Before the Independent Commissioners

In the matter of	the Resource Management Act 1991
And	
In the matter of	the Proposed Canterbury Land and Water Regional Plan

Statement of Evidence of Andrew Webster Macfarlane

Dated: 27 March 2013

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INTRODUCTION

1. My name is Andrew Webster Macfarlane.

2. I graduated from Lincoln College in 1981 with a Bachelor of Agricultural Science degree. I have 32 years' experience as a Farm Management Consultant, 31 of which have been in private practice. I am a registered member of the New Zealand Institute of Primary Industry Management and am a past New Zealand President of that Institute.

3. I am a director of Ag Research, ANZCO Food Limited (**ANZCO**), a Lincoln University Councillor and Chairman of Deer Industry NZ.

4. I have been farming on my own account, with both border-dyke and spray irrigation, for 24 years. My home property was awarded the "Ballance Farm Environment Award" (for setting a high standard in environmentally sustainable farming) in 2003. My farming interests include dairy and mixed farming systems.

5. My advisory work, through my company Macfarlane Rural Business (**MRB**), involves crop and animal systems, the impact of soil fertility and water availability on them, and the financial analysis of such systems. I have been advising farmers on the development and management of their on farm and off farm irrigation systems for 31 years. In recent years a significant amount of my time has been involved in assisting farmers:

   (a) re-develop existing irrigated areas (both spray and border-dyke) to enhance efficiency of resource use and hence profitability;

   (b) develop sound design and management practices for proposed water use, both individual and group schemes; and

   (c) manage production and financial risk around water enhancement schemes, both group and individual.

6. I have been working with processing waste water and associated solids for 25 years and started work on land management systems on ANZCO land in 1992 (under previous Fortex ownership). I still retain an overview of management strategy in regard to utilization of waste flows.

7. Environment Canterbury has utilised MRB's skill set to examine existing and potential further outcomes for the Hinds Catchment. That involves detailed analysis using biological models (such as Farmax), a nutrient management model (Overseer) and financial modelling.

8. I acknowledge I am not appearing before the hearing panel in my role as an expert witness, but rather in my role as a director of ANZCO.

Scope of evidence

9. My evidence will outline:

   (a) An overview of ANZCO, CMP and Five Star Beef operations;

   (b) An overview of how the companies manage discharges including the use of processing support units;

   (c) An overview of the companies water use;

   (d) The close relationship of livestock processing with farmers including:

      (i) The importance of processing plants in times of drought; and

      (ii) The impact of the "lag effect" for processing plants;

   (e) An overview of the farm and environmental management systems used by the companies including examples to differentiate the application of waste compared to conventional farming systems; and

   (f) Lastly, outlining some of the future opportunities and risks to changes in the system.

Overview of operations

<u>Canterbury Meat Packers (CMP)</u>

10. ANZCO operate three divisions:

   (a) The harvest division, which incorporates "Riverlands" beef plants at Eltham (Taranaki) and Bulls (Rangitikei), CMP beef plants at Blenheim, Kokiri (West Coast), Seafield (Ashburton),

CMP sheep processing plants at Rangitikei (Marton), Seafield and Rakaia.

(b) An agriculture division, which incorporates Five Star Beef, (on the coast east of Ashburton) and animal investments such as a specialist sheep breeding scheme, and bull beef ownership.

(c) A "Food and Solutions" division, with specialist cooked and processed food production facilities at Waitara (New Plymouth), Green Island (Dunedin), and co-product processing at Hawera, Blenheim and Christchurch where an experimental kitchen is being sited. This division also implements agriculture policy with ANZCO, and as such is a major contributor to the Beef and Lamb Primary Growth Partnership project, known as "Collaboration for Sustainable Growth".

11. These operations run in a highly integrated manner, with for example, Green Island being dependent on other South Island sites for raw material, which it turns into products such as cooked hamburger patties, meatballs and frankfurters for Australia's sports stadium market.

12. Waitara, which produces hamburgers (for McDonalds and other burger retailers), salami and jerky, is dependent on supply from mainly ANZCO but also non ANZCO plants.

<u>Five Star Beef:</u>

13. Five Star Beef is unique being the only true feedlot in New Zealand. It is a state of the art facility, taking ideas from the best feedlots in Australia, the US, and Canada.

14. Five Star Beef are extremely precise in the way they feed their animals, achieve target weight gain, days on feed, a final cut size, and also in their method of processing.

15. It is the best example in New Zealand of an integrated supply chain, where: Angus beef genetics (for high marbling, white fat, and weight gain characteristics), on farm performance, time of delivery, feedlot performance, specialist feed contracting in the form of maize silage, grain, lucerne, straw, use of manure waste to enhance the growth of

some of that feed, and processing management all contribute to obtain a high quality product on a set day.

16. Five Star Beef supplies roughly half the cattle processed at the Seafield plant. These cattle (approximately 700 per week) must be killed every week at a much higher level of precision in regard to preservation of meat quality than has been historically possible in New Zealand meat plants.

17. Five Star Been obtain its young stock from local suppliers, which are then grown out at the feedlot.

18. Five Star Beef is dependent on its own consents (to abstract and discharge etc) and also on the CMP consents to process its livestock.

Discharges overview including "cut and carry"

19. The livestock processing plants at Seafield and Rakaia and also at Five Star Beef, all require support land. The primary purpose of that land is to manage the waste water disposal.

20. The land required is dependent on both the nature of the waste water, and the assimilative capacity of the soil. Canterbury has ideal soils for waste water assimilation. It has flexibility of land use, allowing integrated cropping regimes, resultant markets for the feed and crops that are produced, good water, infiltration rates, medium moisture holding capacity, a deep water table and a lack of lowland streams.

21. That position is in stark contrast to traditional meat processing sites, which were typically near towns and cities, on heavy soils next to lowland streams (for waste disposal), with shallow water tables.

22. In Canterbury, CMP Canterbury (at Seafield) is supported by 590 ha, which is all owned. CMP Rakaia is supported by 372 ha owned by the Hood family, who own the adjacent Mountain River plant.

23. Five Star Beef is supported by 361 ha of adjacent farmland.

24. Irrigation to the support land is critical, and the soil's assimilative capacity is co-dependent on plant productivity. That plant productivity is reliant on a consistent and predictable moisture supply.

25. In turn, the plants can absorb nutrient discharge, convert into fodder reserves to be exported off site.

26. Where harvest and export of plant material is not feasible (in the April to September months for example) stock are used to feed on the surplus in growth.

27. The mechanism by which the pasture is harvested (commonly known as “cut and carry” off site) is integrated with fodder and cereal crops such as fodder beet, maize (silage), wheat and barley to optimise dry matter growth leading to optimum nutrient off take and allow pasture renewal (typically after 3 – 4years). The cut and carry cycle is illustrated in the diagram in **Appendix 2.**

28. CMP exports those crops to both dairy farmers (fodder beet, pasture silage, and cereal silage) and to Five Star Beef (maize silage and grain).

29. Five Star also utilizes a similar system.

30. The integrated supply chain of nutrient application, removal in the form of edible feed, and conversion to milk and/or meat is entirely dependent on waste water discharge to land, and associated consents to draw and apply water with those discharges where moisture is limited.

31. The ability of the processing plant to absorb slaughter and further processing capacity is much wider than Canterbury. In situations such as that existing this autumn, animals have arrived from all over the South Island, and sometimes the North Island, due to farmer need to destock for both economic and animal welfare considerations.

32. At the other end of the supply chain, the safety of the feed grown from waste water is paramount to meeting quality assurance standards for dairy and meat company standards.

33. The limiting component of nutrient in meat processing waste water is nitrogen, which is almost exclusively applied as organic and ammonium N is association with other nutrients in lesser concentrations.

34. Plant absorption of N in ammonium form is up to 12 times more efficient than N in the form of nitrates. Further, nitrogen in this form (ammonium) does not leach.

35. The various sites effectively use a nitrogen balancing model with nitrogen inputs being offset by nitrogen exported in the form of feed.

36. The approximate balance for the three Canterbury sites are:

    (a) Seafield: 500kg input – 250kg export = 250kg/ha net

    (b) Rakaia: 300kg – 150kg export = 150kg/ha net

    (c) Five Star Beef: 125kg input – 56kg export = 69 kg/ha net

37. The move to land based waste disposal in rural areas, with reliable water supply, is based on good science. Waste water (in the case of a meat processing unit) or waste water runoff from pens and solid manure scrapped off from the feedlot, is an asset, used wisely.

38. In fact, the soils now existing under waste management are significantly better soils than those existing prior to irrigation and waste water application.

39. Characteristics include better cation exchange capacity, higher organic matter, and more active microbial population. In summary, a better 'living' soil.

Water use overview

40. Apart from the water used to ensure optimal plant growth, meat processing plants require a significant amount of high quality water for stock washing (on arrival), slaughter, and further processing.

41. In the case of Five Star Beef, water is also required for stock consumption.

42. In broad terms, the annual site use water on an annual basis is (in cubic metres:

	Processing	Irrigation	Stock Water
Seafield	1,200,000	4,790,000	incl

Rakaia	408,000m^3	incl	incl
Five Star Beef	N/A	1,173,797m^3	546,000m^3

43. It is impossible to separate the function of the processing support land from the feedlot (in the case of Five Star Beef), or the processing facilities (Seafield and Rakaia).

44. The entire culture of the land management is to optimise absorptive capability to ensure that, over time, stock feeding capacity (such as at Five Star Beef) or processing capability is not compromised.

45. In the case of Five Star Beef, their core output is high growth rate healthy livestock from the feedlot. Any stock run on the support land is a by product of the nutrient management system. Stock are typically run on the support land temporarily to achieve target weights for feedlot entry.

Support for farmers particular in dry weather conditions

46. In dry weather conditions, farmers typically wish to sell livestock at smaller liveweights, often up to 20kgLW less than feedlot entry weights. Five Star Beef will, in such times as at present take animals off long standing clients earlier to assist the farmer and ensure good animal welfare.

47. For that reason, supply of livestock tends to increase when supply catchments are dry. Five Star Beef needs absolutely predictable output numbers and carcass weights. If animals arrive lighter, they have to be pre conditioned to achieve feedlot “start” liveweights to ensure a consistent “finish” liveweight.

48. The impact is even more dramatic on processing plants. In seasons such as 2010/11 and 2011/12 due to weather patterns, livestock processing was slow as farmers converted high pasture growth rates into higher carcass weights. Hence, they supplied animals late in the season, creating a peak kill for lambs in March/April/May, when pasture growth rate slowed as autumn advanced.

49. In contrast, in a dry year such as 2012/13, peak kills are reached in January, February and at much higher weekly kills than wet years.

50. Despite the industry never reaching more than 70% of slaughter capacity in 2010/2011 and 2011/2012, this year, the industry has had to absorb several successive weeks of capacity kill, and even defer livestock slaughter till kill capacity is available.

51. Some lambs can be taken from drought affected farmers at lighter weights on to the support land but only after silage crops have been harvested. CMP also observe a 30 day withholding period for lambs after waste water applications to allow nutrient levels in the field to be diluted, and any pathogens to be killed by ultraviolet exposure.

Interrelationship with farmers and the resultant "lag effect"

52. The preceding paragraphs illustrate the direct and complex relationship between ANZCO's operations and the support they give to primary farming activities in Canterbury and vice versa. They co-exist and rely on each other.

53. However, the relationship between supplier and processor means that expansion of livestock processing capability lags behind any expansion in agriculture. This can create difficulties for the livestock processing industry, in terms of securing new water and obtaining authorisations to discharge waste particularly in areas that are fully allocated and where competition for available resources is strongest.

Overview of environmental management systems used in operations.

54. Over the last two decades, the ANZCO companies have invested a significant amount in dealing with all of the associated issues of being located in a rural area.

55. A key component of dealing with its water use and effects of waste disposal is the development and implementation of ANZCO's environmental policies, including the development of detailed nutrient budget modelling and other such systems.

56. As part of this, the ANZCO companies have invested significant resources into its operational and environmental management systems

and in obtaining the necessary water use and discharge consents. Overall, it holds nine resource consents to discharge contaminants to land, six consents to abstract groundwater for use within the processing facilities, to irrigate surrounding land and for stock and staff drinking water.

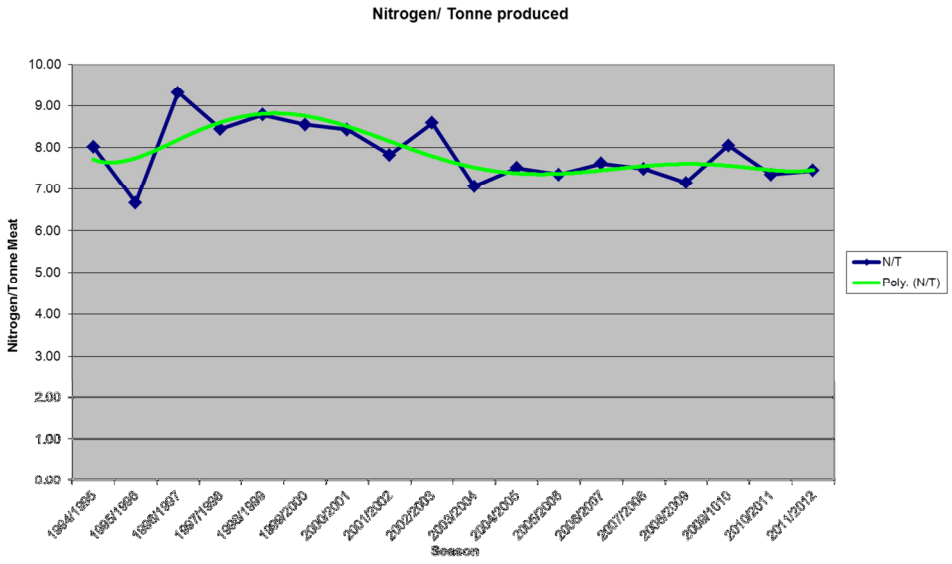
57. It also holds numerous stormwater, domestic wastewater, effluent and odour discharge consents, and consents relating to the storage of animal effluent at the Five Star Beef feedlot.

58. It has therefore had extensive involvement in regional and district planning issues. I discuss, by way of example, the systems at the Seafield plant in the following section of my evidence.

Seafield plant

59. I attach as **Appendix 1**, the original farm management plan for CMP Canterbury (Seafield). The objectives of that plan have not altered over time, but continuous improvement in matching productivity and environmental outcomes has generated a positive trend in kilogram output per kilogram nitrogen applied to the land.

60. The following graph demonstrates CMP's commitment to reducing its footprint while increasing productivity.



61. The blue line denotes N output per tonne of meat processed. The green line is an averaging of the blue line.

62. Such an objective is not easy to implement. It requires an integrated approach to growing, harvesting and efficient removal of feed grown as a result of water and nutrient application.

63. The implementation plan requires good soil management, minimising animal damage, minimising bare ground, and aiming to build organic matter.

64. The Seafield site has adapted its infrastructure and management system over time through developing and implementing the following:

    (a) Advanced quality control systems in the processing plant to minimise the loss of any product to waste streams that could either be saved (on the input side) or processed for sale rather than waste (on the output side).

    (b) Advanced primary treatment systems to reduce solids content and outfall of key nutrients such as nitrogen. The primary treatment system includes sufficient storage but small enough to avoid settling of waste water into anaerobic conditions.

    (c) A farm management system that aims to firstly, optimise soil health as a mechanism for increasing nutrient absorption capacity.

65. Secondly, to optimise feed production for export in order to minimise the input-output deficit. One of ANZCO's primary objectives is to manage the wastewater application to land as it "can become an asset that generates further capability and lowers risk".

66. Thirdly, utilize any surplus feed not in a form or timing capable of calf rearing export for young, growing, livestock.

Use of a monitoring system to track performance

67. Measuring soil health is a key factor in ensuring ANZCO's environmental systems are performing well. Improved soil health equals improve water capacity in soils and improved ability for plants to uptake nutrients (as opposed to leaching out). ANZCO employs a variety of mechanisms to measure soil health including objective soil measurements and visual assessment of structure.

68. Liveweight gain of young stock is an objective way to quantify the quality and nutrient balance of the feed generated from the soil. The quality and saleability of the feed sold (in the form of grain, silage, cereal straw, and fodder beet) is another measure. If pastures are boosted with organic N based waste water, followed by fresh water to clean the leaf, that will lead to high quality young stock. Conversely, high levels of nitrate in feed can cause animal scour and poor health.

69. The photo below demonstrates the high health of animals on the CMP farm.

70. Additionally, in 1993 ANZCO installed lysimeters to check nitrate leaching. These results have been supplied to ECan since that time.

71. In 1993 consented N *application* (i.e. what is applied, not leached) was 800kg/ha. In the following season this reduced to 500kg/ha with the purchase of more land.

72. The total nitrate *leached* from 17/11/94 to15/05/95 was 4.1kg N/ha.

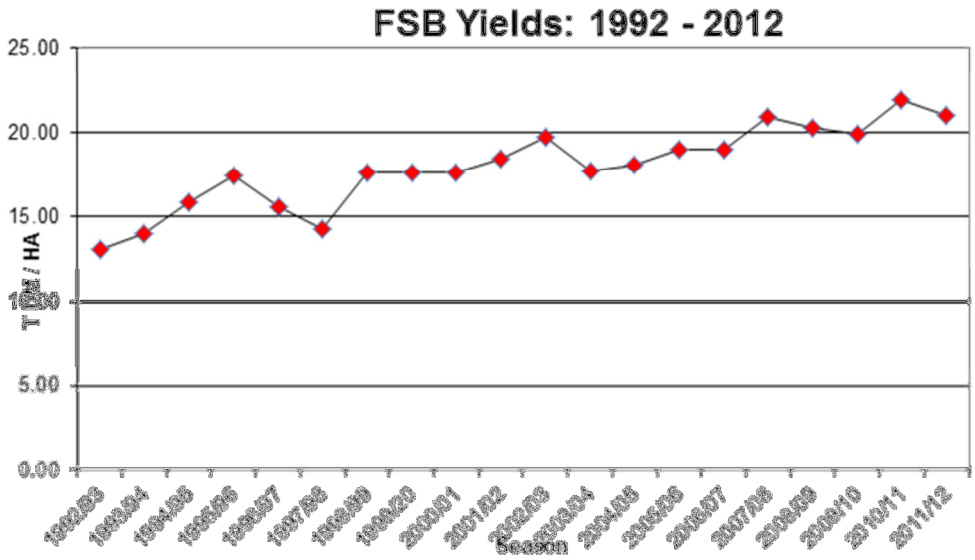
73. The total nitrate leached from 15/05/95 to 11/09/95was 52.5kgN/ha, bringing the annual total to 56.6kg N/ha.

74. The higher leaching was due to younger pastures which typically exceed more established pastures.

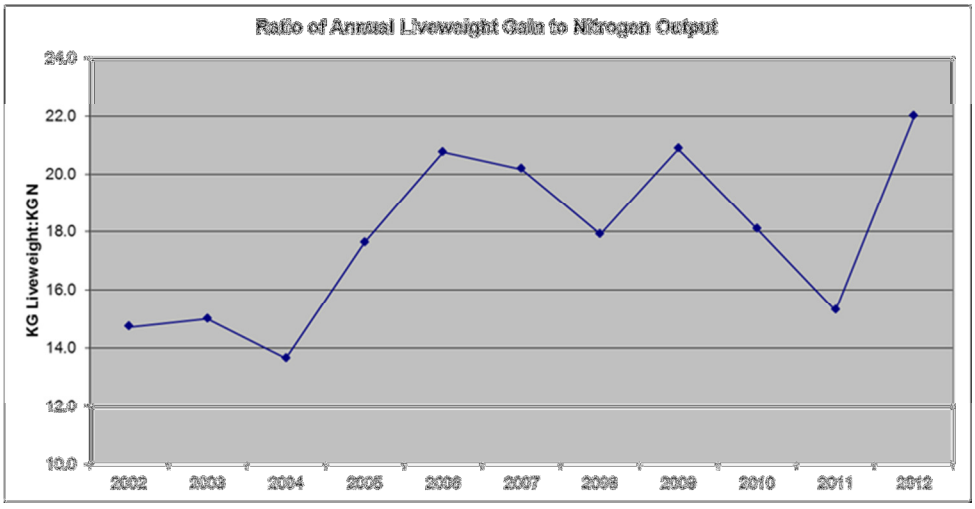
75. Measurements over the past four years show considerable seasonal variation with annual leaching ranging between 25kgN/ha/yr and 224kgN/ha/yr. The variations are typical of Canterbury, and reflect land

cover and seasonal rainfall patterns. The lysimeters are likely to overstate leaching due to the difficulty in maintaining healthy pasture on the lysimeter, and some macropore cracks opening up with age. Nevertheless, the data is valuable.

76. The table below demonstrates the improvement in maize yields contracted to Five Star Beef as a result of technology gains, management improvement, and the constructive use of recycled manure from the feed lot.



77. Further, the feedlot output of meat per kg of N output is demonstrated graphically



78. ANZCO ensures the pen surfaces allow good runoff to holding pond capacity, and a doubling of that capacity to allow the runoff to be reapplied to pastures and maize for silage production in mid spring, when they can better absorb nutrients.

79. By comparison, the CMP Rakaia site has a relatively low output of nutrient given its small scale and due to the site being almost the perfect for land disposal of nutrient.

FUTURE OPPORTUNITIES AND RISKS

80. With almost 20 years of objective information, expert advice, and experience of what works, ANZCO is in a position to continue evaluating the impact of new technology on productivity and environmental outcomes.

81. ANZCO are evaluating various monitoring tools and application systems, including nitrate inhibitors on an on-going basis, with a view to looking ten years ahead.

82. The objectives for evaluation will be the same as for the past 19 years. That is, transparency of information, efficient use of natural resources (both inputs and outputs), efficient use of capital, enhancement of combined production and environmental outcomes, and maintaining its reputation.

83. ANZCO, and its advisers regard the maintenance of best practice as an on-going exercise in continuous improvement.

84. For that to continue, the Land and Water Regional Plan must have sufficient flexibility, and allowance for non-conventional farming land uses such as those practised by ANZCO.

Andrew Macfarlane

27 March 2013

APPENDIX 1

OBJECTIVES OF THE ANZCO PROCESSING SUPPORT UNITS

1. ANZCO subscribes to the principle that where possible, land application of nutrients in support of processing capacity is more sustainable than the alternatives, typically to municipal facilities (someone else's problem) or to sea (out of sight, out of mind).

2. The side benefit of land application of waste flow nutrients is they can become an asset that generates further capability and lowers risk.

3. The Canterbury processing and feedlot operations run by ANZCO (CMP Canterbury, Rakaia, and Five Star Beef Wakanui) are all sited to enable that principle to be followed.

4. ANZCO have been leaders in building water management systems, and associated farm management systems to implement that strategy.

5. I have lifted the farm management objectives directly from 1995 records applied internally, and outlined in support of a resource consent application for waste water application to additional land.

Farm Management

(a) To allow sustainable application of waste water by modifying farm practises to optimise nutrient extraction.

(b) To profitably use dry matter grown through waste water application.

(c) To finish store stock from Climatically affected properties as appropriate to enhance the quality of stock available to the plant.

(d) To maintain or improve the environmental effect of the waste water management system on the property.

(e) To meet these objectives, I have structured the proposed farm management programme around a similar system to that

operating successfully on the existing Seafield Road land. That system is designed to:-

(i) Optimise extraction of nutrient.

(ii) Minimise nutrient loss through soil.

(iii) Provide feed for stock at times less critical to meeting nutrient extraction criteria.

Means of Nutrient Extraction

I believe the key strategy in ensuring the management system is sustainable long term, is to harvest a large proportion of the nutrient applied in excess of that applied to conventional farms. The means by which we are harvesting that nutrient are:

(a) Harvest of grass silage off all areas not utilised for stock.

(b) Removal of that silage off farm.

(c) Harvest and export of maize silage

(d) Harvest and export of cereal grain and straw or silage.

Principles of Maximising Nutrient Extraction

In order to maximise the rate of nutrient extraction per hectare , we are attempting to:

(a) Maximise <u>dry matter production</u> in order to increase total demand for nutrient.

(b) Optimise <u>nutrient concentration</u> of the grown herbage.

(c) Maximise the rate of <u>uptake of nutrient</u> in order to minimise losses to groundwater.

(d) *Optimise feed palatability and digestibility for grazing livestock and silage feeding in order to maximise animal liveweight gain.*

In order to Optimise the above factors we require:

(i) Plants genetically capable of sustaining:

- *High dry matter production.*
- *High stock growth rates/*
- *High nutrient concentration*

(ii) *Healthy soil* - (defined as microbially active, balanced in nutrient, status and physical characteristics).

(iii) *Healthy stock* - (defined as fast growing, contented, of good animal health status).

Consistent Farm Management results depend on minimising the likelihood of one management factor limiting the output form the others.

6. These objectives and implementation strategies have stood the test of time, and been refined as ANZCO group units continue to push for best practice.

7. Over that period, productivity of the processing units has also increased to develop sustainable returns to producers, the ANZCO business, and offshore customers, who in turn depend on the ANZCO brand for ethically produced product.

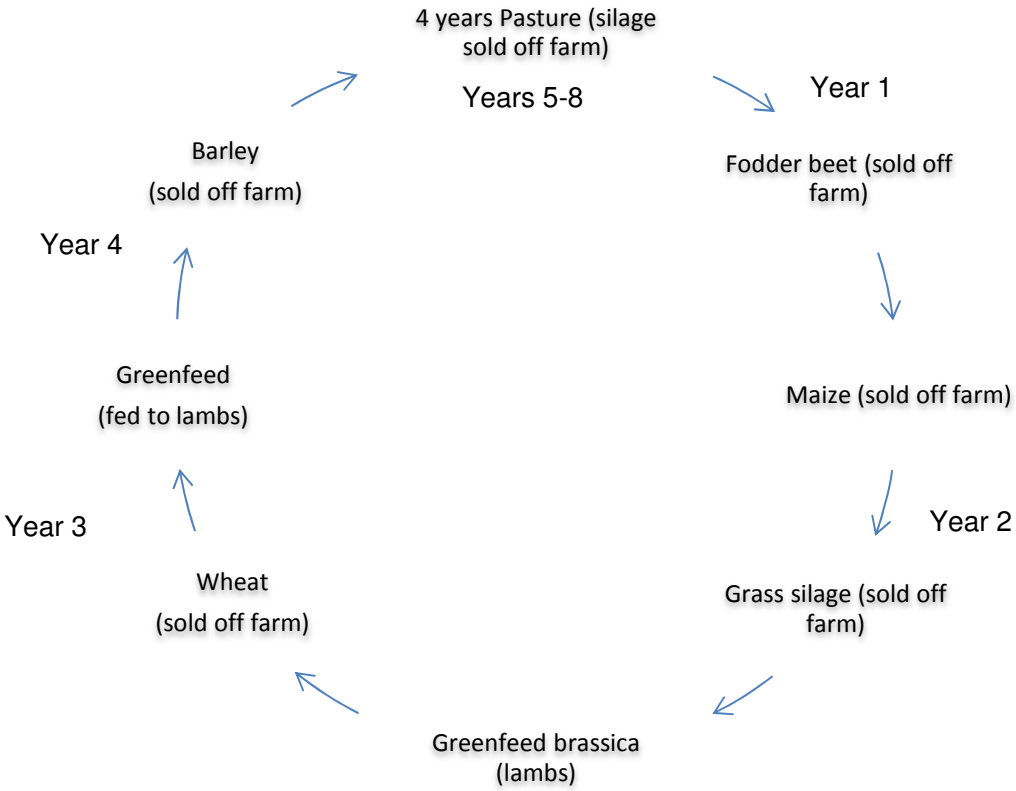
8. Many high value customers take specific notice of farm management systems both at producer level and processor level.

9. Without the associated waste flow distribution areas for Seafield, Rakaia and Wakanui, the processing business would fail.

APPENDIX 2

FARM MANAGEMENT PLAN TO SUPPORT OBJECTIVES

1. I summarise the present day management system for CMP Canterbury as an example.



2. Of the approximate eight year rotation fodder beet and maize are exported in year one, cereal in years three and four, grass and silage in years three, five, six, seven and eight

3. Typically, a <u>minimum</u> of two cuts of silage are exported each year. Once silage cuts are completed by December (2nd cut) or January (3rd cut) surplus pasture growth is utilised by young cattle and/or lambs.

4. Late summer/autumn silage is not practical as energy levels are typically too low to allow the ensiling process to take place.

5. The means to achieve sustainably high dry matter production in a form other farmers want to buy is completely compatible with the objective that policy serves, which is to maintain healthy soils while minimising nutrient soils through them.

6. The long term goal of extracting around 250kg/ha N was set when consented nitrogen applications were at 1160kgN/ha, subsequently reduced to 500kg/ha/year once the Christys Road block was purchased and developed with a wastewater orientated irrigation and management system, utilising latest monitoring technology.

7. Total feed harvested, and hence total N offtake, is now limited by application levels, implying by definition that N available for leaching is low.

8. Despite major reductions in N applied as processing efficiency improves, and treatment of waste streams maintains best practice, N exported has only reduced a little, implying very high N utilization.