.

↓

Positioning — processing — Niche Marketing

↓ Lamb

↓ Kiwifruit

opportunities

challenges
- neglect markets
- cost increases

challenges
- some reluctant growers
- cost

↘ Sustainable ↙
Economy - growing wealth

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New Zealand's primary production systems are nearing a point where we will reach maximum output in terms of quantity. Increasingly, producers and exporters are turning to value added products to increase profitability of existing products. Value added products involves giving a raw primary product added value through better quality or a point of difference. Lincoln University found there are three key ways of adding value: by through better positioning of existing products in the global market, value added processing or niche production and marketing strategies. Value added products are vital in order to increase demand and regenerate our exports for pre existing products.

The New Zealand Sheep industry has used value added products to ~~to~~ advantage in recent years with its lamb products. Traditionally, lamb exports to the UK have made up the vast proportion of our lamb exports, however a decline in the popularity of red meat ~~dro~~ drop, with ~~over~~ the volume of lamb exports dropping significantly. Currently the sector exports 313,000 tonnes of lamb annually, with 22% (68,000t) going to the UK. Consumer preferences have changed over the years. No longer do people want large, cheap cuts of meat, instead they are willing to pay a premium for premium, quality, ready-to-eat lamb. ~~Lamb exports~~ Silver Fern Farms and Ovation are two key exporters of New Zealand's lamb, and have focused on providing value added products for consumers over

recent years. Silver fern farms implemented the Eating Quality System for its high-value cuts, which tests the lamb for tenderness, colour, pH and fat. Being conscious from our export markets such as Germany, China and the UK, we are all willing to pay a premium for products which meet their consumer preferences, with Ovation processing meat differently for each market to tayler lamb to their requirements. Consumers now want smaller cuts that are able to be prepared quickly with little or no experience - ~~took~~ more people are now wanting to be eating restaurant quality meals at home each night. ~~Consumers~~ The ~~like~~ small lamb medium sell for the equivalent of $26.00/kg in Sainsbury supermarkets, showing how consumers are willing to pay for premium-processed product. No longer do our meat companies aim for the general market, but rather have ~~are~~ the high-end market by producing value added products. Ovation requires farmers to produce lamb with 6-12mm fat on the 8th rib, in order to meet the UKs specific requirements for value added cuts. Packaging and marketing has played a crucial role in the adding value to our lamb products. ~~Silver fern~~ The New Zealand Beef and Lamb successfully run the "love our lamb" campaign in England, which shows the potential when consumers purchasing high-value meat cuts. Promotion of our lamb through celebrity chefs such as

Peter Gordon and in-store demonstrations, all help to add value to our lamb products. The marketing and packaging of products has also added value to our lamb products, with vacuum packed packaging and 'Hot Ready' ranges ~~of~~ packed in black boxes, promoted as being 'expertly portioned and FREE RANGE lamb, for discerning chefs'. The New Zealand lamb industry has significant opportunities for value added products. Also financially. Recently, Silver fern farms launched a TV advertisement in China selling high quality cuts of New Zealand lamb. 12.5T was sold in 30 minutes, with consumers paying premium prices for the convenience of ~~eating~~ being able to purchase from home via online or over the telephone. ~~Mark~~ Niche marketing is a key ~~or~~ opportunity for this primary sector. China is traditionally ~~a low value~~ taker on low-value cuts, ~~as~~ accounting for 35% (85,000t) of our exports but only account for 25% of our total lamb export values. Through marketing and the use of value added processing, New Zealand has the potential to capitalise on this market. However, the industry faces many challenges when implimenting value added products. There is a significant cost of marketing value added products, and this can often come at a cost to the ~~consumer~~ producer. Many farmers oppose these value added strategies, as they ~~as~~ do not get direct financial returns. Value

added products can also mean a drop in the volume supplied, which has been seen in New Zealand with a significant drop in the lamb exports, dropping by 3.6% alone in the last year. However, value added products have seen the value of our lamb exports rise by 10% in the last year, despite the drop in volume, which demonstrates the significant opportunities in value added lamb products. It is important we do not neglect our low value value markets too, who we rely on to sell our products that cannot be added value, which is a challenge faced by the industry. Nick Thorpe, CEO of NZ Trade and Enterprise, emphasises the importance of focusing on high value added-products, due to our fixed land mass meaning we are limited in our production outputs.

The kiwifruit production system is identified as New Zealand's most successful value added industry, largely due to the formation of Zespri. Zespri has been changing its focus from increasing exports volumes to focusing on premium products. The Japanese, Chinese and North American markets have all responded very successfully to Zespri's value added campaigns and products. Japan has been a key target for Zespri, as they are willing to pay a premium for fruit with high bit-level of 11-12, and 19% of consumers decisions are based on taste. Size is of little importance in comparison

which has given Zespri and opportunity to capitalise on this market. Zespri produces only 1/3 of the world's kiwifruit yet earns 3/4 of the world's kiwifruit profits. Japan imports 325000 tonne of New Zealand kiwifruit annually and often grows the highest Orchard Gate Return of any market, at $10.93 per tray, due to their response to value added kiwifruit.

The taste Zespri programme encourages growers to add value to their fruit by increasing bit levels, offering financial benefits in return. Marketing of the gold-kiwifruit has added significant value to its products. The launch of the New yum-gold variety provides significant opportunities for value-added market campaigns, with the 'Water Splash' event held in China, significantly increasing the products reputation. Zespri has the opportunity to capitalise on its ~~successful~~ successful brand, after over $16 million has been spent on marketing. Zespri is known as one of the top five trusted quality fruit brands in both Japan and China, with $30 million spent in 2013 alone. Value has been added to the fruit by pointing it nutritional benefits, such as having 3 times the vitamin C of oranges. They have also tried to create a point-of-difference with the nation of the spike. Launched in 1997, it adds value by providing a product free with kiwifruit, which consumers perceive, as saving time, fun and novelty ....

6

QUESTION THREE – CONTEMPORARY ISSUES (8 marks)

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Choose TWO of the following contemporary issues:

- animal welfare
- biosecurity
- traceability
- food safety
- country of origin labelling.

For EACH of your chosen contemporary issues, and with reference to ONE primary production system:

- critically analyse the impact that the issue has had on the selected primary production system
- discuss likely future developments in regard to the issue, and the effects that these developments will have on the primary production system.

Plan your answer here. Begin your answer on page 15.

Trust, Image, Strict

↙ ↘

Traceability
- EID tags
- cost
- Demand

Lamb (Sheep production)

Animal Welfare
- Docking
- Slaughter

Future
- genetics
- value added

- Superior product
- China, India concerned.

Get tougher China

UK increase 40-50%

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New Zealand's exports are reliant on our global image of producing high quality products. Consumers need to be able to trust our New Zealand brand, and as our trading partners are placing increasingly tighter controls on diseases, traceability and animal welfare. Maintaining these high standards and our global image is particularly crucial in order for the nation to keep increasing export volumes and tap into high-end markets which demand top quality, ethically produced products.

New Zealand's sheep production system is reliant on high standards of animal welfare and traceability. The NAIT (National Animal Identification Scheme) was ~~introduced in 2012~~ made mandatory for all cattle born after July 1 2012, allowing cattle to be traced from birth to the time of slaughter. When the Bill was passed it allowed for the inclusion of other species (notably sheep) at a later date. Sheep tracking is unworkable, according to Federated Farmers, due to increased biosecurity and biodiversity requirements of our export markets. We need to better disease and herd control and changes in consumer patterns, who want their meat products to be traced. Currently EID (Electronic Identification using Radio frequency) tags are only optional for sheep farmers, and as of yet

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There is no fully established national data base for farmers to record stock movements. Currently, the negative impact traceability has had on sheep are minimal due to EID tags not being compulsory. At present, most slaughter companies allow products to only be traced back to the place of slaughter, although some small exporters such as Overton all traceability of carcasses back to the individual carcase, using meat stamps and barcodes. However, it is only traceable to within a 15 minute period, of slaughter so generally cannot be traced back directly to the farmer. This is where the future of traceability comes into play. Electronic Identification has huge potential for the New Zealand sheep industry in the future. Overseas consumers are increasingly wanting to know where their food has come from and how it is produced. Overseas are in the process of developing QR codes that can be scanned by the consumer, that will allow them to trace back directly to the grower. Consumers are willing to pay more for premium products that are traceable. Traceability of our lamb product will considerably improve consumer confidence, as they can be sure they are getting ethically produced, free range, disease free lamb. The Food Safety will also be improved, with any issues in term of food safety being able to

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be traced directly back to the farmer or slaughter house. Disease Outbreak control would be of significant advantage to producers and exporters, with any the major disease outbreaks such as Foot and Mouth able to be contained, due to the sheeps movements having been tracked while on farm prior to slaughter. This is the insurance plan and protection the sheep industry needs, to ensure it remains an economically viable production system in the countries. The main issues the scheme would pose is the cost and time it would take to set up the system. The practicality and cost to tag large flocks of sheep is an issue. At present, the issues with ear tags falling out are making the system impractical and unreliable, although Tasman Telford farms in conjunction with Silver Fern Farms on Alpha are currently in place. EID will also allow growers to track weight gain and carcase data, to help offset the cost of traceability by increasing productivity. Consumers will be willing to pay more for traceable products too, which will see economic advantage long-term for growers and packers. Single international standards for disease control and biosecurity are about to come into place, so New Zealand can further position itself with a system that allows for recording of physical evidence.

Animal Welfare is becoming an increasingly important issue for all animal products, including the sheep industry. High-end consumers are becoming increasingly concerned over animal welfare issues. While New Zealand has exceptionally high animal welfare standards, it is important we maintain them and keep improving, to ensure we meet international requirements and changing consume preferences. The Animal Welfare Act was adopted in 1999 and in 2010 the Animal Welfare Act for Sheep and Cattle was ~~also~~ updated, to ensure we continue to meet consumer requirements and remain competitive against competing markets. With Animal welfare has generally had a positive impact on the sheep production system, as exports have remained high due to a good global perception of our animal welfare. Docking has been a controversial animal welfare of late. Traditionally, our lambs have been docked to prevent flystrike, which is an animal welfare issue as it eats the animals flesh. ~~Scientist have~~ Concerns from UK consumers about the welfare of sheep after docking, has prompted research to be carried out. Concern over short tail length docking of 2012 ~~is~~ ~~20-30~~ 30-40mm compared to Britains 70-80mm, have been quoted.

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Research found docking significantly protected sheep from flystrike due to the reduction of dags and did not impact the animals growth in any way. However, breeds of sheep with bare-backsides and short tails have been developed and are currently being commercially breed, ~~in~~ in order to meet future animal welfare fears of consumers, who are becoming increasingly concerned over any practice carried out to the animal. ~~The docking of animals is also against dags.~~

The Docking, the surgical removal of the skin on the backside, is no longer an accepted practice in New Zealand, which has given us a competitive advantage over other lamb exporters such as Australia. Because all sheep must be stunned before bleeding to death, consumers can trust our products have been ethically killed, whilst still meeting Halal requirements. ~~UK~~ sheep in are often not stunned and die just bled to death. Docking is important as it renders the animal insensitive, and ensures they do not suffer pain when their tail is cut. Future developments of animal welfare are likely to be in the form of tougher welfare standards due to increased consume pressure. As we venture into new High-Value markets such as China, we must adapt to their requirements. Recent survey

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Write the question number(s) if applicable.

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by Caroline Saunders found 50% of Chinese placed animal welfare as very important compared to only 24% for the traditional UK export market. We must raise our standards if we want the developing market to continue to purchase our lamb, and give our product a significant point of difference.

Traceability and animal welfare will no doubt be of benefit to the sheep industry. While traceability has significant cost, it is predicted to earn the industry $161 million over the next 20 years, due to minimisation and control of any future disease outbreaks. Animal welfare and traceability are both important factors when consumers are making informed decisions, so by raising our standards we will be able to increase the value and volume of our exports, and ensure economic viability of the New Zealand sheep industry to future generations.

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QUESTION NUMBER

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The biospike was also awarded from biosilent residue to encourage high-end, environmentally conscious consumers to purchase the product. Zespri has an opportunity to create a high value - environmentally friendly product with the creating of 100% compostable boxes, meaning added convience also. Consumers will be able to through away and compost both bottle and the packaging, along with skin meaning no waste.

The largest threat of value added products in competition from China, which is expected to be producing 65% of the global kiwifruit production by 2020. Zespri must remain competitive, and ensure its high value products do not out price competition from countries with low production costs. Zespri has avoided this however, with its marketing manager describing ~~saying~~ ~~was~~ how commodity space is limited, ~~so we~~ so we must turn our ~~product~~ commodity into a premium product. Backlash has also occured causing a threat, as many growers argue that Zespri does not share profit with growers enough, and spend too much money on promotion to add value, such as the Kiwi-ku Mum campaign in South Asia, and the

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2 "Feel the power of the Sun Campaign" Growers find that adding value to their fruit, does come at a cost to the production system. The main challenge for Zespri in adding value is ~~encouraging~~ that consumers turn to ~~eat~~ the brands when V2 fruit is out of season, and the quality is inferior and do not return to purchase our value added product.

Value added products are key to ensuring New Zealands exports are economically sustainable in the future. New Zealand prides itself on its ~~value~~ on high-quality products, and value added kiwifruit and lamb are excellent ways to minimise returns from overseas markets. Increasing global wealth, changing consumer preferences and developing new technology will only see an increase in the profits New Zealand can make from its value added primary products. 1

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Write the question number(s) if applicable.

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QUESTION NUMBER