An Evaluation of Voluntary Environmental Schemes used by the Dairy Industry in Canterbury, New Zealand

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Internationally, there are increasing concerns regarding the environmental impacts associated with intensive dairy farming. However, few studies have determined the characteristics of these approaches in the agricultural industry, or their effectiveness. A comprehensive literature review was undertaken to determine what the desired attributes are or design features which are required to form an effective scheme. From this, the study examines voluntary dairy schemes adopted by the Canterbury dairy industry in New Zealand against the desired attributes of environmental schemes found in the literature. Eight environmental dairy schemes were reviewed against six key design categories of an effective scheme that were identified. The study strived to assess the consistency of voluntary schemes design through focusing on scheme's inclusion of particular attributes in their design. This was achieved by using content analysis, utilising NVivo 10 software and evaluating the schemes in terms of their 1) environmental focus, 2) goals and objectives, 3) measurement mechanisms 4) incentives and benefits provided and 5) involvement and communication with other parties. The main findings of the study were that there was a significant focus on nutrient management issues, lack of incentives and benefits provided and the wide use of third parties for monitoring. This study has the propensity to inform the policy makers on design of an effective voluntary scheme for the dairy industry. The results of this study identified ways in which New Zealand dairy farming voluntary schemes can be improved toward increased sustainability within the New Zealand dairy industry.

Keywords: Dairy industry, voluntary environmental schemes, Canterbury, environmental issues

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Chapter 1

Introduction

The New Zealand dairy industry is currently faced with environmental challenges despite its economic success (Houlbrooke *et al.*, 2004). It's current aim is to improve productivity and profits through increasing outputs of marketable goods (Monaghan, 2008). This has in turn increased the land-use intensity and the level of input resources required such as fertilisers and energy which has reesulted in negative consequences for the environment (PCE, 2004). As these environmental issues are becoming increasingly prevalent, dairy farmers are faced with pressure of adopting sustainable farming techniques to address them. On the other hand, dairy farming is a significant sector to the New Zealand economy. It produces over a third of the dairy products on the world market despite producing less than two percent of the total world dairy products (Homes *et al.*, 2002). Over 90 percent of the dairy products produced in New Zealand are exported, while the rest is consumed domestically. Due to this reliance on international markets, it is imperative that New Zealand is seen to be protecting the environment and continuing to maintain a clean green image (MfE, 2001).

The key challenges for the dairy industry over the past decade have been focused around water quality issues (PCE, 2013). Dairy farming practices contributing to poor water quality include improper effluent management, nutrient budgeting and stock access (Clark *et al.*, 2007). Dairy farming intensification has also been linked to the declining levels of water quality around New Zealand (Wilcock *et al.*, 2006; Monaghan *et al.*, 2007). In addition, New Zealand prides itself on the high quality of its water to sell its dairy products. The negative effects of dairying on New Zealand's water resources have attracted the attention of New Zealand's regulators (Environment Canterbury, 2009).

Historically, the New Zealand government has attempted to mitigate the environmental impacts of farming through regulatory approaches defined through rules in regional council plans. The Resource Management Act (RMA) (1999) is the primary policy tool within this regulatory approach. It allows regional authorities to set policies and plans to manage the natural resources in their designated areas. Sections 9 and 15 are of particular relevance to dairy farming. Many activities, including dairy farming, are controlled through the process of resource consents. Even with these provisions in place, farmers do not always comply with their resource consent conditions which are put in place to mitigate environmental impacts (Burns, 2013). Some argue this type of regulatory approach is unduly ridged, inefficient and does not adequately reduce the environmental impacts (Andrews *et al.*, 2001). Recently this regulatory approach to reducing environmental impacts has been joined by

voluntary approaches, defined as actions taken to improve the environment which are adopted by companies outside of the normal processes of law (UN, 1998).

At a global level, voluntary schemes, initiatives and programmes have been implemented to address various environmental issues. These have been widely adopted by a variety of industries and organisations at a regional, national and global level. Some common international examples are the Forest Stewardship Council (FSC) for the forestry industry, the Marine Stewardship Council (MSC) for fishing, and Fair Trade for developing countries. Many companies, corporations and industries have made commitments to finding their resources from more sustainable sources. This is where the voluntary scheme plays such an important role. There is a growing demand for sustainably produced goods and these schemes work by providing consumers with the confidence that the product they are purchasing meets a particular standard. It is an effective method for communicating to the wider public about what stance has been taken to the wider public regarding sustainability.

In addition to the specific regulatory approaches under the RMA, there have been a variety of schemes implemented by the dairy industry. The dairy industry have taken ownership of environmental issues by the adoption of voluntary environmental schemes. Initially it was the introduction of the Dairying and Clean Stream Accord in 2003 which formalised joint initiatives between local councils and New Zealand's dairy giant, Fonterra. This Accord outlined a set of targets for farmers that were aimed at improving the water quality of New Zealand streams and rivers. The Accord was monitored by Fonterra internally and results have been published biannually to inform on progress towards the targets.

During this time other dairy industry players have created their own schemes to assist dairy farmers. Many of the dairy companies adopted some form of environmental scheme that have formed an integral part of their supply contract with the farmers. Organic schemes were also included as part of the study as they also include environmental practices that dairy farmers can adopt.

Given the industry's focus on self-regulation, the aim of this thesis is to analyse and evaulate the design attributes of voluntary schemes used by the dairy industry. This will be achieved through identifying and analysing voluntary environmental schemes implemented by the dairy industry in Canterbury, New Zealand. Drawing on previous literature on voluntary schemes, a deductive framework is outlined for the study of voluntary schemes, focusing on specific characteristics and design attributes. The diversity in a schemes design and environmental focus will be highlighted and then related to attributes that influence a scheme's effectiveness.

The study strives to assess the content of voluntary schemes design through focus on scheme's rigour to mitigate environmental impacts associated with dairy activities. This is achieved by using

content analysis, utilising NVivo 10 software and evaluating the use of particular attributes in the scheme's design. A coding framework was developed so that each scheme could be analysed in NVivo 10 consistently and objectively as possible.

1.1 Research Gap and Contribution

Although voluntary schemes in dairy farming currently exist, little is known about the characteristics or attributes of these particular schemes. Voluntary approaches used by the New Zealand dairy farming industry are recent in their occurrence, resulting in a lack of understanding in adoption. Therefore this study aims to contribute to the knowledge of how voluntary schemes in the dairy industry are designed and implemented in a New Zealand farming context. By examining the key attributes established in voluntary schemes implemented for the dairy industry, this thesis aims to contribute to the body of knowledge for the development of future schemes and initiatives for dairy (and possibly other) industries. This study will contribute towards a greater understanding of the creation of effective voluntary schemes that are both appealing to the industry and successful in mitigating the dairy industry's adverse impact on the environment. Therefore the dairy industry will benefit from a specific-cased voluntary schemes' review which has largely been ignored in the literature.

1.2 Research Purpose and Questions

The focus of this study is to evaluate the voluntary schemes used by the NZ dairy industry through a Canterbury dairy industry case study. The research determines to what extent these schemes include effective voluntary scheme design attributes. To achieve this aim the research answers these questions:

1. Which voluntary schemes are currently used by the dairy industry in Canterbury?
2. What are the attributes of voluntary dairy schemes within Canterbury, New Zealand?
3. How do the dairy schemes compare in terms of an effective scheme design?

1.3 Thesis structure

Chapter Two provides an introduction to dairy farming in New Zealand along with the environmental impacts that are of particular concern. Following this will be an outline of the relevant literature regarding voluntary approaches and their current use. In addition, the effective voluntary scheme attributes will be summarised according to the international literature. And finally an introduction to voluntary approaches used in the New Zealand dairy industry is provided.

Chapter Three provides an outline of the research aim, objectives and questions. Chapter Four presents an overview of the research methods used for this study.

The results of the study are outlined in Chapter Five, and discussed in Chapter Six in terms of what they mean for advancing effective voluntary dairy schemes in New Zealand. Finally, Chapter Seven summarises the conclusions from the study, discusses the limitations of the research and provides recommendations for future research.

Chapter 2

Literature Review

2.1 Context

This section offers background to the study by providing an overview of the dairy industry (sector focus of the study), Canterbury region (geographical focus of the study), and environmental issues the dairy industry is facing, in addition to current government policies used to address these issues.

2.1.1 The New Zealand Dairy Industry

Dairy farming is a significant industry in New Zealand, accounting for 26 percent of all export goods, contributing $10.4 billion to the national economy (NZIER, 2010). The New Zealand dairy industry is the largest dairy exporter in the world, contributing to more than a third of the products on the world market (Holmes *et al.*, 2002). While dominating the world market for dairy products, New Zealand provides very little of the world's supply with only producing two percent of the total dairy products (ibid). The dairy industry is also very important domestically as it provides around 24,000 on-farm jobs and another 10,000 jobs in the processing plants (NZIER, 2010). These jobs support the rural economies and provide a variety of careers for New Zealanders. Dairying still remains financially rewarding and this can be demonstrated by the rapid conversions to dairy farming occurring around New Zealand, particularly in Canterbury (Tait & Cullen, 2006).

During the mid-1980s the government moved to a 'market economy' with the removal of subsidies (Bührs & Bartlett, 2003). In 1983, the government provided 33 percent of the output value of agricultural products, but this was later retracted in 1984 (Smith & Montgomery, 2004). This exposed local farmers to international competition, global prices and market fluctuations. The distributions of subsidies among the sectors was not consistent with 40 percent of sheep and beef earnings coming from government while the dairy sector had virtually no subsidies (ibid). The removal of subsidies created different scenarios for each of the agricultural sectors. In particular, it placed the dairy industry in a better position financially to cope with these new changes. Since then, the dairy industry has flourished and continued to grow. It has become one of New Zealand's most successful industries.

A change in dairy export markets has occurred with consumer demand shifting from developed countries, such as the United Kingdom and United States of America, to new emerging markets, including China (MPI, 2013). Consumers in China, and other parts of Asia, are shifting their consumption patterns away from rice, lentil and beans to products with a higher protein content

(NZIER, 2010). As a result, a higher proportion of New Zealand products are exported to low to middle income countries. Statistics show China only contributed to 0.4 percent of New Zealand exports in 1989, but now represents 12 percent (NZIER, 2010). Also some high income areas, such as Europe and North America, have exclusionary practices in place which limit what New Zealand can export (Jay & Morad, 2007). A consequence of this is that New Zealand must maintain a lost-cost production system to meet the demands of these countries, in particular those in Asia.

2.1.2 Dairying in Canterbury

The Canterbury Region is located on the east coast of the South Island in New Zealand. Canterbury has the second largest dairy cow population, highest dairy stocking rate and largest average dairy herd size in New Zealand (Table 2.1). A key statistic is that Canterbury almost has double the average herd size in relation to the country average. The stocking rate of cows in Canterbury is above the New Zealand average with 3.43 cows per hectare.

Table 2.1 Canterbury and New Zealand Dairy Statistics (LIC & DairyNZ, 2011-12)

Dairy Statistics	Canterbury	New Zealand
Number of dairy cows	**752, 600**	4, 634, 226
Average herd size	**776**	393
Stocking rate (cows/hectare)	**3.43**	2.83
Production per cow (kg milk solids/cow)	**396**	364

Over the last few decades the Canterbury Region has experienced a surge in dairy farm conversions, mainly from sheep and beef operations (Tait & Cullen, 2006). The key factors leading to the rapid conversion rates include availability of cheap irrigated land and the decreasing return from sheep and beef farms, in addition to the removal of government subsides (Sharma & Starik, 2004). The higher milk prices have meant dairy farming has become more profitable with many sheep and beef farms converted to dairy farms because of this. The aid of large scale irrigation schemes has allowed parts of the plains to be farmed more intensively (ECan, 2010). In 2004 there was 500,000 hectares of irrigated land in New Zealand, of which Canterbury contributed 350,000 hectares (PCE, 2004).

Although dairy farming has been successful in Canterbury, it has come with environmental and human health costs. The costs are a result of the nutrient runoff loses to groundwater and surface water, and methane and nitrous oxide emissions released from dairy farming activities. Dairy production in Canterbury is estimated to cost the environment and human health between $28.7 and $45 million per year respectively (Tait & Cullen, 2006). This cost is currently not reflected in milk prices. Work has been done to reduce these environmental impacts through stricter regulations

(resource consents) and the adoption of voluntary schemes and programmes promoted within the dairy industry. These schemes will form the basis for this study.

2.1.3 Environmental Impacts of Dairying

While dairying remains an economically prosperous sector, the resulting environmental impacts are still causing concern. This is the case for both the Canterbury Region and the wider New Zealand. The next section presents some of the key environmental issues associated with dairy farming.

Water Quality

Nutrients play an important role in pastoral ecosystems especially for providing sufficient pasture growth. Dairy farmers add nutrients (nitrogen, phosphorus etc.) to their pastures in a variety of ways to improve growth. The use of synthetic fertilisers is a common method used to ensure adequate plant growth. Fertilisers can provide increased financial gains to farmers as higher pasture production results in higher milk production as cow intake is essentially turned into milk. However, when the level of nutrients exceeds the requirements of the plants, the surplus is released into the environment. These excesses can cause damage to the environment through runoff and leaching into groundwater and surface water bodies or being released into the atmosphere (PCE, 2004). A major source of water pollution is urine and effluent from dairy cows. As many farms in New Zealand are pasture-based, it can be more difficult to control and collect nutrients that are created on the farm. Once nitrogen reaches water it is readily dispersed and can result in deterioration of groundwater quality (contamination to drinking supply) (Close *et al.,* 2008), risk for recreational purposes (Wilcock *et al.,* 2006), biodiversity losses (Galloway & Cowling, 2002) and eutrophication (McDowell & Wilcock, 2008).

Water Quantity

Water is becoming a significant part of New Zealand's rural economy as intensive farming drives increased demands for water supply (PCE, 2004). Farmers require water for irrigation and for stock to drink. Irrigation allows farmers to ensure sufficient pasture growth and offers drought protection. By increasing pasture growth, farmers can increase productivity and stocking rates (PCE, 2004). Water can be allocated via resource consents through regional councils who develop rules under their regional plans (Makgill, 2010). These allocations are based on current demands for the water source and minimum river flow levels (Clark *et al.*, 2007). Water permits are generally granted with conditions attached, which include the amount of water that may be taken and now must include a maximum annual volume. The over allocation of water can be potentially detrimental to the local ecosystems (PCE, 2004). As fresh water resources are finite, any abstraction of water is going to have an impact. Water quantity issues are closely linked to water quality issues, as irrigation can increase nutrient runoff into waterways and changes to river flow rates (from water abstraction) can have

significant impacts on stream health. Some irrigation methods pose a higher threat to groundwater. For example, border dyke irrigation systems were found to cause significantly higher contamination in comparison to spray irrigators and centre pivot systems (Close *et al*., 2008).

Other environmental challenges

Other challenges that face the dairy industry, albeit to a lesser extent than water quality and quantity, are climate change and biodiversity. Dairy farming relies on the environment for production and is therefore susceptible to changes in weather patterns, such as droughts and flooding. Farmers need to ensure they have plans in place to deal with these risks. As a contributor to global greenhouse gas emissions, the dairy industry must focus on reducing this through cleaner and more efficient technologies. Another issue is biodiversity loss which can occur on farms with existing biodiversity characteristics. Areas of significant biodiversity include wetlands, native bush and other vegetation. The main threats to biodiversity are habitat destruction and the introduction of pests and weeds (PCE, 2004). Areas of vegetation are often cleared to provide extra land for grazing (Wilson, 1993). Waterways that flow through farmland also contribute to biodiversity on farms and have been threatened by cattle with access to streams, however protection measures (such as fencing) have improved in recent years.

Dairy Intensification

The dairy farming industry has been increasingly successful with higher returns on milk and increases in production over recent years. Farmers are intensifying their production by increasing the number of cows in their dairy herds. The Parliamentary Commissioner of the Environment (PCE), Dr J Morgan Williams released a report regarding the intensification of New Zealand's farming in 2004. The report defined agricultural intensification as "*increasing use of inputs into farming systems to produce more food from the same area*" (PCE, 2004, pg. 20). For New Zealand, intensification provides an opportunity to produce more on the same amount of land and correspondingly increase revenue. The total number of dairy cows nationwide has more than doubled from 2.08 million cows in 1974-75 to 4.6million in 2011-12 (DairyNZ & LIC, 2011-12). However, over this period, the number of dairy farms has reduced. This has resulted in a greater proportion of cows per dairy herd. While this intensification has brought about increased efficiencies of milk production and output, it has also increased the amount of nutrient losses in the environment (Longhurst *et al.*, 2000).

New Zealand has also witnessed the conversion of sheep and beef production to dairy production as it has become more financially attractive. This has created a shift to more intensive forms of pastoral production (Macleod & Moller, 2006). From a resource point of view, dairy production uses seven times the amount of fertiliser compared with sheep and beef farming (ibid). This alone shows that a switch in land use can have a significant impact on resource use, such as fertilisers. The

Parliamentary Commissioner for the Environmental released a report *Water Quality in New Zealand: Land use and nutrient pollution* in 2013.This report highlighted a clear link between the expansion of dairy farming and the increasing stress on water quality (Young, 2013). Even though mitigation measures around farm practices have been implemented, they may not be the whole solution as they cannot offset the additional nutrients produced from large-scale conversions to more intensive land uses (PCE, 2013).

One of the reasons for the heightened intensification arises from the fact that New Zealand farmers have to compete with subsidised producers around the world (PCE, 2004). New Zealand's primary producers have had no government support, in the form of subsidies since 1984 (Smith & Montgomery, 2004). The global economy is demanding more product at lower costs so local farmers must meet these demands while improving productivity and increasing profits (Baskaran *et al*, 2009). It is predicted the current trend of intensification will continue for at least another decade unless changes toward sustainable production are made (PCE, 2004).

2.1.4 Dairy farming and Regulation

Under the Resource Management Act 1991, a National Policy Statement (NPS) for Freshwater Management was created in 2011. In 2014 it was superseded and now requires Regional Councils to respond to water quality and allocations in catchments. In addressing this, Regional Councils must set quality limits on all water bodies by 2025 to address issues with over-allocation and declining water quality across the nation (NPS, 2014). This process is just beginning with targets being set currently through community engagement and public consultation.

In addition to the NPS, Regional Councils play a key role in managing land and water resources by creating policies and objectives and instituting rules to achieve them. As required by the RMA 1991, Regional Councils produce Regional Policy Statements which direct the environmental goals for their respective region. For example, Environment Canterbury has implemented the *Canterbury Regional Policy Statement*. Regional Councils also have the option of developing regional plans that set out rules and methods toward addressing more local and specific issues and areas. In Canterbury, the new planning framework is under the *proposed Land & Water Regional Plan,* which became effective in January 2014. The Plan outlines how fresh water and land resources are to be managed in line with the RMA purpose. It covers policies and rules designed to assist with meeting objectives as well as the details relating to the resource consent process.

Key regulations for dairy farmers

Section 9 of the RMA allows anyone to undertake an activity on their land (except subdivision) unless it contravenes a rule in a regional or district plan. Rules are used to determine whether a resource

consent is required to undertake the activity. If it is not a prohibited activity, a person may apply (to the regional or local body) for a resource consent if in breach of the rules. In the case where the activity is designated 'permitted' in the rules, the person will not require a resource consent. This section will highlight the rules specific to dairy farming in Canterbury. The reason this region has been selected is because rules differ from region to region and this section will provide a context to the study area, Canterbury.

In Canterbury the most influential document for dairy farmers is the *proposed Land & Water Regional Plan* which came into effect in January 2014. In line with the NPS for Freshwater Management described earlier, the document is continually developing to set water quality limits in each of the different areas within the region. As well as classifying nutrient allocation zones.

General rules for the region

Under Schedule 7 of the *Land & Water Plan* dairy farmers are required to prepare a *Farm Environment Plan* (FEP) when a farming related resource consent is lodged. The FEP includes assessment of the risks to water quality and the setting of objectives that may cover nutrient management, irrigation management, soils management, wetlands and riparian management, collected animal effluent management and livestock management practices (LWRP, 2012). These plans are then audited by a FEP auditor for compliance with the objectives that have been set out. In addition farmers must also prepare a nutrient budget using the OVERSEER™ nutrient budget model to assist with their nutrient management. The FEP takes an outcome approach where farmers have to implement with their own management methods for meeting these outcomes, giving farmers the flexibility to adopt practices that work for them. Sue Cumberworth, a representative from a Canterbury-based irrigation company states*: "Instead of regulating practices, it's regulating outcomes and it gives farmers the opportunity to get the outcomes through the practices that are going to suit them and their business and on their farm*" (Benny, 2014). These plans may be adopted at an individual farm level, or as part of an irrigation scheme.

Other practices that are controlled include the collection, storage and spreading of animal effluent. Dairy shed effluent tends to contain faeces, urine and the water used to wash down the dairy shed. However, it can also contain spilled milk, detergents and other chemicals which pose a threat to the environment. This activity is controlled through discharge consents that include conditions that mean collected effluent can only be spread at particular times to avoid ponding which can lead to runoff into surface waters. Effluent management standards have continued to become more stringent as more information and research has been conducted on its effects (PCE, 2004). Traditionally in New Zealand, the effluent was allowed to be disposed of into nearby waterways and ditches (Clark *et al*., 2007). However, as the negative effects to water quality became more apparent, different

approaches and practices have been adopted to mitigate the pollutants reaching the waterways. A common approach is to use oxidation ponds to store and treat the effluent before spreading it onto land (PCE, 2004).

Practices to manage nutrient use have also been implemented by dairy farmers around the country. AgResearch, in collaboration with the Ministry for Primary Industries and the Fertiliser Association of New Zealand, have developed and implemented a software tool called OVERSEER™ to assist farmers in managing nutrient flows on their farm. This helps farmers to detect nutrient loss (runoff and leaching) which can improve on-farm nutrient efficiency (Wheeler *et al.*, 2003). This is an extremely important tool for dairy farmers as nutrient management forms the basis of their business. The tool can also be used for estimating greenhouse gas (GHG) emissions (Wheeler *et al*., 2008). Many regional councils around New Zealand have incorporated OVERSEER™ into their rules to ensure farmers make efficient use of their nutrients while protecting the environment (ibid). For example, Environment Canterbury has required the model to be used on all dairy farms (ECan, 2014). Farmers are required to create a nitrogen baseline using OVERSEER™ and record the annual amount of nitrogen loss from the land each year. For some areas in Canterbury this means under the proposed Land and Water Regional Plan, they cannot increase their nitrogen output above the baseline.

Cattle stock with access to waterways also poses a serious threat to surface water (Campbell, 2002). Under the proposed Land & Water Regional Plan, stock are restricted in particular situations that may cause harm to the waterway. Many farms have stock crossings running through streams which results in high concentrations of faecal bacteria, high suspended solids and an increase in nitrogen as cattle are moved across the paddocks. (Davies-Colley *et al.,* 2004). Approaches to mitigate these effects include stock exclusion from waterways through fencing (Davies-Colley *et al.,* 2004; Bewsell *et al*., 2007), creating buffer strips (Ledgard *et al*., 1996) and by using bridges and culverts along stock crossings points (Collins *et al*., 2007).

Canterbury Water Management Strategy

The Canterbury Water Management Strategy (CWMS) was developed as a collaborative, non-regulatory process united with statutory backing (Lomax *et al.*, 2010). It was developed to address areas of conflict between various water users in the Canterbury region. The vision of the strategy is:

> *"To enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from our water resources within an environmentally sustainable framework."* (CMWS, 2009, pg. 6)

This process was different as it took a bottom-up approach to addressing water issues through the creation of zone committees. Zone committees are made up of representative members from

interested groups for each zone. These will often include representatives from Environment Canterbury, territory authorities, Ngāi Tahu, farmers and other stakeholders from the community. Ten targets were created and cover the four pillars of sustainability; environmental, cultural, social and economic (Table 2.2). These targets drive the outcomes and initiatives developed from the CWMS.

Table 2.2 CWMS ten targets (Environment Canterbury, 2013)

Canterbury Water Management Strategy Targets	
Ecosystem Health & Biodiversity	Protect, restore and prevent further loss of habitats and species in all natural aquatic environments – from the mountains to the sea – ki uta ki tai.
Energy Security & Efficiency	Maintain or increase existing electricity supply to New Zealand. Reduce power generation demand on waterways through efficiency gains and alternate smart-power generation solutions.
Environmental Limits	Set and achieve flow, catchment and nutrient limits consistent with all the target areas mentioned here.
Regional & National Economies	Achieve a demonstrable increase in economic wealth due to improved water management for all target outcomes, measured through economic growth and employment.
Irrigated Land Area	Achieve a substantial increase in the reliability of water supplied for irrigation, and in the area of irrigated land which has high standards of nutrient and water use management.
Water-use efficiency	Achieve high levels of best-practice water use for all irrigation, stockwater and industrial/commercial use. Improve water use efficiency in urban water use
Kaitiakitanga	Actively involve rūnanga in water management and decision-making. Increase the community understanding of customary values and uses. Protect wahi taonga and mahinga kai waterways.
Drinking Water	Increase the percentage of people with safe drinking water. Ensure water quality remains high where it is currently. Prevent further decline where it must currently be treated.

Natural Character of Braided Rivers	Maintain, support, enhance and protect our braided rivers and the native species and habitat along their lengths. Actively maintain floodplains. No new dams on the main stems of major alpine braided rivers.
Recreational & Amenity Opportunities	Maintain and improve existing diversity and quality of recreational sites, opportunities and experiences.

Although dairy farming can result in degradation to the environment, the above discussion has highlighted ways in which practices and management tools are improving. Regulation has shifted to ensure what Canterbury values is protected, while allowing farmers to manage their farms in a way that is beneficial to both parties.

2.2 Voluntary Environmental Schemes

Policy approaches to improve environmental outcomes include command-and-control regulation, market-based incentives and voluntary approaches (Segerson, 2013). The command-and-control approach occurs when governments set standards and technologies that are enforced by law (Potoski & Prakash, 2005). Although this type of approach has been successful in improving environmental conditions, it has been criticised for being unduly rigid, inefficient and incomplete for fully addressing environmental challenges (Andrews *et al*., 2001). It has also been argued this approach discourages innovative and environmentally friendly practices (Porter & Van der Linde, 1995). Recently this approach has been joined by other policy instruments, such as market-based instruments and voluntary approaches that also aim at protecting the environment. Market-based approaches use taxes and cap-and-trade programmes to deal with negative environmental externalities. The most recent approach is voluntary approaches which are voluntary environmental actions undertaken by companies beyond what is required by law. These approaches have demonstrated their ability to improve companies' environmental performance (Potoski & Prakash, 2005).

Terms used to describe voluntary approaches vary widely, including *self-regulation* (Gunningham & Rees, 1997; Neale, 1997), *voluntary initiatives* (Peters & Turners, 2004)*, voluntary environmental programs* (Koehler, 2007; Moiser & Fisk, 2013), *voluntary environmental agreements* (Lyon & Maxwell, 2003; Segerson & Miceli, 1998), *voluntary codes* (Nash & Ehrenfeld, 1997)*, voluntary accords* (Cunningham & Clinch, 2004)*, voluntary environmental initiatives* (Rivera, 2002; Rivera & de Leon, 2004)*, new environmental policy instruments* (Jordan *et al.*, 2003), *public voluntary programs* (Lyon & Maxwell, 2007), and *negotiated environmental agreements* (Lilja, 2009). There is no single standard definition used for voluntary approaches (Cunningham & Clinch, 2004).

The majority of the literature on voluntary approaches is theoretical, although empirical literature has been on the increase (Alberini & Segerson, 2002). The following sections will outline the various types of voluntary approaches that exist and what motivates companies to adopt them.

2.2.1 Classes of Voluntary Schemes

A common way to differentiate the types of approaches is by determining what the scheme is focused on, whether it is national or international scheme, a management system, performance or process based, and finally who has set the environmental commitments. In this section I will provide a description of each and real world examples.

Throughout the world there have been various types of these voluntary schemes developed and implemented. Some of them are designed for specific industries, such as fisheries, forestry and agriculture (Gulbrandsen, 2005; King & Lenox, 2000; May *et al.,* 2003). An international example is the well-known Forest Stewardship Council (FSC) which aims to promote environmentally sound, socially beneficial and economically prosperous management of the world's forests (FSC, n.d.). While some others focus on supporting specific groups, such as producers in developing countries (Lee *et al.*, 2012; Elder *et al.*, 2013; Raynold, 2012). The company Fairtrade, for example, ensures that producers in developing countries have fair trade conditions to assist with sustainability outcomes. Other schemes concentrate on particular environmental or social impacts, such as biodiversity and animal welfare. The Greenhouse Gas Protocol provides standards relating to the accounting and reporting of greenhouse gas emissions (Green, 2010). Some focus on measuring a products life cycle or just particular stages of production. For example, the International Organization for Standardization (ISO) has released its ISO 14040 series which outlines procedures for completing a life cycle assessment (Finkbeiner *et al.*, 2006). Finally, some voluntary schemes provide guidelines for conducting best practice, while some support continuous improvement or a combination of both.

Voluntary schemes are developed by various groups and organisations. They may be developed by individual companies, non-governmental organisations, industries, governments and multi-stakeholder initiatives. Some of the schemes include product labels for the consumers or they may simply be a requirement for supply chains and trade. Some are recognised on an international level, such as FSC and the Marine Stewardship Council (MSC), while some are known only in specific countries.

National schemes are created by national bodies such as governments, and can also be created by non-government groups. They are generally intended for use within a national territory, however, some may be adopted at an international level if suitable. An example of a New Zealand national scheme is Sustainable Winegrowing New Zealand, an industry initiative that promotes best environmental practice among wineries and vineyards. As the name suggests, the programme is intended for New Zealand use only. *International schemes* on the other hand, as the name implies, are developed for the purpose of being adopted worldwide (Christmann & Taylor, 2002). The ISO is an international standard-setting body developing and publishing standards for industries around the world. At its core, ISO standards promote sustainability in particular through their ISO 14000 series focusing on environmental management, and their ISO 26000 series focusing on social responsibility.

Management systems standards outline procedures for participants to follow in order to meet objectives. A common environmental management system (EMS) standard is the ISO 14001 standard which sets up the framework for an EMS and provides a certification for doing so. It

provides assurance to consumers, employees and the company itself that it is continually measuring and improving its environmental performance. The key feature of these EMS is they do not set specific requirements regarding outcomes, but allow the company to develop its own level of performance appropriate to their situation. On the other hand, *performance standards* state the level of performance expected by a product or company. Performance standards can be further differentiated into standards that are 'high' (i.e. stringent in their requirements) or 'low' (i.e. less stringent in their requirements). In addition to this, standards may begin with low requirements, but expect that an organisations performance will increase over time with more stringent requirements (i.e. continuous improvement).

Categories of Voluntary Schemes

The literature has generally categorised voluntary schemes into three distinct categories which include *public voluntary schemes* (Borkey & Leveque, 2000; Cunningham & Clinch, 2004; Darnall & Carmin, 2005), *unilateral initiatives* (Borkey & Leveque, 2000; Cunningham & Clinch, 2004; Darnall & Carmin, 2005) and *negotiated agreements* (Cunningham & Clinch, 2004; ten Brink & Morere, 2000; Darnall & Carmin, 2005).

Public voluntary schemes are created by environmental agencies to encourage companies to voluntarily meet specified standards for environmental performance (Khanna, 2001; Lyon & Maxwell, 2003). The specified requirements are developed by the environmental agencies and may include conditions of membership, compliance regulations and monitoring mechanisms (Borkey & Leveque, 2000). Benefits of joining these programmes include increased public recognition, access to technical assistance and information subsides provided to participants (Khanna, 2001). An example of a public voluntary scheme is the Eco-Management and Audit Scheme (EMAS) as developed by the European Commission to allow organisations to evaluate, manage and continuously increase their environmental performance (Iraldo *et al.,* 2009).

Unilateral commitments are developed without direct government involvement and are industry or company-led (Lyon & Maxwell, 1999; Borkey & Leveque, 2000; Khanna, 2001). This is also known as self-regulation where companies take a proactive approach to address environmental issues. Companies are responsible for developing environmental targets and the provisions governing compliance (Borkey & Leveque, 2000). Khanna (2001) outlines the three unilateral approaches that a company can use; (1) develop their own plans or management systems, (2) participate in codes of conduct and other guidelines or (3) meet standards of a certifying agency. Even though the company determines the environmental targets, they may also chose to incorporate a third party to conduct the monitoring and dispute resolution. An example of a unilateral scheme is the Responsible Care

initiative, developed by the chemical industry to improve the industries health, safety and environmental performance (King & Lenox, 2000).

Another voluntary approach falls under the category of *negotiated agreements* (Borkey & Leveque, 2000; Khanna, 2001; Lyon & Maxwell, 2003; ten Brink & Morere, 2000). These particular schemes form an agreement between public authorities and a specific industry (ten Brink & Morere, 2000). The environmental target is set by the public authority while the methods and timetable are then negotiated with the concerned industry (Lyon & Maxwell, 1999). The joint collaboration of scheme development is what differentiates negotiated agreements from other voluntary approaches (Borkey & Leveque, 2000). Many of these agreements come about after a regulatory threat from government is proposed, and this will generally form the penalty if the targets in the agreement are not met (Khanna, 2001). The contracts agreed upon may be binding or non-binding. An example of a negotiated agreement is the Montreal Protocol on Substances that Deplete the Ozone Layer, which outlines the phasing out of various substances responsible for ozone depletion.

2.2.2 Adoption & Motivation

It is important to understand what motivates companies to adopt schemes, as their effectiveness will largely depend on how they respond to them, particularly around participation (Lyon & Maxwell, 1999). The primary drivers around companies adopting these voluntary schemes have been attributed to *stakeholder pressure* (Khanna, 2001; Darnall *et al*., 2010; Delmas & Toffel, 2004), *public pressure* (Anton *et al.*, 2004; Khanna & Anton, 2002), *consumer pressure* (Delmas & Toffel, 2004; Anton *et al.,* 2004; Delmas & Montiel, 2009), *competitive pressure* (Khanna, 2001; Bansal & Hunter 2003), *regulatory pressure* (Khanna, 2001;; Delmas & Toffel, 2004; Doonan *et al.*, 2005; Khanna *et al.,* 2007; Delmas & Montes-Sancho, 2010), *industry pressure* (Delmas & Toffel, 2004), *environmental group pressure* (Delmas & Toffel, 2004) and *investor pressure* (Anton *et al.,* 2004). Studies have also linked adoption to a company's characteristics including *size* (Arora & Cason, 1995; Khanna & Damon, 1999; Videras & Alberini, 2000), *financial health* (Khanna, 2001), *technical feasibility* (Khanna, 2001), and *past environmental performance* (Arora & Cason, 1995; Khanna & Damon 1999; Videras & Alberini, 2000; Khanna, 2001; Lyon & Maxwell, 2002; Delmas & Toffel, 2004). Other reasons for adopting such schemes has also been credited to *reduction in costs* (Lyon & Maxwell, 1999), *'green' consumer demand and benefits* (Lyon & Maxwell, 1999), *competitive position* (Delmas & Toffel, 2004), and the *pre-emption of government regulation* (Lyon & Maxwell, 1999; Khanna, 2001; Khanna & Kumar, 2011).

2.3 Effectiveness of Voluntary Schemes

Voluntary schemes can be evaluated by their environmental effectiveness, cost-effectiveness and economic efficiency (Segerson, 2013). The focus of this study was on the environmental effectiveness of voluntary schemes. Scholars have defined the 'environmental effectiveness' of voluntary approaches in many ways. Convery & Leveque (2001) state that environmental effectiveness "The manner in which targets are set, the degree to which they are achieved, and how these targets relate to what would have been achieved in the absence of the agreement" (pg. 68). While Paton (2000) states it is "The ability of a voluntary approach to achieve its intended results" (pg. 330). And finally, Alberini & Segerson (2002) define effectiveness as the measurement of improved environmental quality that occurs from the implementation of the voluntary approach.

Challenges

Efforts to evaluate the effectiveness of voluntary schemes have been limited due to an absence of data (Paton, 2000). Convery & Leveque (2001) state that without the data to determine the environmental effectiveness, it becomes virtually impossible to measure a scheme that is already implemented. Other factors for measuring the effectiveness include weak metering, evaluation methods and no monitoring (Mazurek, 2002). To evaluate if a scheme has been effective, requires some measurement to determine the environmental improvements that have come about since the schemes implementation. It can be challenging to link actual environmental changes as a result of the voluntary approach, which in turn makes it difficult to determine the environmental effectiveness (Mazurek, 1998). Convery & Leveque (2001) suggest voluntary approaches in the past failed to set out 'with-without' estimates of the approaches which assists in measuring the success of the scheme. In other words, a standard needs to be set to demonstrate the outcomes that could be expected with no voluntary approach and then can be compared to actual outcomes (Segerson, 2013). Also an important point raised by Convery & Leveque (2001) is this is not just an issue for voluntary approaches, but for any environmental policy in general.

Baseline

Properly evaluating the success and effectiveness of a scheme requires a baseline or 'business-as-usual' scenario to be developed (Paton, 2000; Cunningham & Clinch, 2004; OECD, 1998). The baseline provides a standard in which the performance can be judged (Convery & Leveque, 2001). This is not only helpful for determining the success of the scheme, but can also be used for comparing two or more environmental policy options (Segerson, 2013). If the baseline is then set, it should be then imperative that the voluntary approach has some reference to a desired performance that it wishes to achieve. For instance, an ambiguous goal like, 'outcome is to improve water quality' can be too general meaning that if the voluntary approach improves water quality but only slightly (i.e. still not

safe to swim in), has the scheme been successful at meeting its goals or should a clearer target have been set? These issues need to be addressed in the design process before the scheme is implemented.

Bizer & Julich (1999) evaluated a schemes effectiveness by whether it went beyond 'business-as-usual' with regard to technical reduction potential and also if the scheme performed accordingly. Alberini & Sergerson (2002) argue the effectiveness of a voluntary approach can be measured by the level of environmental protection that is realised and depends on at least three factors: (1) the quantity of participants that take part in the programme (2) total pollution reduction undertaken by each participating polluter and (3) the impact the approach has on the number of polluting firms. From these factors we see the importance of scheme adoption and actual reduction in pollution in determining the schemes effectiveness. This is one way to assess the effectiveness of a scheme in meeting environmental performance goals. The next step is to look at the particular attributes of a scheme directly affecting these factors. For example, if a scheme provides participants with incentives and benefits, it will likely increase the participation in the scheme which affects factor one. These incentives could be recognition of environmental stewardship, market-based incentives, government incentives, free-rider incentives and specific targeting for high polluters (Khanna, 2001; Alberini & Segerson, 2002). Looking at factor two, the environmental impact reduced by the scheme can be determined by how stringent the abatement obligations are. Alberini & Segerson (2002) claim that it is the incentive (factor one) that determines how much pollution abatement (factor two) the participant is prepared to undertake. Another way to look at it is that the effectiveness relies not just on the 'breath of adoption' (number of participants), but also the 'depth of adoption' (pollution reduction) (Corbett & Muthulingam, 2007).

2.3.1 Design of Voluntary Schemes

> *"In order to generate these benefits for society and firms, voluntary approaches must be carefully designed to limit free-riding and strategic behaviour by firms and to generate public credibility and support. This requires that voluntary approaches are the result of a transparent process that involves independent parties in the validation of targets for environmental improvement, and that they include credible independent mechanisms for monitoring and enforcement, and provisions for sanctions in the event of noncompliance"*

(The Research Network on Market-based Instruments for Sustainable Development, 1998, pg. 3*)*

The use of voluntary schemes has been linked to improving environmental outcomes (Arora and Cason, 1996; King and Lenox, 2000; Khanna and Damon, 1999). As the use of voluntary schemes

increases, it is important to understand how they are designed and to evaluate their credibility (Harrison, 2002). Darnall & Sides (2008) argue that one reason voluntary schemes are developed with weak design structures is due to the trade-offs between maintaining the schemes rigour, while trying to provide a flexible means to move participants beyond environmental laws. There is currently a conflict between encouraging scheme adoption while ensuring the schemes requirements and goals are met (Darnall *et al.*, 2003). This being said, it is important to understand what determines an effective voluntary scheme.

This next section provides an overview of the literature on voluntary approaches with a specific focus on design attributes recommended for an effective scheme design. It does not look at the types of schemes used specifically. Rather, it seeks to highlight the attributes that are important determinants of environmental effectiveness. An effective scheme design has been defined for this study as, "*a scheme that improves the environmental performance of participants".* These attributes act as 'building blocks' for an effective scheme design working together to build an effective voluntary scheme. By identifying the critical attributes for effective scheme design, the study will be able to recommend better voluntary schemes and create a usable template on how to design these schemes.

2.3.2 Attributes of Effective Voluntary Schemes

This section outlines the attributes of effective voluntary environmental schemes internationally (Table 2.3).

Table 2.3 Design attributes and their sources

Attribute	References
Baseline	Blackman (2012); Convery & Leveque (2001); EEA (1997); OEAD (1998); Segerson (2013)
Benefits-incentives	Alberini & Segerson (2002); Banerjee & Solomon (2003); Barth & Dette (2002); Bizer & Julich (1999) Chittock & Hughey (2011); Convery & Leveque (2001); Darnall & Carmin (2005); Darnall *et al* (2003); Mazurek (2002); Moiser & Fisk (2013); Price (2005); Segerson (2013)
Budget-funding	Blackman & Rivera (2011); Chittock & Hughey (2011)
Continuous improvement	Gunningham & Sinclair (2002); Moffet *et al* (2004); OEAD (2003); Potts *et al* (2010)
Government involvement	Banerjee & Solomon (2003); Price (2005)
Information support	Chittock & Hughey (2011); EEA (1997); OEAD (1998)
Monitoring	Barth & Dette (2002); Bizer & Julich (1999); Chittock & Hughey (2011); Convery & Leveque (2001); Darnall & Carmin (2005); Darnall *et al* (2003); Delmas & Teraak (2001); EEA (1997); Gunningham & Sinclair (2002);

	Mazurek (2002); Moffet *et al* (2004); OEAD (2003); Potts & Haward, 2007; Potts *et al* (2010); Prakash & Potoski (2007); Segerson (2013)
Public participation	Barth & Dette (2002); Jimenez (2007); Moffet et al (2004); Paton (2000)
Regulatory compliance	Gunningham & Sinclair (2002)
Regulatory threat	Chittock & Hughey (2011); Krarup (2001); OEAD (1998); Price (2005); Segerson (2013)
Reporting	Bizer & Julich (1999); Darnall *et al* (2003); EEA (1997); Gunningham & Sinclair (2002); Mazurek (2002); Moffet *et al* (2004); OEAD (2003)
Sanctions	Barth & Dette (2002); Bizer & Julich (1999); Darnall & Carmin (2005); Delmas & Teraak (2001); Gunningham & Sinclair (2002); Krarup (2001); OEAD (1998); OEAD (2003); Potts *et al* (2010); Prakash & Potoski (2007)
Stakeholder involvement	Darnall *et al* (2003); Paton (2000)
Targets	Barth & Dette (2002); Bizer & Julich (1999); Blackman & Rivera (2011); Chittock & Hughey (2011); Darnall & Carmin (2005); Darnall *et al* (2003); EEA (1997); Krarup (2001); OEAD (1998); OEAD (2003); Price (2005)
Third Party	Bizer & Julich (1999); Blackmann & Rivera (2011); Darnall *et al* (2003); Delmas & Teraak (2001); EEA (1997); Highley *et al* (2001); Moffet *et al* (2004); OEAD (1998); OEAD (2003); Potts & Haward (2007); Prakash & Potoski (2007)
Transparency	Auld & Gulbrandsen (2010); Barth & Dette (2002); Bizer & Julich (1999); Chittock & Hughey (2011); Convery & Leveque (2001); Delmas & Teraak (2001); Gunningham & Sinclair (2002); Krarup (2001); Paton (2000); Potts *et al* (2010)

Description of Design Attributes

The following section provides a brief description for each of the design attributes in relation to the findings from the literature review.

Baseline

Many authors argue a baseline is a crucial aspect for determining a scheme's environmental effectiveness (EEA, 1997; Convery & Leveque, 2001; OECD, 1999; Paton, 2000). It has been noted that it can be extremely difficult to assess whether a scheme has been successful or not without data showing an actual environmental improvement. The baseline works by assessing if the scheme has actually been successful in making environmental improvements. It provides a 'stick' by which the improvements can be measured (EEA, 1997). The determination of the baseline can be done prior to the scheme implementation in order to gain an accurate picture of the current situation (Convery & Leveque, 2001). The baseline is also referred to as the 'business-as-usual' (OECD, 1999). These baselines also need to be paired with 'targets' which is discussed later.

Benefits

Benefits contribute to the successfulness of a scheme by providing tangible or visible benefits to the participants of the scheme (Chittock & Hughey, 2011). They provide motivation for adopting the scheme and can also provide an incentive to meeting the requirements, particularly if sanctions are in place. The benefits can be sourced from the private sector or from government (Segerson, 2013). Darnall *et al*. (2003) highlight benefits can be in the form of enhanced networks and public relations, increased resources and environmental capacity and reduced regulatory oversight. Segerson (2013) outline other benefits such as environmental stewardship, market-based incentives, information (in the form of technical assistance by regulators), incentive programmes (direct payments) and regulatory threats. If companies can indeed pre-empt regulation, it may allow them to reach environmental targets at their own pace and by their own means which still allows for positive environmental outcomes at a lower cost for the organisations (Delmas & Terlaak, 2001).

Incentives

Incentives, as with benefits, provide motivation for adopting a voluntary scheme. Incentives can be in the form of environmental stewardship, market based incentives and government required incentives (Alberini & Segerson, 2002). Bizer & Julich (1999) argue the success of a scheme largely relies on adequate incentives being provided (available funds or other services). Price (2005) found through their study of 23 energy efficiency and GHG reduction programs that a combination of both incentives and penalties led to higher participation in the scheme and increased likelihood of meeting the scheme's goals. Incentives can be provided to participants for meeting their responsibilities (Convery & Leveque, 2001).

Sanctions

Sanctions have been also described as incentives for participates to meet requirements and standards set by the scheme (Bizer & Julich, 1999). Sanctions are used in the case where a participating company fails to meet and comply with the requirements (Krarup, 2001). Sanctioning mechanisms complement monitoring practice by penalising those who fail to comply (Delmas & Terlaak, 2001). Only in binding agreements can sanctions be enforced which tends to make them more effective than non-binding agreements (OECD, 2003). Sanctions provide schemes with a mechanism to deal with poor performers (King & Lenox, 2000). An example of a sanction that may be used is the denial to relax certain regulatory measures (Delmas & Terlaak, 2001).

Budget and funding

Any successful programme will ensure it has sufficient funding to meet the required targets (Banerjee & Solomon, 2003; Chittock & Hughey, 2011). Funding can be sourced through government

sponsorship or membership to the participants of the scheme. This funding needs to be adequate and consistent to ensure the schemes success (Chittock & Hughey, 2011).

Target and goal setting

Generally, voluntary schemes will provide some form of target, goal, requirement or standard that must be met to participate in the scheme. Targets outline what the scheme and participant plan to achieve regarding environmental outcomes (Darnall *et al*., 2003; Darnall & Carmin, 2005). The way these aspects are defined is important for the scheme's effectiveness in addressing the environmental issue. The literature stresses targets need to be clearly defined (Bizer & Julich, 1999; EEA, 1997; OECD, 1999; OECD, 2003; ten Brink & Morere, 2000). It is also recommended that the targets (in agreements) be created in an open and transparent environment with the involvement of stakeholders (Krarup, 2001). Bizer & Julich (1999) recommend the use of interim targets and have a 'staged approach' to meeting environmental outcomes. Another consideration is the use of timelines to meet the targets specified (Chittock & Hughey, 2011; OECD, 2003; Gunningham & Sinclair, 2002).

Performance indicators

Performance indicators provide a frame of reference for measuring a scheme's environmental effectiveness and progress (Moiser & Fisk, 2013). They lay the foundations for successful monitoring and auditing measures by determining what is to be measured. Performance indicators can also demonstrate whether the scheme is meeting its targets and requirements (Convery & Leveque, 2001). These indicators 'track' the progress of the scheme and will be in the form of quantifiable and qualitative measures (Moiser & Fisk, 2013; Gunningham & Sinclair, 2002). Ideally, the results on the performance indicators would be made available to the public (Convery & Leveque, 2001).

Reporting

Studies have shown the reporting of a scheme's outcome is linked to an increase in environmental performance (Bizer & Julich, 1999). Reporting involves presenting the results and outcomes of the scheme in some form to the public. The inclusion of reporting into the scheme's design can enhance the credibility and transparency of the scheme (Delmas & Terlaak, 2001; Chittock & Hughey, 2011; Zarker & Kerr, 2009). Transparency demonstrates to the stakeholders that schemes are being implemented and targets are being met (Chittock & Hughey, 2011). Reporting can increase the effectiveness of the schemes as companies are pressured to meet goals and outcomes, and if they do not, they may face the scrutiny of stakeholders. It can also be referred to as 'public disclosure' of the auditing information (Prakash & Potoski, 2007). Zarker & Kerr (2008) state the information released to the public should contain auditing, performance measures, monitoring and enforcement strategies. Reporting needs to balance disclosure of the outcome while maintaining confidential information that could be important to the company (Delmas & Terlaak, 2001).

Information

Information provisions in the scheme can add to its effectiveness by providing help tools for the participants (Chittock & Hughey, 2011; OECD, 1999). Examples are technical publications, available technology, technical assistance, technical workshops and editions of best practice guides (OECD, 1999; Chittock & Hughey, 2011).

Third party involvement

Voluntary schemes are generally more effective if third parties are involved (Bizer & Julich, 1999; OECD, 2003). Third parties can play a major role in the monitoring and auditing of the scheme's requirements. They provide greater reassurance to the wider public compared with internal audits (Gunningham & Sinclair, 2002). This allows for increased credibility of the scheme among stakeholders and the wider public (Gunningham & Sinclair, 2002; OECD, 2003). Third parties can also be involved in the setting of targets, funding and overall management of the scheme (sponsor) (Darnall *et al.*, 2003).

Stakeholder involvement

Stakeholder involvement is especially important in the initial stages of the scheme's development. Stakeholders can play a key role in target, activity and standards setting. Darnall *et al.* (2003) both explored the types of stakeholders involved and also measured the diversity and intensity of stakeholders in the developing of voluntary schemes.

Government Involvement

Government can provide funding which can improve the financial stability, long-term viability and effectiveness of a scheme (Banerjee & Solomon, 2003; Chittock & Hughey, 2011). They can also act as sponsors providing schemes with increased credibility and recognition from the wider public whilst providing legal protection to the companies.

Regulatory threat

The presence of a regulatory threat can benefit a programme in many ways. Primarily it increases the motivation for participation in the programme and may mean financial incentives are not required (Alberini & Segerson, 2002; Chittock & Hughey, 2011). It can also strengthen the bargaining power of the government involved and possibly result in an increased target level being set (Krarup, 2001). However, the regulatory threat must be viewed as credible or it will not be useful (Alberini & Segerson, 2002; Chittock & Hughey, OECD, 1999). If regulatory threats are made, they must be paired up with monitoring to ensure participants are meeting the targets set by the scheme (Alberini & Segerson, 2002).

Monitoring

Monitoring is used to ensure the scheme's requirements are satisfied by focusing on the targets and goals set by the scheme (Darnall *et al.,* 2003; OECD, 1999). This must be also occur regularly (Hughey & Chittock, 2011) and specify clear and reliable monitoring mechanisms (EEA, 1997). Bizer & Julich (1999) found that proper monitoring correlated with better performance. Monitoring can be performed by various entities that include self-monitoring (whereby a firm conducts its own monitoring), internal monitoring (whereby the sponsor or coordinator of the programme conducts the monitoring) and third party monitoring (whereby an independent organisation conducts the monitoring) (Darnall *et al.,* 2003). By including third party verification, the company can gain credibility with stakeholders and the wider public (Gunningham & Sinclair, 2000).

Regulatory compliance

This attribute basically means that to participate in the scheme, regulatory laws must be met. Darnall *et al.* (2003) argue that because schemes generally encourage beyond required performance, regulatory compliance demonstrates the companies' willingness to achieve environmental outcomes.

2.4 Voluntary schemes in the NZ dairy industry

2.4.1 Introduction

Self-regulation in the dairy industry is not a recent phenomenon however there has been a rapid increase in the use of environmental voluntary schemes since the 1990's (MfE, 2003). Approaches for dealing with the environmental effects of dairy farming have moved away from the traditional command-control approach to a more voluntary approach, with the inclusion of voluntary agreements with the dairy industry, voluntary initiatives and conditions set in supplier contracts for farmers. The Ministry for the Environment (MfE) supports self-regulation in mitigating the impact agriculture has on the environment and views these self-regulation measures as achieving more positive environmental outcome in contrast to relying on regulations alone (MfE, 2003).

Blackett & Le Heron (2008) argue that it was certain particular elements that facilitated the change in governance within the New Zealand dairy industry. The elements were scientific evidence (showing poor water quality), public concern over the quality of our water resources and a need to maintain our 'clean green' image. Public concern was heightened by a high profile campaign led by Fish & Game (NGO) in 2002 that accused the industry of 'dirty dairying' (Blackett & Le Heron, 2008). The campaign was in contrast to New Zealand 'clean green' image that is often portrayed at an international level. This image provides New Zealand with various economic benefits such as increased tourism and branding for the products we produce (MfE, 2001). This campaign threatened not only the dairy industry, but New Zealand's economy as a whole.

In response to the campaign and public concerns, Fonterra and local council developed the *Dairying and Clean Streams Accord* in 2003 (Fonterra co-operative Group *et al*., 2003). The Accord was signed by Fonterra Co-operative Group, regional councils, Ministry for the Environment and the Ministry of Agriculture and Forestry (now Ministry for Primary Industries). The purpose of the Accord was to set a framework focusing on reducing the environmental impacts of dairy farming on water quality in New Zealand. In order to achieve its purpose the Accord included actions and targets. The actions included stock exclusion from waterways, bridging or culverts over stock crossings, effluent management, nutrient management, protection of wetlands and the development of action plans by Fonterra and regional councils. (Fonterra co-operative Group *et al*., 2003).

The Accord targets were monitored by Fonterra and results were reported and published biennially in report titled *Dairying and Clean Streams Accord: Snapshot of Progress*. The assessments were conducted by Fonterra by a farmer self-assessment and questionnaire. Data for effluent management was also acquired by regional councils through their compliance monitoring of dairy effluent disposal. This approach has been criticised when a technical report, *Stock Exclusion Survey* (MAF, 2011) by the Ministry of Agriculture and Forestry, found large discrepancies in the reported targets. By the end of the Accord's timeline, only one of the five targets had been met and the aim to improve water quality was not achieved.

Chapter 3

Research Aim, Questions & Objectives

The aim of this research is to analyse voluntary schemes used by the dairy industry with a focus on the design attributes that have been included to form these schemes. These voluntary schemes have been designed to improve environmental outcomes and their relevant attributes will be evaluated as part of this study. In order to achieve this, three research questions in addition to four objectives, have been proposed.

3.1 Research Aim

To evaluate voluntary dairy schemes adopted in Canterbury in respect to key attributes forming a rigorous dairy scheme.

3.2 Research Questions

1. Which voluntary schemes are currently used by the dairy industry in Canterbury?
2. What are the attributes of voluntary dairy schemes used within Canterbury, New Zealand?
3. How do the dairy schemes compare terms of an effective scheme design?

3.3 Research Objectives

1. Review current literature regarding voluntary scheme design to determine effective design attributes
2. Identify participating dairy schemes in Canterbury for the study
3. Compare Canterbury dairy scheme attributes with effective voluntary scheme attributes identified in the literature
4. Contribute to improved understanding of how voluntary schemes in the dairy industry should be designed

Chapter 4

Methodology

The aim of this section is to outline the methodology that was used for this study in order to answer the research questions and objectives above. Section 4.1 presents an overview of the research methods used (Figure 4.1). This will be followed by a discussion in Section 4.2, outlining the case study selected, dairy schemes used in the study and the design attributed that are being evaluated. In Section 4.3 an explanation is provided to explain the data analysis.

4.1 Overview of Research Methods

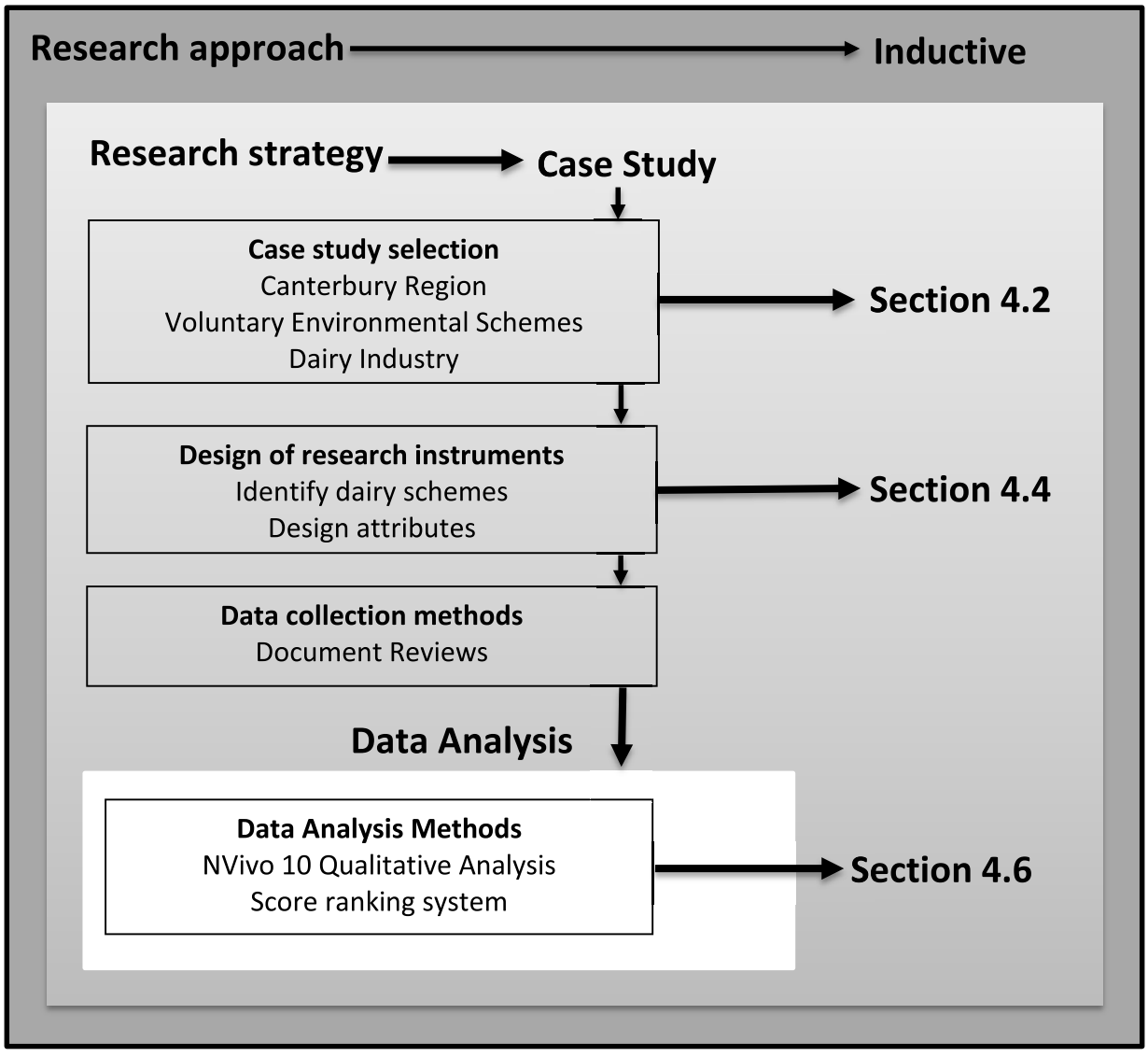

Figure 4.1 Overview of research methods

4.2 Study Area

For the purposes of this study, a case study is the most relevant as it focuses on a contemporary phenomenon and is not concerned with societies or cultures (Saunders *et al.,* 2009). The researcher has accepted the limitations of this method (selection bias, inaccurate measurement and the failure to make generalised conclusions) and believes this design is the most appropriate for this study. Below outlines the characteristics of the proposed case study.

The case study is focused on the voluntary environmental schemes used by the dairy industry in Canterbury (Figure 4.2). Canterbury was selected as the geographical boundary as it is easily accessible to the researcher, it is a dairy intensive region and is facing environmental issues such as declining water quality. Also the entire Canterbury region is governed under one body, Environment Canterbury (Regional Council). A major reason why a region was selected (as opposed to New Zealand) was due to the existence of different regional council regulations and rules around New Zealand which could impact on the analysis because the schemes may reflect local regulations. Also different organisations and dairy companies exist in each region. By selecting one region, we can be more accurate at deciphering how these schemes are used and implemented. This can avoid generalising for the entire New Zealand.

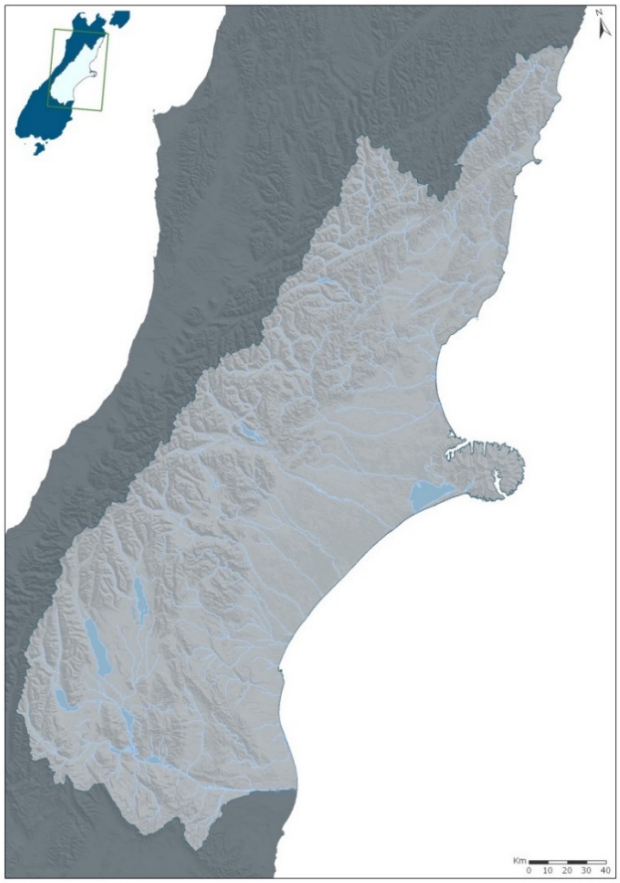

Figure 4.2 Light area represents Canterbury region used in this study (ECan, 2011)

4.2.1 Dairying Schemes

We define a voluntary dairy scheme as "*a voluntary programme or initiative that aims to improve the environmental performance of dairy farmers*".

In order to identity the relevant schemes for the study, a list was initially compiled with the agricultural initiatives used worldwide. From this list of over 100 schemes, relevant schemes were then selected based on their implementation in New Zealand. This list consisted of schemes from many sectors including wine, dairy, horticulture and sheep and beef. The schemes for the study were selected against the following criteria; whether a given scheme was a) voluntarily adopted by the dairy industry, b) addresses the environmental impacts caused by the dairy industry and, c) was adopted in the Canterbury region in New Zealand. Finally, eight schemes that were found to be relevant to the Canterbury region were identified (Table 4.1).

Table 4.1 Study voluntary dairy schemes

Voluntary Environmental Scheme	Scheme Coordinator	Type
AsureQuality Organic Label	AsureQuality	Third Party
BioGro NZ	The New Zealand Biological Producers and Consumers Society	Third Party
Code of Practice	Westland Milk Products Ltd	Company
Code of Practice for Nutrient Management	Fertilisers Association of New Zealand	Third Party
Lead With Pride	Synlait	Company
LEAF Marque Global Standard	Linking Environment and Farming	Third Party
Supply Fonterra – Environment Programme	Fonterra	Company
Sustainable Dairying: Water Accord	DairyNZ	Joint scheme

4.2.2 Overview of Dairy Schemes

This study is particularly interested in these design features (attributes) that have been included as there is a clear link to the scheme's effectiveness. The following table provides a brief description of the schemes that were included in the study (Table 4.2). From looking at what each scheme entails, there appears to be a wide range of issues addressed which will provide an interesting case study. In the mix we have international schemes such as the LEAF Marque as well at local schemes in Canterbury such as Lead With Pride.

Table 4.2 Dairy schemes used in study

Scheme	Description
Code of Practice	The Code of Practice requires all Westland milk suppliers to implement best practice in regards to environment, animal welfare and farm presentation. The dairy company is collaborating with Westland Regional Council to manage the programme. The programme was first introduced in 2011 and is currently been updated for the year 2015It was developed to ensure that farmers complied with RMA 1991, Animal Welfare Act, Sustainable Dairying: Water Accord and other relevant council rules.
Supply Fonterra: Environment Programme	To assist with the Clean Stream Accord and meeting of objectives, the "*Every Farm, Every Year*" was implemented in 2010 (PSWP, 2009-10). This provided the basis for the Supply Fonterra programme which was launched in 2012. The aim of the programme was to develop initiatives to support suppliers of Fonterra and the industry as a whole. The programme included the requirements expected of Fonterra farmers regarding environmental and food safety. The environmental aspect is separated into 'modules' including Waterway Management Programme, Effluent Management Programme, Nitrogen Management Programme and Water Use Programme. The programme also covers food safety and animal welfare. Assessments are carried out by AsureQuality and Quality Consultants of New Zealand.
Lead With Pride	Lead With Pride is Synlait's certification tool available to their supply farmers and financially rewards their supply farmers who achieve best practice dairy farming. The tool has an ISO 65 accreditation. The scheme was launched in 2013 and covers four aspects (pillars) including environment, animal health & welfare, milk quality and social responsibility. For each aspect Synlait have defined specific criteria that must be met in order to become a certified member of the programme. Certified members get the benefit of a premium price for the milk they produce.

BioGro Organic Standards	BioGro was developed to provide an internationally respected organic standard and certification process. They certify producers with organic certification providing NZ producers access to international markets such as USA, Japan and Canada. The company is accredited by both NZ and international accreditation bodies and regulatory authorities such as IFOAM, JAS-ANZ, IOAS and EU Equivalent Certification Body. BioGro certify dairy farms as organic.
AsureQuality Organic Standard for Primary Producers	AsureQuality is commercial company providing quality assurance services to the food and primary production sectors. The company is fully owned by the New Zealand government. AsureQuality hold international accreditation and hosts various laboratories to provide quality assurance. These services include evaluation of the Risk Management Programme, certifications, laboratory testing of dairy products and training regarding heat treatment. The AsureQuality Organic Standard for Primary Producers was created in 2001 and is currently at version 5 of the standard.
LEAF Marque Global Standard	The Linking Environmental and Farming (LEAF) Marque Global Standard was developed in the UK and is used to promote sustainable food and farming. Products meeting these standards can use the LEAF Marque logo on their products. The standard focuses on the Integrated Farm Management approach whereby whole-farm principals are incorporated to balance technology and traditional methods with positive environmental outcomes. Although LEAF originates from the UK, it is currently being implemented on some New Zealand farms (Scoop, 15 Mar, 2010).
Sustainable Dairying: Water Accord	Sustainable Dairying: Water Accord supersedes the Clean Streams Accord implemented in 2003. The new Accord is more robust and includes additional requirements for dairy farmers. Unlike its predecessor, its targets are required by all dairy farmers rather than simply the suppliers of Fonterra. It is based on some of the proposals through the Land and Water Forum, a forum consisting of key stakeholders of freshwater and land management. The Accord was developed by the Dairy Environment Leadership Group (DELG). DELG is a representative group including farmers, government, dairy companies and the Federation of Māori Authorities. The Accord's vision surrounds the idea of protecting our freshwater resources so they may be of benefit to other users (DELG, 2013). A variety of groups within the dairy industry have signed into the Accord.
Code of Practice for Nutrient Management	The Code of Practice for Nutrient Management was implemented by the Fertilisers Association in 2007. The scheme focuses on fertiliser use and helps to ensure they are used safely, responsibly and effectively while reducing adverse environmental impacts. The Code also outlines how to prepare a nutrient management plan, as is becoming required by Regional Councils. The scheme also describes good management practices regarding fertiliser use particularly for farmers.

4.3 Content Analysis of Scheme Attributes

Content analysis was used as it is an effective method for assessing large amounts of text. Babbie (2001) defines content analysis as "*the study of recorded human communications*" (pg. 304). To provide an insight into how these schemes are designed it made sense to analyse the scheme based on its actual content, i.e. the scheme standard. It has the benefit of allowing for both the quantitative and qualitative analysis of text (Kohlbacher, 2006). For content analysis to be successful the codes of interest have already been determined beforehand; which in our case it was through an extensive literature review.

4.3.1 Data Analysis Tool

"Qualitative data analysis is essentially about detection, and the tasks of defining, catergorizing, theorizing, explaining, exploring and mapping are fundamental to the analyst's role" (Richie & Spencer, 2002, pg. 309).

NVivo 10 is a software tool that can assist with coding qualitative-based data that was developed by the Qualitative Society of Research International (QSR International). NVivo 10 can assist the research in five ways; managing and organising data, managing ideas, running queries, graphical models and creating reports from the data (Bazeley, 2007). Text within NVivo 10 can be coded to 'nodes' which are generally a word of phrase used to code particular items. For example I had a node for 'third party' which was used to code any reference in the text that referred to the use of a third party.

4.3.2 Coding System for Analysing Scheme Attributes

A framework developed by Richie & Spencer (2002) was used as a method for developing the scheme attribute coding system (Figure 4.3). This framework was adapted to develop a standardised coding method that could be used to analyse documents to uncover their attributes and level of rigour. The first stage of the analysis involved sourcing and uploading the relevant documents for the study. Richie & Spencer (2002) outlined that the first stage in their analysis framework is to familiarise yourself with the content. The dairy schemes were read to give the researcher an idea about the content of the documents that would be analysed.

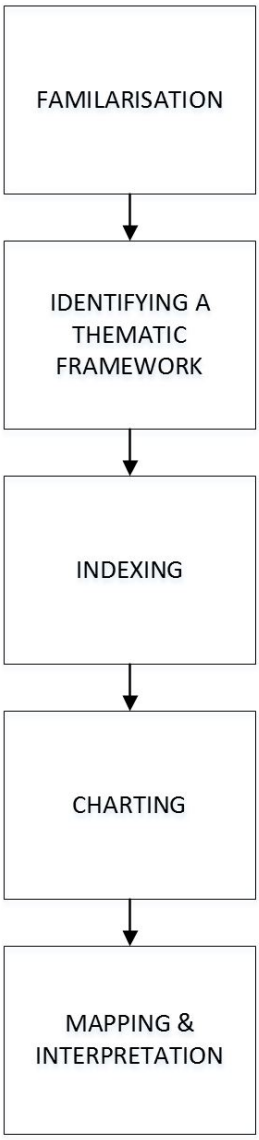

Figure 4.3 Framework for developing scheme attribute coding system (Adapted from Richie & Spencer, 2002)

This began the process of abstraction and conceptualisation. A list of attributes that relate to the environmental effectiveness of a voluntary environmental schemes were identified from the literature are outlined previously in the literature review. Search engines used included ScienceDirect, SpringerLink and Google Scholar. For the purposes of this study an attribute is defined as "a characteristic of a voluntary environmental scheme that improves its environmental effectiveness". The searches to find relevant documents included key words such as 'design', 'features', 'effectiveness' along with 'voluntary approaches', 'voluntary agreements' and 'voluntary programmes'. From this 'related articles' from relevant hits were used in the Google search engine which provide an effective method for capturing additional literature. Also many of the articles included references to similar work were also was useful in finding the most relevant literature.

With these attributes a pre-analysis of the documents was done as recommended by Richie & Spencer (2002). From this, design attributes used in the Canterbury dairy schemes could be identified and were able to provide a clearer picture of what attribute characterised dairy schemes in Canterbury. After the initial coding, there was a need to deal with the issues surrounding internal reliability and validity. The next phase was to take the pre-analysis and look into designing a coding framework to be used. The task was to create a method to 'capture' the design attributes from the text. Initially the nodes developed from the pre-analysis were taken and clustered into common themes. This method was around 92 percent reliable. From the clustering we ended up with five categories that had a bearing on the scheme's likely effectiveness (Table 4.3). This process was reflective of the nodes that had appeared in the documents with the help of the attributes identified from the literature. This is what was expected, as the documents were reflective of dairy schemes and the literature was based around a wide variety of voluntary approaches. The next step was to create definitions or key terms for each of the nodes that were created.

Table 4.3 Design attributes used in the study

Category	Sub-Category	Definition	Design Attribute
Scheme Focus	Environmental Factors	Environmental aspects addressed in the schemes	Biodiversity
			Climate and Air Quality
			Nutrient Management
			Soil Management
			Water Management
Goals and Objectives	Goals	Overall goal of the scheme and any sub-goals	Scheme Goal
			Sub-goals
	Objectives	Specific requirements for the schemes' participants	Practice-based
			Outcome-based
	Compliance with regulations and industry standards	Any requirement to meet legal and industry standards	Industry Standards
			Regulation Requirements
Monitoring and Measurement	Monitoring party	Checking and verification of scheme's requirements	First Party
			Second Party
			Third Party
Communication and Involvement	Communication	Any transparent reporting of monitoring	To Farmers
			To Government
			To Public
			To Scheme
			To Stakeholder
	Involvement	The inclusion of external parties in the design of the scheme	Of Farmers
			Of Government
			Of Public
			Of Stakeholder
Incentives and Support	Support	Any help or assistance provided to the farmer	Support
	Incentives	Addition of direct benefits as a result of adopting the scheme	Direct Incentives

		Addition of indirect benefits as a result of adopting the scheme	Indirect Incentives

For the indexing stage, as outlined by Richie & Spencer (2002), we were able to use NVivo 10 software to assist with coding. Richie & Spencer (2002) state that making judgements is subjective but by developing a system to code the text can in turn make the whole process more visible and accessible to outside groups. In some cases it made sense to uses key terms to identify in the text. For example if we were looking at statement that talked about farmers having to manage their 'nutrients' or 'fertiliser's' we would code that section as 'nutrient management'. However in some case it made more sense to include definitions to code the text. A scheme objective, for example, would be coded when the requirement could be measured or checked for compliance. Where scheme statements indicated they could be categorised under more than one node, they were categorised as such. Richie & Spencer (2002) state this is typical during the content analysis process.

Next step was to build up a picture of the findings. NVivo 10 software made it easy to code and store different sections under one nodes and avoided the need to painstakingly cut and paste each section together. It was also useful in this sense as graphs, word clouds and other diagrams could be created with the sections that had been coded under the nodes. As you will see in the results chapter, different diagrams from NVivo 10 were used to present the findings in a visual way.

4.3.3 Scheme score ranking system

A ranking score system was developed to measure the extent of desirable attributes that were present in the schemes and was generally based on the presence or absence of a particular design attribute. Scheme Focus covered breadth and depth of a scheme's ability to mitigate the environmental aspects. Goals & Objectives strived to analyse the specificity of the objectives and requirements in terms of performance-based objectives vs practice-based objectives. Monitoring & Measurement assessed the type of assessment used by each of the schemes typically conducted through first, second or third parties. Communication requirements were identified through reporting and disclosure practices undertaken by each of the schemes. Involvement identified the presence of other external parties during the scheme's development. And finally Incentives & Support were assessed against the presence of direct and indirect incentives and support provided by the scheme co-ordinators.

The scores were determined by the number of nodes coded from the NVivo 10 analysis. All scores were then converted to comparable scales [0,1] for each of the categories showing percentages in the scheme's design rigorousness.

Chapter 5

Results

This section outlines the findings of the research process undertaken by this study. It is structured as follows: Section 5.1 summarises the findings of Research Question 1, which outlines the findings in relation to the dairy schemes to be used for this study. Following this the findings from Research Question 2 regarding the attributes of Canterbury dairy scheme are outlined in Section 5.2. Section 5.3 outlines the findings from the score system that was developed to compare schemes.

5.1 Environmental schemes used by the Canterbury dairy industry

Question 1. What types of voluntary environmental schemes are used by the dairy industry in Canterbury?

This study identified over one hundred voluntary schemes applicable to agribusiness, however only eight voluntary schemes were adopted by dairy farmers in the Canterbury region. A scheme was selected against the following criteria; whether a given scheme was a) voluntarily adopted by the dairy industry b) addresses the environmental impacts caused by the dairy industry and c) was adopted in the Canterbury region in New Zealand. Table 5.1 presents the list of identified voluntary dairy schemes in the Canterbury region along with the scheme's principal coordinator.

Table 5.1 Overview of dairy schemes in Canterbury

Voluntary Scheme	Scheme Coordinator	Year implemented (current version)	Locality	Type
AsureQuality Organic	AsureQuality Limited	2001 (2013)	New Zealand	Third Party
BioGro Organic	BioGro New Zealand	1983 (2013)	New Zealand	Third Party
Code of Practice	Westland Milk Products Limited	2011 (2014)	South Island	Company
Code of Practice for Nutrient Management	Fertilisers Association of New Zealand	2001 (2014)	New Zealand	Third party
Lead With Pride	Synlait Milk Limited	2013	Canterbury	Third party/company

LEAF Marque Global Standard	Linking Environment and Farming	1991 (2008)	International	Third party
Supply Fonterra: Environment Programme	Fonterra Co-operative Group Limited	2012 (2013-14)	New Zealand	Company
Sustainable Dairying: Water Accord	DairyNZ	2003 (2013)	New Zealand	Joint scheme

The study had a regional focus on Canterbury, however the spread of schemes analysed also included New Zealand-wide schemes and one international one (see Table 5.1). Most of the schemes had a nation-wide focus.

In terms of industry focus, the schemes were split 50/50 between being applicable solely to dairy farming, and general agriculture. Of the general agricultural schemes, AsureQuality Organic and BioGro Organic focused on primary producers while LEAF Marque Global Standard and Code of Practice for Nutrient Management included requirements for both horticulture and agriculture.

As stated earlier, the schemes were all voluntary actions taken by the dairy companies. This meant there was no law dictating the implementation of these schemes. However, an important note is the dairy company's schemes were in fact compulsory for all their supply farmers. This meant farmers that supplied to Fonterra and Westland Milk had to meet the requirements of the dairy supply contracts for their respective company in order to have their milk collected. This is a significant point and will be discussed later.

5.2 Evaluation of dairy schemes

Question 2. What are the attributes of voluntary dairy schemes within Canterbury, New Zealand?

Below outlines each of the identified design attributes described in the analysis framework from Methods Section 4.3.2.

Scheme objectives

Scheme objectives were analysed to determine which reflected practice-based objectives and which used out-come objectives. The majority of the schemes' requirements were based around practice-based objectives (Figure 5.1). Lead With Pride was found to have all their requirements in the form of practices. Meanwhile, BioGro had almost half of its requirements as outcome-based objectives.

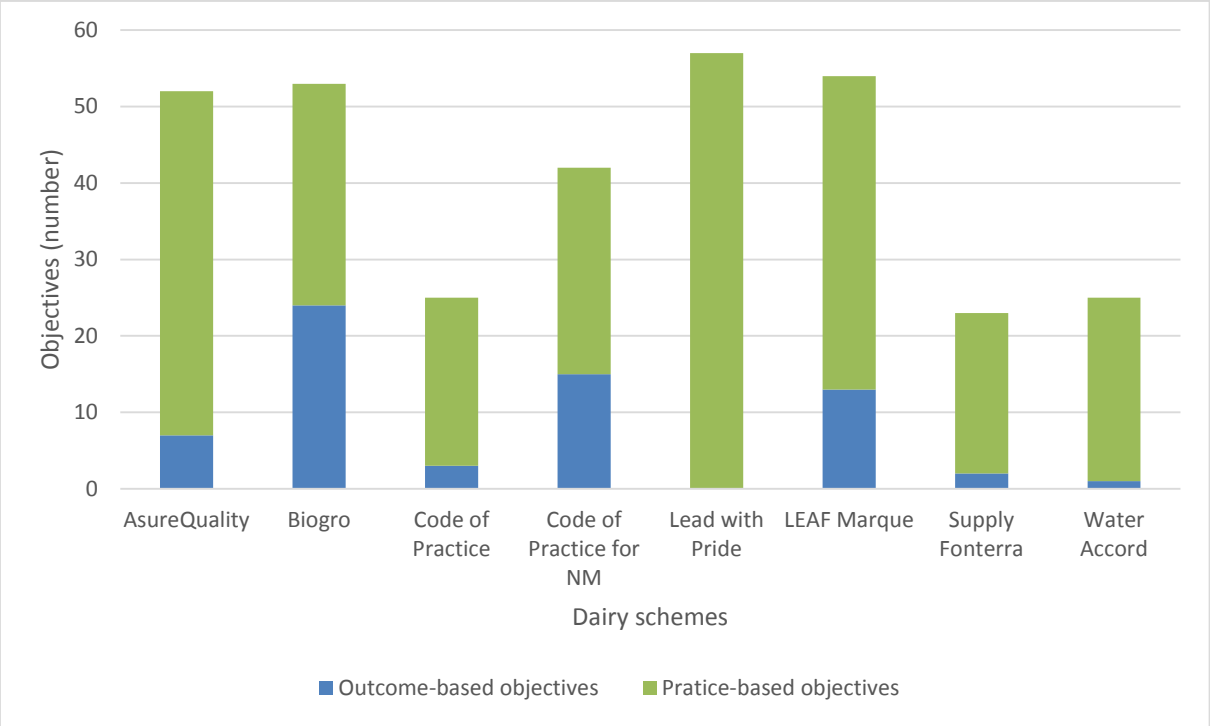

Figure 5.1 Outcome-based vs practice-based objectives referred to in schemes

Compliance with regulations and industry standards

All of the schemes mentioned that regional plans rules (resource consents, local regulations and laws etc.) must be met as a requirement. Overall, four schemes mentioned meeting both general regulatory requirements and industry standards. Three of the eight schemes made reference to meeting regulatory requirements of the RMA. Any specific reference to non-environmental regulations or industry requirements were not included in this table (e.g. Animal Welfare Act).

Table 5.2 References to regulatory and industry compliance

	Regional Rules	Resource Management Act	Regulatory Requirement	Industry Standard
AsureQuality	✓	✓		
BioGro	✓		✓	✓
Code of Practice	✓	✓		✓
CoP for NM	✓	✓	✓	✓
Lead With Pride	✓		✓	✓
LEAF Marque	✓		✓	
Supply Fonterra	✓		✓	✓
Water Accord	✓		✓	

Environmental focus of scheme

Five environmental dimensions were used in the dairy schemes; *Nutrient management, water management, soil management, climate and air quality and biodiversity.* This analysis was used to demonstrate the scope and breadth of environmental aspects addressed in each of the schemes (Figure 5.2). While some schemes such as the LEAF marque covered a wide range of environmental aspects (demonstrated by the colourful band presented in the figure) others had a limited focus such as the Water Accord.

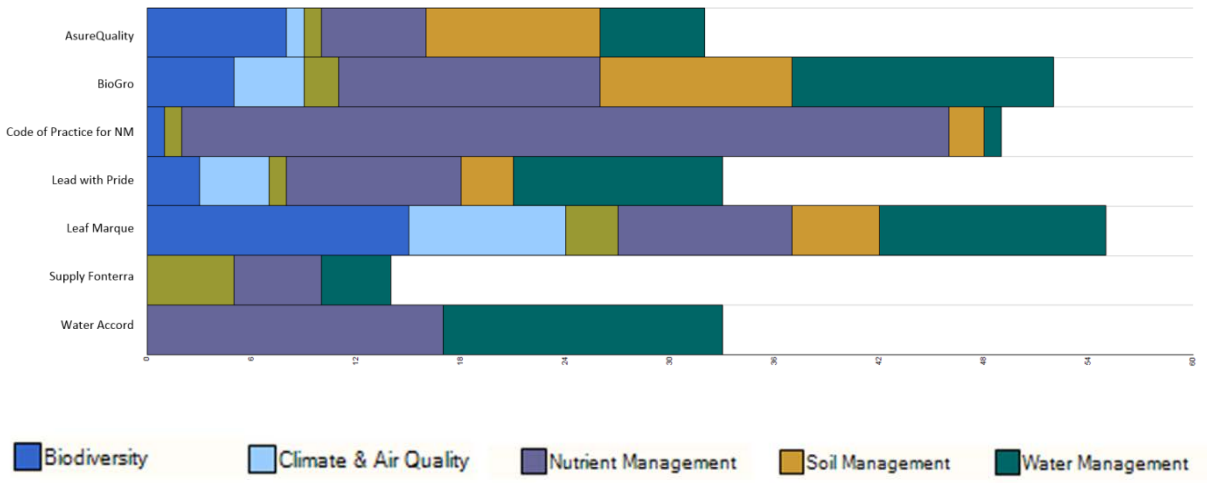

Figure 5.2 Environmental scope of the dairy schemes

Environmental Dimensions

The next section provides a breakdown of all the environmental aspects present in the dairy schemes. The findings are based on the number of occurrences (references coded) in each of the schemes.

Nutrient Management

Nutrient Management was found to be the most widely addressed environmental issue present in the schemes. This factor included fertiliser use, effluent management and general nutrient use management as the main farm requirements. Figure 5.3 demonstrates how the nutrient

management coding was distributed between the various schemes. The most significant source of nutrient management references were from the Code of Practice for Nutrient Management. Following this was the Sustainable Dairying: Water Accord which had the next highest nutrient management coding along with the BioGro Organic scheme. Lead With Pride and LEAF Marque Global Standard included about the same number on nutrient management. Likewise, Supply Fonterra and AsureQuality Organic were similar.

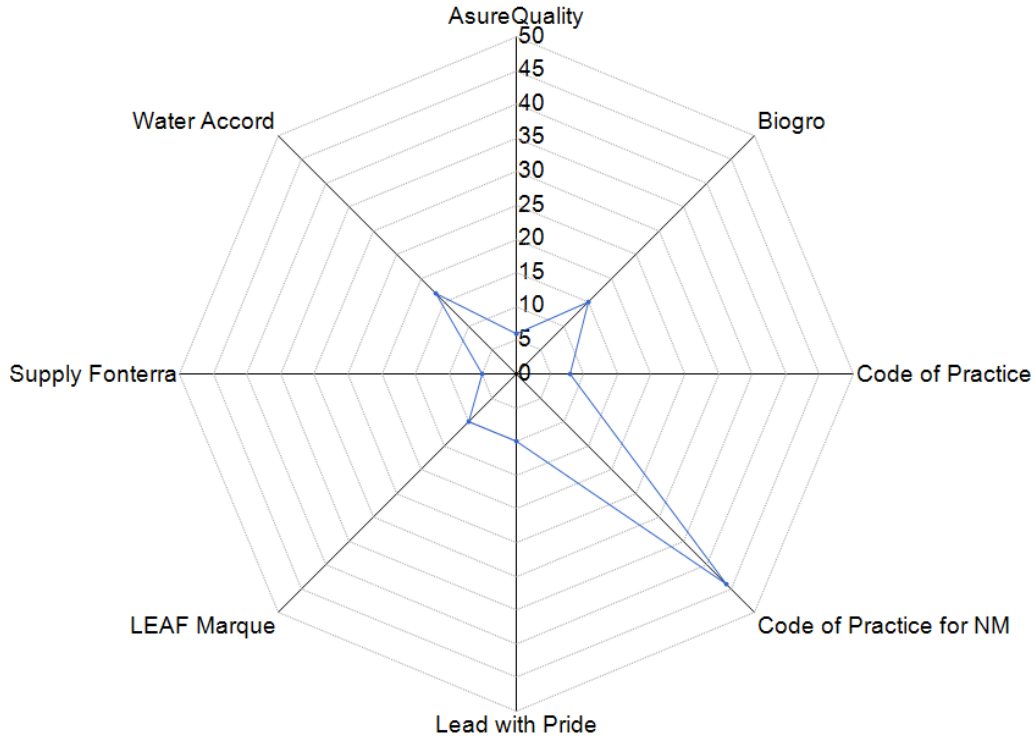

Figure 5.3 Number of Nutrient Management requirements in the dairy schemes

Nutrient Management Practices

The nutrient management aspects were then explored further to reveal what types of practices were included in the schemes. Three distinct practices emerged; effluent management, fertiliser management and general nutrient management which tended to be a combination of the previous two (Table 5.3). Effluent management generally referred to the treatment and disposal of effluent on the farm property. It was also common for requirements to mention the regional council's regulations regarding effluent. All dairy schemes analysed included some form of effluent management practices in their requirements. Fertiliser management mainly included the spreading of fertiliser and doing it in such a way to minimise environmental risk from leaching and excess run-off. These practices were not as common with only half of the schemes including specific requirement to managing fertilisers. And finally, nutrient management practices, which as stated earlier were likely to be a combination of fertiliser and effluent use, were generally in the form of a

nutrient management plan, providing nutrient requirements to plants and minimising environmental damage from nutrient management practices. All schemes were found to include practices that encouraged nutrient management practices that improve environmental outcomes.

Table 5.3 Nutrient Management practices required by the schemes

Nutrient Management	**Effluent Management**	**Fertiliser Management**	**Nutrient Management**
AsureQuality	3	0	4
BioGro	1	6	6
Code of Practice	7	0	1
Code of Practice for NM	1	41	11
Lead With Pride	3	4	3
LEAF Marque	2	2	4
Supply Fonterra	3	0	2
Water Accord	6	0	11

Water Management

Water management included irrigation and the protection of water quality. The water management objectives were coded to show what schemes were addressing this issue (Figure 5.4). As stated earlier this was one of the top issues addressed by the schemes. The scheme with the most references to water management was the Sustainable Dairying: Water Accord. It was no surprise the Accord came out on top given its main aim is to improve water quality outcomes in New Zealand. Next was the BioGro Organic, followed closely by the Lead With Pride and Leaf Marque Global Standard. The Supply Fonterra and Code of Practice for Nutrient Management had significantly less requirements regarding water management.

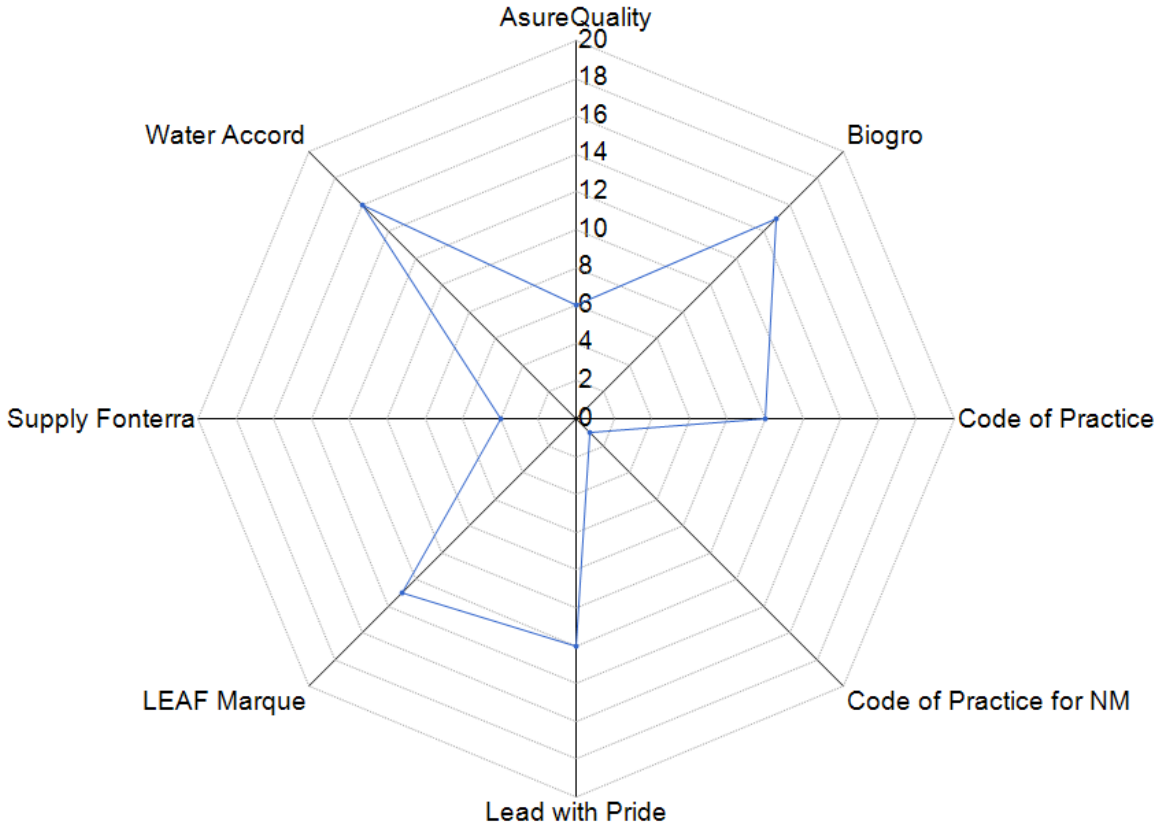

Figure 5.4 Number of Water Management requirements in the dairy schemes

Water Management Practices

The next table provides a breakdown of the water management practices that were identified in the dairy schemes (Table 5.4). Water quality included references to improving the state of water quality, reducing pollution and minimising risks to waterways. These tended to be outcome-based requirements as described earlier. Even though water quality will likely involve the other aspects from the table, it was analysed separately to show how many of the schemes used the term 'water quality' rather than using specific practices. All the dairy schemes included requirements regarding water quality. Water efficiency related to irrigation practices, specifically to ensuring water from irrigation was used in the most efficient way. Five dairy schemes included requirements about water efficiency. Stock exclusion and fencing referred to any requirements regarding excluding stock from waterways or in form of fencing to prevent stock from accessing waterways. Half of the schemes included some requirement to exclude stock or use riparian management which generally involved undertaking riparian planting and the development of riparian management plans. Four schemes included stock crossings, which refers to methods including culverts or bridges that can provide crossing points for stock that protect water quality.

Table 5.4 Water Management practices required by the dairy schemes

Water Management	**Water quality**	**Water efficiency**	**Stock exclusion and Fencing**	**Riparian management**	**Stock crossings**
AsureQuality	6	0	0	0	0
BioGro	11	5	1	1	0
Code of Practice	1	3	2	3	1
Code of Practice for NM	1	0	0	0	0
Lead With Pride	1	10	1	0	1
LEAF Marque	9	3	0	0	0
Supply Fonterra	2	0	2	1	1
Water Accord	1	6	3	4	2

Soil Management

Soil management requirements were analysed as part of this study. These included; the protection of soil from erosion, increasing soil biological activity, soil fertility and health and preventing any pollution to soils (Figure 5.5). The organic schemes, AsureQuality and BioGro, included the most requirements regarding soil management. LEAF Marque Global Standard, Lead With Pride and Code of Practice for Nutrient Management included a few soil requirements. Sustainable Dairying: Water Accord, Supply Fonterra – Environment Programme and Code of Practice did not make any reference to soil management practices.

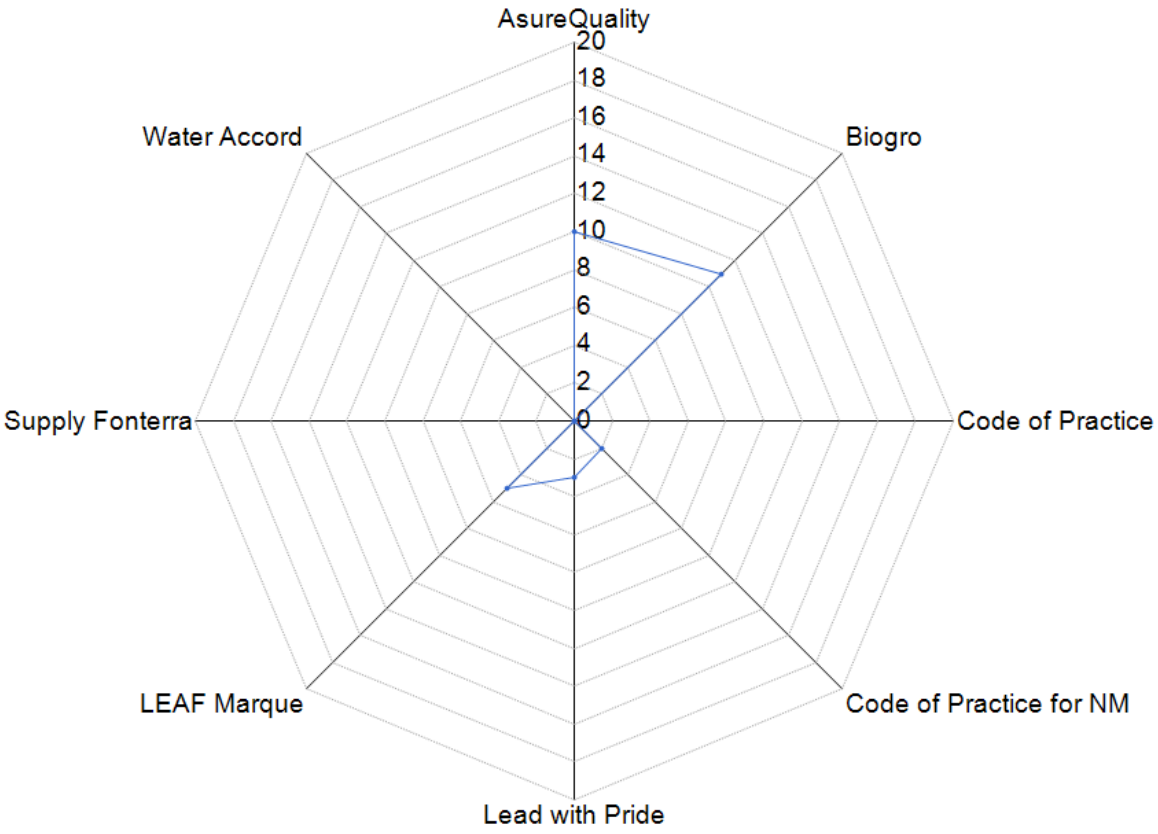

Figure 5.5 Number of Soil Management requirements in the dairy schemes

Soil Management Practices

Soil management results were then explored further to identify individual practices to reflect what soil requirements were covered in the schemes (Table 5.5). All the schemes that identified soil management included increasing fertility, soil biological activity, organic matter and overall general health. Erosion and soil structure referred to practices encouraging farmers to consider soil types that may be vulnerable to structural damage and to adjust stocking accordingly to reduce compaction. And finally, pollution to soil referred to reducing contaminants to the soil itself.

Table 5.5 Soil Management practices required by the dairy schemes

Soil Management	**Maintenance of soil health**	**Erosion and soil structure**	**Pollution to soil**
AsureQuality	7	2	3
BioGro	9	5	1
CoP for Nutrient Management	2	0	0
Lead With Pride	3	0	0
LEAF Marque	1	3	1

Air Quality and Climate

Air quality and climate was in this study, and was particularly relevant given today's focus on this issue. Requirements that were coded included any reference to GHG releases, energy usage and potential air pollution (Figure 5.6). NVivo 10 analysis shows LEAF Marque Global Standard covered these aspects far more than any of the other schemes. BioGro and Code of Practice for Nutrient Management did include a few requirements in their schemes. Sustainable Dairying: Water Accord, Code of Practice, Supply Fonterra – Environment Programme and the Code of Practice for Nutrient Management did not include any of the above aspects.

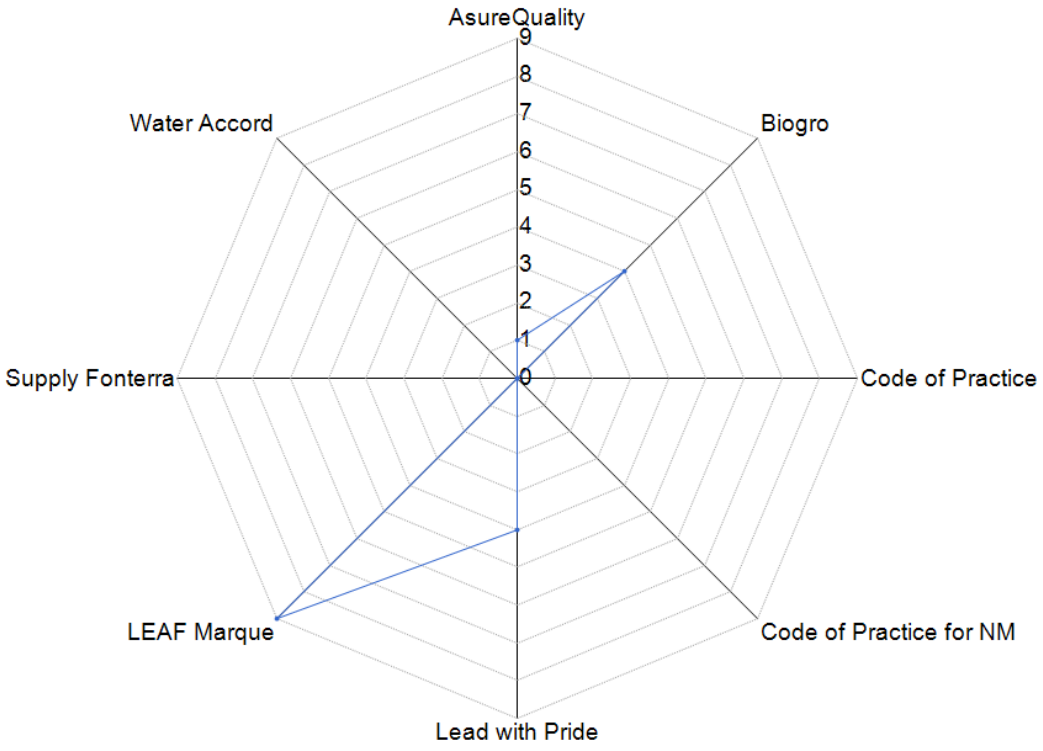

Figure 5.6 Number of Air Quality and Climate requirements in the dairy schemes

Air Quality and Climate Practices

A further assessment was done to provide a better picture of the practices recommended to improve air quality and climate. The statements that were coded were then further separated into four categories; energy use and efficiency, pollution to air, CO_2 emissions and fuel storage (Table 5.6). Practices that were covered under energy usage and efficiency were in regards to monitoring and checking energy consumption. Practices to reduce consumption were encouraged and expected for BioGro, Lead With Pride and LEAF Marque Global Standard. The use of more energy efficient technology was also included in the LEAF Marque Global Standard. A reduction in pollution to air was also a common requirement. The focus was on contamination and releases to air, but practices to mitigate this specifically were not included. LEAF Marque Global Standard also went a step further and required its farmers to translate their energy usage into actual CO_2 emissions to track them. Lead With Pride and LEAF Marque Global Standard also required farmers to ensure their fuel was stored and secured adequately.

Table 5.6 Climate and Air Quality Practices required by the schemes

Climate and Air Quality	**Energy usage and efficiency**	**Pollution to Air**	**CO_2 Emissions**	**Fuel Storage**
AsureQuality	0	1	0	0
BioGro	2	2	0	0
Lead With Pride	2	1	0	1
LEAF Marque	6	0	1	1

Biodiversity

Biodiversity referred to maintenance of diversity on the farm through the protection of habitats and wetlands. The schemes were analysed in terms what extent they included requirements based on biodiversity aspects (Figure 5.7). The LEAF Marque Global Standard included significantly more requirements regarding biodiversity. The organic schemes, AsureQuality and BioGro, included some biodiversity practices along with the Lead With Pride. Code of Practice for Nutrient Management had one requirement while the remainder did not include this aspect.

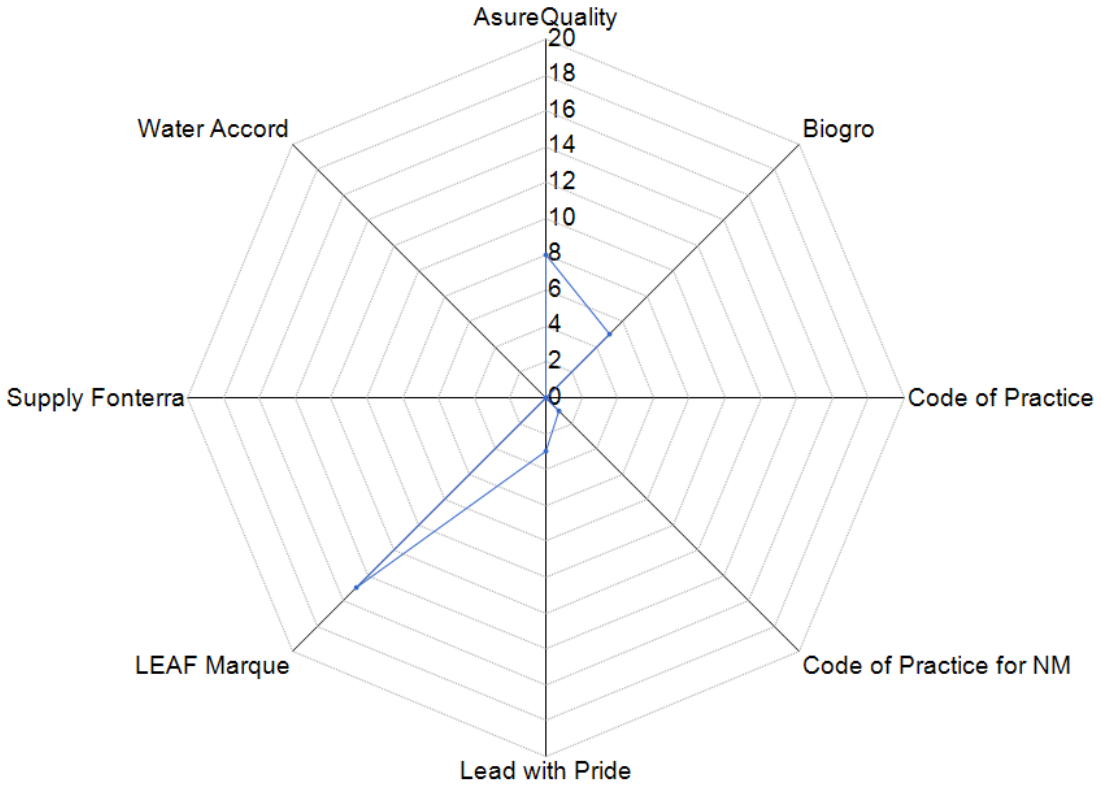

Figure 5.7 Number of Biodiversity requirements in the dairy schemes

Biodiversity Practices

The aspects of biodiversity were broken down further to demonstrate the types of farms practices that were recommended for biodiversity management (Table 5.7). The most common method to enhance biodiversity was through the maintenance of any forests, habitats and ecosystems present on the farmers property. Forest clearance was restricted in the many of the schemes. Any wildlife habitats had to be either protected or created to encourage different species on the property. Practices for protection included managing pests, using shelter belts and weeds and also minimising contamination from fertilisers and sprays. AsureQuality also required its certified farmers to ensure there was a diversity of plants produced and minimum crop rotations were used. Diversity also extended to animals and AsureQuality recommended using a wide biological diversity and selecting breeds that could adopt to local conditions. LEAF Marque Global Standard required its farmers to monitoring the flora and fauna present on their property to check for any issues or demonstrate any improvements. Monitoring records were checked for this requirement. Native vegetation was mentioned in two schemes, Lead With Pride and LEAF Marque Global Standard, and included using native vegetation for the creation of habitats and the preservation of native areas.

Table 5.7 Biodiversity practices required by the schemes

Biodiversity	Maintenance of forest, habitats and ecosystems	Diversity in production	Monitoring or flora / fauna	Protection of native vegetation
AsureQuality	4	3	0	0
BioGro	4	0	0	0
Code of Practice for NM	1	0	0	0
Lead With Pride	1	0	0	1
LEAF Marque	13	0	1	1

Monitoring and Measurement of the Schemes

The schemes were coded to what type of monitoring mechanism they used to assess the farmer's performance (5.8). All the dairy schemes mentioned what type of assessment is required for the scheme. Five schemes have adopted a third party to audit the scheme's requirements.

Table 5.8 Monitoring mechanisms used for each of the dairy schemes

Monitoring	First-Party Monitoring	Second-Party Monitoring	Third-Party Monitoring
AsureQuality	✓		✓
BioGro	✓		✓
Code of Practice		✓	
Code of Practice for Nutrient Management	✓		
Lead With Pride			✓
LEAF Marque	✓		✓
Supply Fonterra	✓	✓	
Water Accord		✓	✓

First-Party Monitoring

First-party monitoring refers to any assessment mentioned in the scheme that the farmers must undertake themselves with no outside party being involved. For example, some farmers were expected to list goals they wanted to meet and then to use self-assessment tools to test if these goals had been met. First-party auditing may also include any contamination testing that the farmer may have to undertake. In some cases the self-assessment could be used as an initial assessment before the actual audit was performed. BioGro, in its scheme, recommended the use of a self-audit to prepare for the actual audit. In addition the Organic Management Plan that BioGro requires its farmers to implement, must also include ways in which the farmer plans to monitor the possible environmental issues. The Code of Practice for Nutrient Management highlights the Nutrient Management Plan that should be developed must be followed rather than be treated as additional

paperwork. It involves the farmer and the staff members checking planned activities went ahead and the desired outcomes were achieved. Finally LEAF Marque Global Standard required its farmers to complete a LEAF self-assessment every year and to then upload the data to the LEAF database. This allowed farmers to measure their performance against other farmers. Similarly, Fonterra required its farmers to record information relating to nutrient management so it could be modelled and compared with the rest of the suppliers. The main finding was that first-party auditing was generally in association with the preparation and implementation of a plan that was required as part of the scheme. These plans were generally left to the farmers to check and monitor themselves.

Second-Party Monitoring

Second-party monitoring occurred when the scheme organisation was the party involved with the auditing and monitoring of the scheme. This differs from third-party auditing in that the auditor does not have a direct connection to the scheme organisations. Issues with this will be discussed later. Even though AsureQuality and BioGro technically oversee their organic programmes used in this study, they were treated as third parties as they are both accredited to certify products and processes by external organisations and have no relationship to dairy farmers like in the case of the dairy companies. In the case of Westland Dairy, suppliers were monitored by the company as well as also Regional Councils. Farm assessments by Westland Milk were conducted annually, which included checks for compliance with the Code of Practice and any relevant farm records. The requirements in the Supply Fonterra: Environment Programme are assessed during their annual Farm Dairy and Environmental Assessment. As previously mentioned, Fonterra suppliers were required to provide nutrient management information to Fonterra for benchmarking purposes. In addition to this, Fonterra also states it will audit a sample of farms to ensure these results are accurate. As part of the Sustainable Dairying: Water Accord, dairy companies and DairyNZ are required to monitor and report on various requirements outlined in the Accord. Overall, the schemes audited by a second party were the schemes created by the dairy companies (excluding Synlait) and they were the ones undertaking the monitoring to ensure compliance with their scheme.

Third-Party Monitoring

Finally schemes were coded according to whether they involved a third party in the auditing. This is where an outside organisation (or accredited organisation) has been nominated to undertake the audit and report the results. Lead With Pride is audited to the ISO 65 standard that is granted by JAS-ANZ. JAS-ANZ then accredits AsureQuality who then conduct the audits for the Lead With Pride scheme. In the case of the Sustainable Dairying: Water Accord, the scheme itself is not audited, but the final results are checked by a third party to check the practices used for data collection and reliability of the sample by verifying the reported information. For the organic schemes, both AsureQuality and BioGro audit their farms on an annual basis. In addition, AsureQuality certified

farmers are inspected if they are organically rearing livestock. The documents did not state whether these audits would be predetermined or conducted randomly on the spot. Of the eight schemes, half of them have a certification label as part of the third party audit. Only if the farm passes these audits, can it be granted the associated labels. These labels can then be displayed on the products (as they are) and also provide traceability through the supply chain if the product is a portion of the final product for consumption.

Incentives and Support

Direct and Indirect Incentives

Direct and indirect incentives were identified within the schemes (Table 5.9). Direct incentives were benefits that had a direct impact on the farmer themselves. This could be in the form of positive incentives, such as incentive payments, increases in productivity and increases in efficiency. Negative incentives were also included, such as penalties and fines that could be imposed if the requirements were not met. The Lead With Pride scheme included incentive payments in the form of premium payments to their farmers that successfully met the standards of the scheme. As both the Supply Fonterra - Environment Programme and Westland's Code of Practice are both compulsory for their respective supply farmers, they provided incentives for meeting the requirements through the use of fines and penalties. For example, if a Fonterra supplier is not compliant with the standard they may bear additional costs to ensure they reach the minimum standard required. For the case of Westland's Code of Practice, its farmers face a penalty if they do not remedy corrective action. For both schemes, farmers risk having their milk refused to be collected as a last resort. Indirect incentives were benefits that could potentially impact the farmer. These included the dairy industry reputation, access to export markets and respect from the community. The Lead With Pride scheme focuses on the indirect benefit associated with consumer demand through product differentiation (improved food safety and sustainability). Supply Fonterra mentions the acceptance of their product to overseas markets and meeting consumer demands.

Table 5.9 Use of incentives and support in the schemes

Incentives and Support	**Direct Incentives**	**Indirect Incentives**	**Support**
BioGro	0	0	3
Code of Practice	4	0	3
Code of Practice for Nutrient Management	0	0	2
Lead With Pride	12	5	4
Supply Fonterra	3	2	8
Water Accord	0	0	1

Support

Support was also included to highlight the different ways the schemes support farmers in meeting outcomes. The most common type of support was in the form of services that were provided to the farmers. For example, advisors could be used to assist farmers in preparing plans to ensure requirements were met. Other schemes made recommendations of contacts in the industry who could assist.

The dairy companies placed a strong emphasis on providing support to their farmers. Below provides a comparison of the statements made regarding support provided by the programmes:

Fonterra's Supply Fonterra states;

> *"Fonterra will ensure you are well supported to continuously improve the environmental outcomes on your farm; and undertake assessments to ensure that the minimum requirements are being achieved"*

Synalit's Lead With Pride states;

> *"The Lead With Pride team will help you to prepare and once they feel confident you will pass they will put you forward for the audit."*

Westland's Code of Practice states;

> *"Westland will assist Suppliers to develop a riparian management plan for any new conversions."*

Communication

Farmer communication refers to the communication between farmers and other farmers. Three of the schemes included this (Table 5.10). There was some information sharing within Supply Fonterra and the Sustainable Dairying: Water Accord surrounding nutrient efficiency performance. The Accord requires data from all dairy farmers to be collected and modelling to show nitrogen losses and conversion efficiencies. The data will then be collated and reported alongside the rest of the peer group and suppliers. This gives farmers an idea on how their farm is performing in comparison to others. As this is a requirement of the Sustainable Dairying: Water Accord, Fonterra have required all their farmers to supply data in their Supply Fonterra: Environment Programme. Public communication refers to how the schemes progress is communicated to the public and wider community. For this study, the main methods of communicating to the public were through the use of a label on products demonstrating the adoption of an organic or sustainable certification. The schemes that also had labels as part of their scheme were AsureQuality, BioGro, Lead With Pride and LEAF Marque Global Standard.

Table 5.10 Schemes that communicated to other parties

Communication	Farmers	Public	Scheme	Stakeholders
AsureQuality		✓		
BioGro		✓		
Code of Practice	✓			
Lead With Pride		✓		
LEAF Marque		✓		✓
Supply Fonterra	✓		✓	
Water Accord	✓		✓	✓

Stakeholder communication refers to how the farmer's progress is communicated to the scheme coordinator. Two schemes required its farmers to submit information to the coordinator. The Sustainable Dairying: Water Accord required the dairy companies to monitor and report progress on the given targets. As part of the Accord, Fonterra was required to collect N efficiency data from its supply farmers so it has a requirement to reflect this in its schemes. Finally, stakeholder communication refers to how the progress is reported to relevant stakeholders. In the case of LEAF Marque it requires farmers to communicate their environmental policy to their suppliers and contractors to ensure they are aware so they can help them with achieving the objectives of the schemes. Sustainable Dairying: Water Accord also has a requirement to have an annual meeting with accountable and supporting partners to address any issues with the Accord and its implementation. We found that there was no government communication mentioned in the schemes

Involvement

Stakeholder involvement referred to the inclusion of external stakeholders in the development of the scheme (Table 5.11). The LEAF Marque Global Standard was developed with organisations such as the Farming Wildlife Advisory Group, United Kingdom Accreditation Services and Natural England. These, plus more stakeholder groups, formed the technical advisory committee that was part of the development reviewing of the schemes. In a similar style, the Sustainable Dairying: Water Accord was developed by the Dairy Environment Leadership Group. This group included representatives from the dairy sector, government, iwi and the New Zealand Fish and Game Council. The Accord also went a step further and allocated responsibilities to various stakeholder groups to ensure the targets for the Accord were met. The second group that was found to be included in the development of these schemes was the government. In the LEAF Marque Global Standard the technical advisory committee were government representatives such as the Department of Environment, Farming and Rural Affairs and the Environment Agency. As stated earlier, the Accord included government representatives from central government and regional councils.

Table 5.11 Schemes that involved other parties

Involvement	Government	Stakeholders
LEAF Marque	✓	✓
Water Accord	✓	✓

5.3 Dairy Scheme Score System

Question 3. How do the dairy schemes compare terms of an effective scheme design?

Using the score system outlined in Methods Section 4.4.3 each of the schemes could be compared. The colour bands represent how well that particular scheme performed for each category analysed (Figure 5.9). Lead With Pride came out on top as it performed the best for most of the categories Followed closely behind was the BioGro organic scheme.

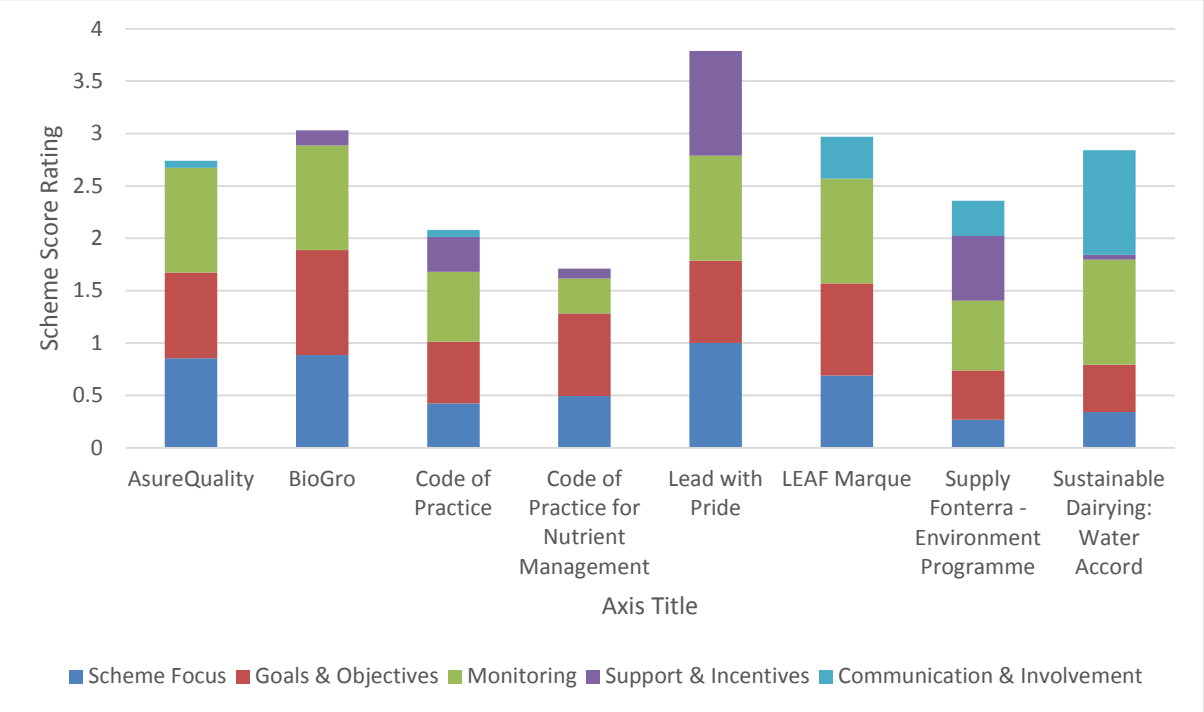

Figure 5.8 Dairy scheme rating in regard to five design categories

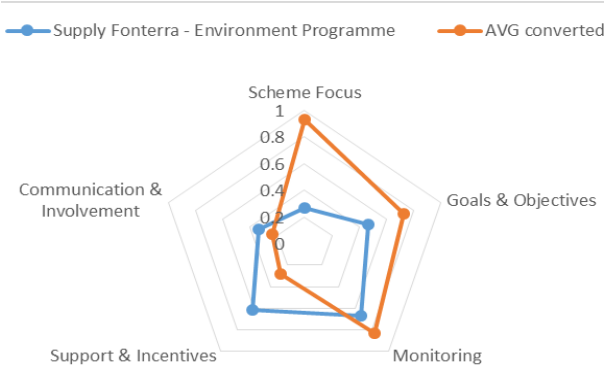

Figure 5.8 Scheme score rating for Supply Fonterra and overall average

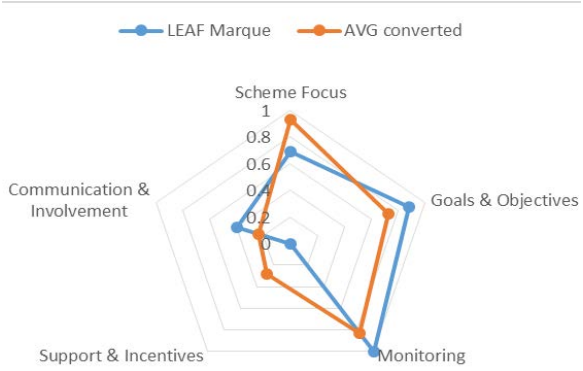

Figure 5.10 Scheme score rating for LEAF Marque and overall average

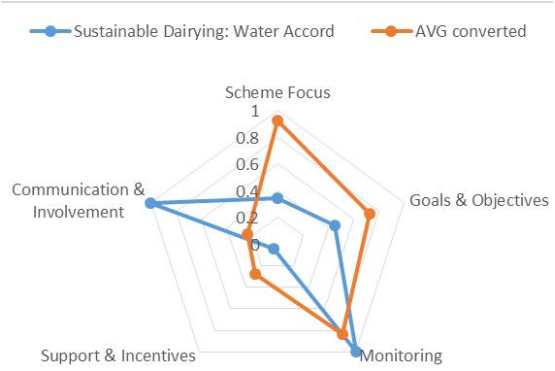

Figure 5.11 Scheme score rating for Water Accord and overall average

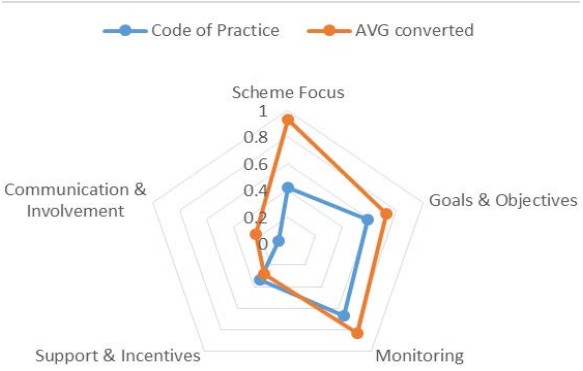

Figure 5.12 Scheme score rating for Code of Practice and overall average

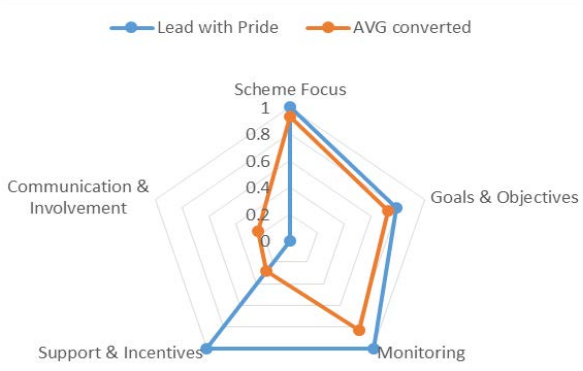

Figure 5.13 Scheme score rating for Lead With Pride and overall average

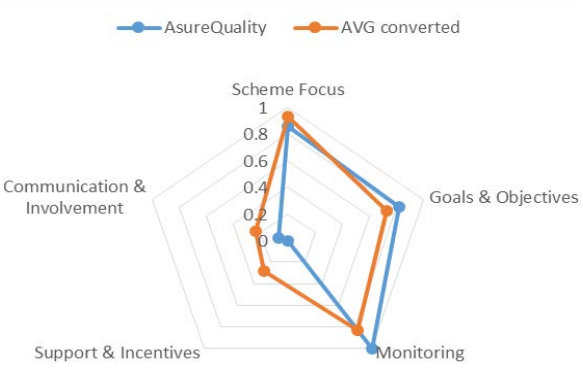

Figure 5.14 Scheme score rating for AsureQuality and overall average

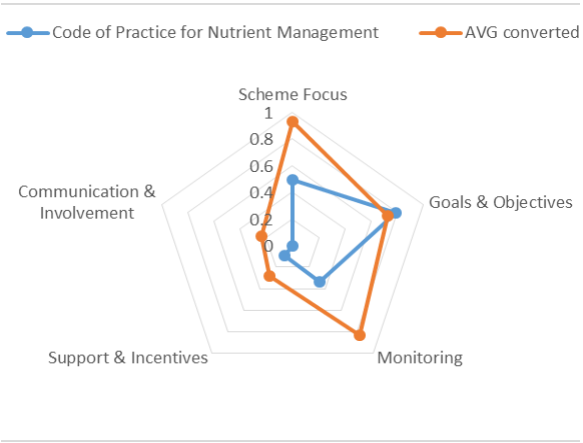

Figure 5.15 Scheme score rating for CoP for nutrient management and overall average

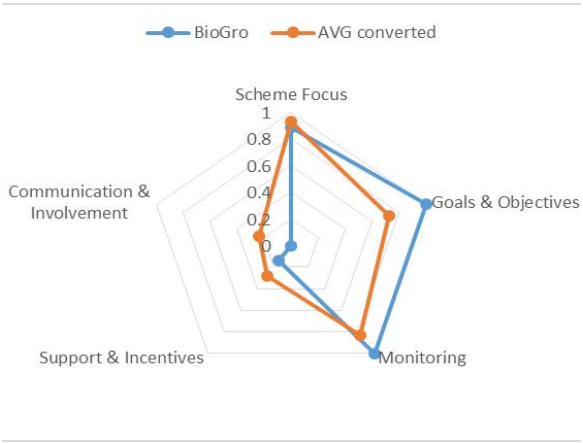

Figure 5.16 Scheme score rating for BioGro and overall average

Schemes were then compared to the total average (orange lines) for all the schemes (Figure 5.9-5.16). This made it clear which schemes performed above average for each of the design attributes. It also demonstrates the strengths and weaknesses for each of the dairy schemes. AsureQuality performed close to the average with slightly better monitoring mechanisms in place (Figure 5.14). BioGro also did slightly better in the monitoring aspects and was rated highly in terms of the goals and objectives used (Figure 5.16). Communication and involvement could be enhanced for these schemes. Code of Practice fell below the average rating of the schemes for most of the attributes however it did offer support and incentives on par with the average (Figure 5.12). Major improvements that could be made are the scope of the scheme focus to address more environmental issues.

Code of Practice for Nutrient Management was unsuccessful in meeting the average for most of the attributes however slightly exceeded the averaging terms of goals and objectives (Figure 5.15). Improvements for this scheme could be an official third party for the scheme. Supply Fonterra – Environment Programme performed well by providing some communication and involvement mechanisms and support and incentives (5.9). However the inclusion of a third party for monitoring and an increase in scope of issues addressed would enhance the scheme's design.

LEAF Marque Global Standard performed better in the number of goals and objectives, monitoring and communication and involvement (Figure 5.10). However more incentives and support could have been utilised for this scheme. Finally the Lead With Pride performed well with their goals and objectives, monitoring and support incentives (Figure 5.13). More communication and external involvement could be incorporated into this scheme.

Chapter 6

Discussion

This chapter discusses the findings for the design of voluntary dairy schemes in Canterbury, New Zealand. Section 6.1 discusses the implication of the voluntary scheme design for the dairy industry in Canterbury. Section 6.2 outlines the barriers for implementation and the environmental focus of the schemes. Finally 6.3 discusses the need for more verification, certification and communication in the dairy industry.

6.1 Scheme Design in the Canterbury Dairy Industry

The schemes used in this study were not refined to one single region but represented a selection of local, national and international programmes. The literature argues that there are benefits and disadvantages for both local and broader geographical scope schemes. Local schemes have the benefit on addressing specific issues to the region however their applicability in other regions may be limited due to differences in climate, faming style and council regulations. On the other hand, other schemes that may be implemented at a national or even an international level lack the specificity to actually effectively address specific environmental issues due to their wide scope. The study identified that most dairy schemes had been designed at a national (New Zealand) level. So they are likely to reflect issues and practices reflective of the New Zealand dairying environment, however each catchment can have different issues to the next. Reflecting on the schemes used in this study, it became clear very quickly how many were focused on specific practices and allowed little flexibility to the dairy farmers. For example the organic schemes can be seen as a very prescriptive scheme as opposed to the LEAF Marque which outlines more outcome based requirements and allows farmers to measure their performance.

Objectives were evaluated in terms of whether they were practice-based or outcome-based. Both were found to have their advantages and disadvantages. Practice-based provided clear and specific practices that were required. Making it obvious to farmers and easier for the auditors to check during monitoring. However the main limitation is measuring the environmental improvements that are a result of the practice. It is one thing this to adopt the practice, but the weakness lies where it does not include provisions to measure the results. On the other-hand outcome-based objectives state the desirable outcome providing an end outcome and leave the in between (i.e. practices) for the farmers to decide. This provides greater flexibility for the farmer and allows them to adapt to local conditions. Which in itself can provide significant benefits to the farmer and the environment through reduced costs and better focus on the issues in particular that need to be addressed. The

majority of the schemes had taken a practice-based approach which was no surprise given that practices are generally easier to implement, communicate to farmers and to measure through audits. However some of the schemes were found to include elements of outcome-based objectives focused on environmental improvements. In light of this, a mixture of the two is probably a logical and effective way to go to ensure practices can be measured accurately and easily while actually aiming for specific environmental outcomes.

Most of the schemes specifically addressed practices to dairy farming. Half of the schemes that were not solely designed for dairy farmers did provide some specific requirements for dairy producers however most requirements were laid out for all producers. It was interesting to find that the either type of scheme did not do significantly better than the other with both present at carrying levels in the rankings.

The study addresses the schemes that have been voluntary adopted by the dairy industry. However not all are voluntary at the farming level. Westland Milk and Fonterra have adopted their environment programmes in their supply contracts which mean that a farmer must meet the programme's requirements in order to supply the milk produced to the company. As all farmers have to meet the standard, they generally have to be set in a way to ensure all farmers can successfully meet the requirements. There is also the issue of the company being a farmers' cooperative which means the company itself loses some power to implement stricter rules in that respect. While participation from this approach can be relatively high, the risk of a lower environmental outcome is much higher. While this issue is not directly addressed or measured in this thesis, it is an important point to remember when looking at successful environmental programmes. Alberini & Sergerson (2002) found that less stringent voluntary schemes had higher participation but less improvement to the environment. On the other hand more stringent schemes had a much lower participation level and higher environmental improvements (ibid). Neither presents the perfect case but a combination of both is most ideal as the more people participating and mitigating the environmental impact the better off the environment is.

Synlait on the other hand, had additionally created a scheme that could be voluntarily adopted by their supply farmers. Only farmers who were willing and able to meet the requirements of the scheme did so. Reflecting on this it becomes clear that the scheme is there to 'reward' farmers performing well, rather than lifting the performance of the rest. Rosin (2008) found that organic farmers saw the price premium from organics as an incentive to certify their current level of practice rather than adopting new practices. Within the scheme there are two certification 'tiers'. This approach provides farmers with different levels to achieve. It recognises and rewards farmers adopting best practices and those achieving excellence in farming practices. Farmers sitting at the

best practice level may then be motivated to reach the excellence level to gain even higher milk premiums. Any future scheme would be wise to adopt a tiered approach as it provides a chance for different levels of performance to be achieved.

Compliance with regulation and industry standards was found to be an important element in these schemes. Given the negative attention of non-compliant farmers in the media, it was no surprise that there was a clear emphasis on meeting regulations as a condition of the scheme (Young, 2013). Regional Council regulation is the most relevant legal regulation required by dairy farmers and this was demonstrated by all schemes making at least one reference to meeting regional rules. Canterbury does not currently have a great track record in terms of full compliance with regional rules. At this time just over 70 per cent of dairy farmers in the region were found to be fully compliant (ECan, 2012-2013). The remaining had either minor or major non-compliance issues which are of concern as they pose a potential higher risk to the environment. Environment Canterbury has been proactive in supporting farmers to meet rules by providing them with clear guidance on how to address their non-compliance issues. Industry standards were also mentioned in many of the schemes however none of them specified which standards specifically. It became obvious, in particular the dairy supply contract schemes, that the requirements were largely based around regulations already in place. However there could be many reasons for this including ensuring all farmers are compliant with rules, improving company and industry image and the occurrence of varying dairy rules around the country. The inclusion of legal regulations demonstrates how the dairy companies have taken on the responsibility of ensuring their farmers achieve minimum compliance.

In order for a scheme to be successful it makes sense the participant is rewarded for their efforts (Alberini & Segerson, 2002). The lack of incentives provided for the schemes was surprising. However as stated in the results the limitation of the finding was that the standards themselves were the only document analysed. Other benefits made have not been included as part of the scheme however it is likely that core benefits should be outlined if indeed the requirements are all met.

Incentives also fall under the category of disincentives which was in the form of fines and penalties is there is not full compliance with the requirements. As the Fonterra and Westland supply contracts were compulsory for all supply farmers, fines were used as a method to ensure compliance. For Fonterra suppliers, the penalties started off with a standard $200 fee to cover a farm visit by a Fonterra representative, all the way through to milk collection being rejected by the company. Westland took a slightly different approach with an increasing penalty (%) per collection depending on how many visits were needed. Once the remedial action has been completed the penalty can be refunded. Westland also included refusal of milk as a last resort. It was excellent to see that instead of giving out one-off fines, Fonterra also included a method to ensure the incident would not be

repeated. This was done through the use of sustainable dairying advisors and environmental improvement plans. The plans were created to specifically address the area of non-compliance and create a method of reaching compliance. This overcomes the issue of farmers paying the fines instead of fixing the problem. Although not measured in this study, the type of support will likely increase the successfulness of schemes improving environmental outcomes.

Following the literature review it became clear that a baseline needs to be established to successfully measure if a scheme has been successful (EEA, 1997; Jimenez, 2007). This provides a business-as-usual picture before the implementation of the scheme (OCED, 1998). For example determining the level of environmental quality without the scheme (Alberini & Sergerson, 2002). Issues around this can arise if schemes are implemented in conjunction with other environmental policies so it can be difficult to determine what caused the improvement if any (Blackman *et al.*, 2012). Past studies have indicated the lack of baselines in voluntary approaches (Paton, 2000). This study revealed a very similar finding with no apparent baseline set as part of these schemes. This judgement is based on the fact that there was no reference to such a baseline in existence, provisions for the farmers to provide a baseline initially and finally scheme requirements to monitor environmental indicators which are consistent with the baseline. In order to measure whether the scheme has been successful a baseline provides proof of improvement to the environment. Other methods that have been used include levels of participation which can be misleading if the environmental requirements are not stringent enough to make environmental improvements (Alberini & Sergerson, 2002).

A limitation of this study was that it did not measure the level of participation in these schemes. This is an important factor in measuring the actual effectiveness of the scheme (Praksah & Potoski etc). However drawing on previous research by Agricultural Research Group on Sustainability (ARGOS) we can get a picture on adoption of some of these schemes. A survey by ARGOS in 2012 found that over a quarter of farmers surveyed are using the Code of Practice for Nutrient Use. BioGro was the top organic standard used with half of organic farmers adopting it. Closely in second was AsureQuality on 38 per cent.

6.2 Addressing Environmental Issues in the Dairy Industry

Dairy farming is, and still remains one of New Zealand's key industry's providing jobs, rural income and export revenues. As highlighted in Chapter 2 the environmental impacts of dairy farming are too serious to ignore. The Government has a target to double the value of agricultural exports by 2025 (National Website, 2014). The two main ways of going about this is to either double production or increase the overall value of the product. As Dr Jan Wright states in the Parliamentary Commissioner

for the Environment report, Water Quality in New Zealand, "*New Zealand does face a classic economy versus environmental dilemma*" (PCE, 2013). New Zealand has appeared to taken the increased production approach with the intensification of dairy farms and this can be seen with the surge of irrigation schemes around the country. One of the expected outcomes of this research was to provide the current context on what the dairy industry is doing to improve environmental outcomes outside of regulation.

There are many challenges that dairy farmers face when adopting an environmental schemes. These include the potential conflict with production, cost of implementation, lack of incentives and the low-cost production orientation to meet market demands. Other factors include relatively low income, high debt levels, sharemilking structure can limit decisions, availability of labour and views on the future of the farm itself (Jay & Morad, 2005). While these can be barriers to the uptake of environmental schemes, this has clearly not prevented the development and implementation of schemes as demonstrated by this study. However, these challenges should not be ignored and should form an integral part of scheme development.

Best-practice schemes have been found to have a greater impact on farmers' environmental orientation in comparison to government regulation. Fairweather (2009) found that environmental standards are becoming more 'normalised' in the farming sector and producers are becoming more receptive to adopting them. This a good sign for the use of these schemes into the future. However dairying poses a unique situation where the quality of the product is associated with *"tangible characteristics of the end-product"* rather than the systems of production used (Rosin, 2008, pg. 50).

An issue that any scheme developed needs to contend with is that scepticism will always be present if the requirements are in conflict with production values of farming (Rosin, 2008). This is due to the existing 'spirit of farming' in the New Zealand dairy sector (ibid). High production is directly linked to the perceived success of a dairy farmer and they are judged accordingly (Jay, 2007). The dairy sector has often been compared to the kiwifruit sector to demonstrate the different approaches taken by each industry (Rosin, 2008; PCE, 2004). It had been found that the kiwifruit sector has taken the high value approach while dairying has focused on the high volume approach (PCE, 2004). Both are methods are successful in increasing production earnings.

As this study was based around the environmental schemes in the dairy industry, it was fitting that the environmental issues explored further in these schemes. The study resulted in five key environmental aspects which were nutrient management, soil management, water management, biodiversity and climate & air quality. Nutrient and water management came out on top as the main environmental aspects that were addressed in the schemes. This finding is in line with Jay (2007) that stated the "*narrow focus on water quality and pasture management*" has come about from political

pressure (pg. 266). Jay (2007) argues that the dairy industry has taken a 'productivist view' of environmental issues and therefore the environment is viewed as a resource to benefit production. For example, nutrient management and soil production for pasture growth rather than improved environmental outcomes. While this means improvements can be made as there is financial benefits, other issues such as biodiversity, have therefore missed out on the debate. This view can also cause issues when solutions come from one single environmental aspect rather than looking at the whole farm ecosystem.

Nutrient and water management have received considerable attention in the last decade, not only in the media but in research reports and new environmental regulations both at a national level and regional level (PCE, 2013). Scientific research has demonstrated the declining water quality around the country which has prompted action to address this issue (Blackett & Le Heron, 2008). Core practices have been adopted to ensure water resources are protected. This was witnessed initially by the Water Accord in 2003 and has since continued in the Sustainable Dairying: Water Accord which was used in this study. The practices include excluding dairy cows from waterways, to bridge or culvert stock crossings and using efficient and effective systems for managing dairy shed effluent. With the help of tools such as OVERSEER™, dairy farmers can monitor there nutrient use which not only reduces the environmental risks but can provide economic benefits too.

However the previous findings were expected given the attention they have had in the past decade. What was of most interest in this study, was the other environmental issues which appear to be less prevalent in the schemes. In particular it was found that biodiversity and climate and air quality (i.e emissions, energy) were addressed significantly less. As stated earlier this is a result of the 'productivist view' whereby resources are viewed by their relationship to production. While there was little specific reference to mitigating emissions, many of the practices involving nutrient efficiency will have a positive effect by reducing GHG emissions. Research is currently being done into solutions to reduce the emissions for agriculture in New Zealand (PGGRC, 2012). This has been in response to the commitments made through the Kyoto Protocol which has only recently come into force. It is easy to speculate that the lack of inclusion of climate change in the schemes is due to the limited of knowledge in this area and the access to technology that is cost effective for farmers.

As stated earlier, biodiversity issues also appeared to be lacking in the schemes. To demonstrate biodiversity's importance, ARGOS surveyed farmers in 2012 to determine their stance on various biodiversity aspects. Despite our findings of relatively little presence of biodiversity practices in the schemes themselves, ARGOS farmers did rate their importance rather high with over half deciding they were 'important' and 'very important'. Biodiversity aspects were present among the organic schemes which was understandable given the ethos behind organic farming.

There has been a strong focus on food safety in previous audit schemes, but recently the incorporation of environmental and animal welfare has been included. This is not a shift away from food safety and quality but demonstrates an appreciation the triple bottom line or three pillars of sustainability. Producers recognise that in order to be sustainable other issues need to be included. The study found that in addition to environmental issues, many of the programmes also included requirements for animal health and welfare and to a lesser extent, social issues. This reflects the acknowledgement that to be sustainable, all factors need to be addressed.

6.3 Verification, Certification and Communication of Voluntary Dairy Schemes

Rosin (2008) states "*the growing distance (social and cultural, as well as physical) between the origin of production, the centre of processing and the point of consumption impedes direct communication and the development of trust among the actors involved*" (pg. 45). In a market that is continuing to demand more sustainable products (with verification) this is an issue that needs to be addressed. Environmental schemes can provide this through credible and transparency programmes and with the assistance of third parties and certification logos.

The use of an environmental label or 'eco-label' can communicate to consumers the efforts the producer has gone through to improve their environmental performance. Half the schemes in this study were found to have some form of label provided they have met the requirements of the programme generally after an audit has been conducted. Applicants of each of the scheme are then certified against the scheme's criteria before they are able to use the label on their products. Two of the schemes in this study were organic programmes by AsureQuality and BioGro. The schemes prime function were to allow organic farmers to verify their organic practices through an audit. AsureQuality certified farmers are allowed to display their organic label on their certified products. However AsureQuality note that the actual quality is left to producer and is not included in the certification. BioGro provided various labels to show the different levels of product certification such as Certified Organic (international), Certified Organic (domestic) and Certified Input for organics. An important aspect of any environmental scheme is traceability through the supply chain (Opara, 2003). AsureQuality has ensured this by providing a unique customer number on the producer's organic label. This way a product can be directly traced back to the farm it was produced on.

Over half of the schemes analysed were found to include some form of third party monitoring. This was great finding as third party involvement increases credibility (OECD, 1998; Moffet *et al*, 2004), increases the chances of going beyond business-as-usual (OECD, 2003), improves environmental

quality (Darnall *et al,* 2003), and ensures transparency (Delmas & Terlaak, 2001). However what appeared to be clearly lacking was any form of reporting. Barth & Dette (2002) argue that the results of monitoring should be published to notify the public. The only scheme found to have public reporting was the Sustainable Dairying: Water Accord. It is important to note that the results in the report have not been independently verified at the industry level. Moffet *et al* (2004) state that to ensure public trust in the results, the findings needs to be independently verifiable. So it can be concluded that there is not a (publicly available) publication or report of third party results from the schemes analysed in this study. This is a concern considering the view of dairy farming by the wider public. In order to effectively communicate progress towards environmental achievements, this area should be addressed in the future to assist not only the dairy farmers in meeting targets but also improve the image of dairy farming to the wider public. Darnall *et al* (2003) stress the importance of including public reporting as part of a successful scheme. This in turn will likely promote greater trust and public participation in the scheme itself (Mazurek, 2002).

While not all schemes used a third party in their audits, some involved the scheme's organiser to check that the requirements had been met. And while this is not as credible as a third party due to potential bias, it is a more credible method that relying on self-assessments. Another risk with this method is due to resourcing issues, not all farms and all requirements can be checked regularly. Generally a sample may be checked but depending on the size this can cause obscurities in the data.

Chapter 7

Conclusions

7.1 Conclusion

The purpose of this study has been to evaluate voluntary dairy schemes in Canterbury against design attributes recommended in the literature. Through reviewing environmental schemes used by the dairy industry, eight schemes in the Canterbury region of New Zealand were identified. These schemes have been developed in response to both national and international markets demanding greater sustainability in food production (PCE, 2004). Firstly this study reflects the changing environmental responsibility undertaken by the dairy industry in the past few decades. Many of the schemes used in this study are relatively new in their existence, and even their older counterparts have been updated in recent times to reflect changing issues and new best practices. The environmental focus of these schemes were mainly around nutrient and water management practices. Secondly, this study demonstrates the response that has been taken outside the regulatory arena and expresses the industry-led initiatives that have been used to address current environmental issues. This shows the industry's willingness to go beyond minimum compliance and introduce standards to improve dairy farmers' environmental performance. Many of the schemes also included some reference to meeting existing regulatory requirements. And finally, the use of third parties in the implementation of these schemes demonstrates the commitment to designing credible and transparent schemes. There were high levels of third party involvement in the schemes, in particular ones that required annual auditing.

7.2 Study Limitations

While methods used in this study were designed in a way to maximise objectiveness and impartiality, there will always be shortcomings and limitations. This section outlines any limitations of the study and their effect on the validity of the findings.

The case study approach to the study immediately created limitations. The selection of Canterbury as the region of study meant that results found are only reflective of this region and cannot be assumed or generalised for New Zealand. The specific focus of the study allowed for greater depth and investigation to be achieved. Next the focus on dairy farming meant that while some findings may be also present in other sectors, they cannot be assumed or extrapolated to other sectors. The study

was also only limited to environmentally focused schemes. And finally all the schemes analysed were voluntary.

The procedure used to code the documents using NVivo 10 included some subjectivity which could not be avoided. In order to make the analysis more objective, coding rules were created for consistency and internal-reliability tests were conducted with a high consistency rate.

Another major limitation was that study was limited to the scheme standard only and did not include any additional material or reference. This way done to create an even 'playing field' to compare the schemes by. However if a scheme did include particular information such as public reporting and another one did not have it in the document (but still reported), it created

While this study seeks to address the rigorousness of these schemes, the overall effectiveness was not measured. The extent to which these schemes can be judged as effective remains limited. Due to time constraints it was not possible to measure the environmental outcomes for each of the schemes. This would need to be undertaken over many years and is simply outside the scope of this study.

7.3 Future Research

This study has focused on the actual standards and the text they contain. My first recommendation would be to measure adoption levels for each of these scheme as an indicator of its potential effectiveness. As the general overall goal of these schemes is to improve environmental performance, it could be explored to what extent are these programmes are actually being implemented on the farm level. This would provide a greater understanding into how these scheme are used and what components are most important to the user and auditor.

Furthermore, this study has only focused on the Canterbury region. These schemes and additional ones can also be found throughout New Zealand. Another study could look at other regions for comparison to Canterbury. It would provide insight into the issues facing other regions and provide a better picture of what is being done in the New Zealand dairy industry as a whole.

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