

MARKET ISSUES FROM CLIMATE CHANGE: CARBON FOOTPRINTING, LIFECYCLE ANALYSIS AND FOOD

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Introduction

This paper examines the trends in consumers concerns regarding sustainability in key overseas markets for New Zealand. These trends are affecting, and will continue to affect, what consumers buy and the premiums they will pay. The implications of these for New Zealand are explored.

In general there has been rising concern for the sustainability of lifestyles and consumption. There are three ways we interact with the environment. Firstly, we interact through resource use such as fossil fuel consumption and this has led to concerns about resource depletion and the need to increase our reliance on renewable resources. Secondly, there is the interaction with the environment as a sink for wastes and its absorptive capacity, and with that have risen concerns about pollution such as greenhouse gases. Finally, there is the use of the environment for amenity and aesthetic qualities, both use and non-use, with concerns about loss of landscape.

However, for consumers sustainability can have very varied meanings and be interpreted in different ways. This paper will focus on the ways this concern is affecting and manifesting itself in consumer behaviour in overseas markets and how this is likely to affect NZ exports. The paper will focus on the high value premium markets segments which currently are discernable in the developed markets however it will also include emerging markets and their trends where appropriate. Initially the paper will review some of the regulatory changes and the context in which they will affect consumer behaviour then the paper will focus on the current and future changes in behaviour.

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The focus and drive for sustainability can be seen from a number of fronts. In general the market is leading this drive with retailers vying for market share for high value premium market share and thus increasing and specialising their market assurance schemes. Behind this are various groups of NGOs' both business and non-profit organisations which provide standards, labels and organisational support for producers and retailers. Governments are tending to follow in this area with regulation and mandatory labelling being behind. However, there are areas where government intervention is much more pro active and this is in sectors where there is a history of government intervention such as agriculture or in areas where they have more traditionally been interventionist such as health with nutritional labelling.

The changing international policy environment

As stated above, governments especially in developed countries have adopted sustainability or sustainable development as a general high level goal of policy. This permeates many levels of government as well as many companies have also adopted sustainable criteria for their operation. This includes general factors such as concern for the environment, social responsibility and recycling.

Examples of such policies include all food processors in the EU must now comply with the Integrated Pollution Prevention and Control (IPPC) Directive which aims to ensure reduction in industrial waste output and emissions affecting water, air, soil and climate change. The IPPC system is based on a permit system that takes into account the whole environmental performance of a plant, and the permits are managed by member states. To get the permit, processors must adhere to a set of standards of best available techniques (BATs). The BATs are based on information from experts, industry and environmental organisations, and are presented in a document. The document outlines processing techniques and technology that may be used by processing plants to guide how to reduce the pollutants resulting from their operation. The permits do not prescribe the use of any specific techniques or technology, and take into account geographical and environmental conditions.

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The directive was previously compulsory for new plant installations and those undergoing substantial changes, but now applies to all processors. The directive forces companies to reduce the environmental impact of their operation.

Since 2003 the EU has been implementing Integrated Product Policy (IPP) that seeks to minimize environmental degradation caused by product manufacturing, use or disposal. The objective is to look at all phases of a product's life-cycle and taking action where it is most effective. The tools to achieve the objectives include economic instruments, substance bans, voluntary agreements, environmental labeling and product design guidelines (European Commission 2005).

The identification of products with environmental impact (action called EIPRO) is currently being held and was aimed to be finalized by the end of 2007. Food and drink, private transportation and housing all together are responsible for 70-80 per cent of environmental impacts. The EU is identifying the possible ways in which the life-cycle environmental impacts can be reduced. A set of measures are foreseen, such as state aid, environmental management system, Eco-design, labeling and product declarations (Eco-label and Energy labeling), greening public procurement, green technology and legislation. The Eco-label includes several categories of products such as cleaning products, appliances (TV, computers), tourism, etc (European Commission 2008). At the moment agricultural products are not included, although they are not excluded in the future. The IPP is an example of the upcoming trend towards improved environmental actions and correspondent labeling being driven by government.

Agriculture is our main export and it is in this sector that the changes in international environment will be seen the most, especially given the level of government support for this sector. However, a major way this does, and will in future affect NZ is in the form of market access, but also through agricultural subsidies.

Historically market access was the biggest impediment to NZ exports and this still exists. However changes in key policies overseas have meant increasing relaxation of trade restricting policies. Policy focus overseas has now shifted towards environmental protection and enhancements with associated subsidies.

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This can be seen most clearly with EU Common Agricultural Policy which for decades paid its farmers a minimum price for products. This has encouraged environmental damage to farm land in Europe and a resulting concern by the general population about the environmental degradation. This has led to introduction of policies to subsidise farmers for environmental enhancement since 1987 and these currently cover over 25 per cent of the area. More importantly the EU has changed from paying high prices for food to a Single Farm Payment (SFP). This is a huge change in policy from market-based support (which historically has caused, and continues to cause, hardship for New Zealand producers) towards direct payments to farmers based on social and environmental criteria. The budget for this is 75 billion euros per year, which is comparable to New Zealand's annual national income. Additional incentives are also being given to farmers who join food quality certification schemes and consumer information campaigns EU Regulation 1257/99.

There is likely to be a stronger environmental focus in the new proposed CAP. The key aim is to make agricultural production more market driven and so reduce financial support to farmers and other trade distorting interventions. Farmers must also protect wild birds and conserve natural habitats of wild flora and fauna. They must also take measures to protect groundwater and soil pollution, in particular against nitrates from agricultural sources. Indeed comments have been made that the Common Agricultural Policy is becoming more of a Common Environmental Policy and the latest proposals include extra \$2 billion euros intended to be allocated to specific schemes which address the new challenges facing the rural environment: that is climate change, bioenergy, biodiversity and water management.

The US Farm Bill (2008) also has extensive proposals for conservation of land. The new Conservation Stewardship Program aims to reward producers for good stewardship and resource management, as well as incentivising new conservation initiatives. The program intends to have 115 million acres by 2017. In addition there is increase support for working land conservation. The Environmental Quality Incentives Program is to grow by \$3.4 billion up to 2017.

As stated above, this is an area where government have traditionally been interventionist and provided larger resources to the sector. Thus changing the focus of these resources to aid farmers to meet environmental and social criteria does mean that this will aid farmers to meet

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growing requirements of market assurance schemes from retailers which stress sustainability attributes of products. This can already be seen in the growth of schemes such as EureGAP (now GLOBALG.A.P.) that include requirements or recommendations for environment and hygiene, environmental management including wildlife policy, groundwater, staff facilities, training, and health and safety. Whilst not all of these are “must dos” at present but only recommended, the subsidisation of EU and US farmers to meet these requirements will enable them to become “must dos” sooner.

Thus the growth in market assurance schemes, with most major retailers having some scheme or another for their products. Waitrose (which accounts for 4 per cent of UK supermarket sales), for example, has pledged that by 2010 all produce will be produced to high sustainability standards. These include minimising the use of pesticides, encouraging natural predators, retaining ‘green corridors’ to protect wildlife, conserving water and energy, and maintaining soil vitality through crop rotation. The scheme is called ‘Leaf Marque’. Leaf Marque was established in 1991 to promote integrated farm management. This is part of a European wide movement - the ‘European Initiative for Sustainable Agriculture’ (EISA). Similar projects operate in Germany, France, Italy, Sweden, Luxembourg.

Tesco has developed Nature Choice, an integrated farm management scheme introduced in 1992, which sets environmental standards and specifies shape, size, taste, variety and shelf life requirements of food. All of the 12,000 growers from whom Tesco source product are registered, and all suppliers comply with the standards. This is a major factor, given Tesco is the fourth biggest retailer world wide, with sales of 4.7 million pounds in 2007 and 31 per cent of UK supermarket share.

Changing consumer attitudes

Over last couple of decades there have been changes in consumer attitudes, particularly in premium segments of the market. Consumers have demanded more credence attributes for their products, be it food or other. These have included environmental, social and ethical attributes and as consumers grow in wealth these are set to continue further. These concerns will be discussed in turn below.

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A class of consumers are described as LOHAS (Lifestyles of Health and Sustainability) in the US. This market was estimated to be valued at \$226 billion in 2000 and include 30 per cent of adult in the US. This is now estimated to be over \$300 billion and growing by double digit figures per year. These are the higher income premium market consumers that are argued to be trendsetters in market development (Cohen 2007). Moreover, the growth in this market segment has seen greener products available in mainstream retailers such as Safeway and Wal-Mart and available to a wider range of consumers (Cohen 2007). In addition prices have fallen which has also been seen in the UK for organic produce as it became more main stream.

A variety of consumer concerns such as pollution and the use of non-renewable resources have crystallised around the issue of climate change and a general move towards reduction in carbon emissions. This is underpinned by government policy and targets. The UK has taken the lead in this area with the Climate Change Bill aiming to reduce total emissions in the UK by 60 per cent from 1990 to 2050, and has established a committee to aid achieving this. The EU proposes a reduction of emissions in the EU by 20 per cent by 2020, and by between 60 and 80 per cent by 2050. The US has agreed to reduce emission intensity (that is the ratio of emissions to output) by 18 per cent by 2012 and individual states have introduced their own level targets. California, for example, is aiming to reduce emissions to 1990 levels by 2020 and 80 per cent by 2050 and the NEG-ECP (Eastern US and Canada) to reduce emissions by 10 per cent by 2010. Japan also has announced a 50 per cent reduction in emissions by 2050.

The concern about climate change has been seen also through changes in markets and development of labelling schemes. The Carbon Trust in 2006 introduced a label called the Carbon Reduction Label with the proviso that products have to reduce emissions by 20 per cent over two years. Tesco has stated it is carbon footprinting 70,000 of its products and this has been followed by other major supermarket chains. The UK has established an enquiry into the environmental labelling under Environmental Audit Committee. This is to focus on issues around labelling, including feasibility of an international labelling scheme. This is an important initiative that shows that carbon footprinting is not just in the private sector, but government involvement may well lead to regulation as has been seen with other labelling schemes.

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Carbon labelling is not confined to the United Kingdom with a number of schemes developing across European countries. In Sweden a climate certification standard is being developed. In Switzerland products are being labelled 'Climatop' if they cause less damage to the environment than similar products. In France one retailer is planning to label 3,000 of its food items. Elsewhere in the world, Japan is trialling a scheme with the intention of introducing this in 2009. Carbon labelling is also being explored in Canada and in Australia. All of these schemes are under development, and in their infancy. The UK retail and NGO sectors have taken the leadership in this area and have schemes further developed than other countries, but other countries are catching up fast and the need for carbon footprinting will be required. Interestingly these schemes do not generally allow for offsetting, but stress reduction in emissions, so they require producers to reduce their footprint by different amounts over a period, or show they are more carbon friendly than competitor's products. Thus whilst it is the private sector that has taken the initiative in developing carbon labelling schemes, governments are becoming involved in these as seen above in the UK, but also in Japan. There are international standards to aid the development of measuring a carbon footprint and these include the ISO standards and also the Greenhouse Gas Protocol. These provide the framework for undertaking a carbon footprint and guidance on the scope of footprint. However, there is still considerable discussion around the exact methodology over factors about data to be included, how data is to be collected and the coefficients to be used. An important factor to note is that, as stated above, the EU is highly likely to subsidise farmers to measure and reduce their carbon footprint using farm level data. This has implications for NZ exporters in that they will have to footprint without subsidies but also this may mean collecting data at the farm level as opposed to from secondary or modelling sources.

This is extremely important for NZ exporters, firstly because the markets above developing these schemes are important to NZ. In particular schemes in the UK, Australia and Japan would mean that producers supplying those markets would have to carbon footprint their products and reduce this. Moreover, given the growth and importance of international procurement chains, standards developed in any important importing country generally become necessary to supply other markets as well.

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These carbon labelling schemes stress reduction in footprints, but there are also industry initiatives in the UK such as the Milk Road map which aims to have a reduction in emission from dairy of between 20 and 30 per cent by 2020 from 1990 levels (Dairy Supply Chain Forum, 2008). That report also states that methane emissions from dairy have fallen 13.4 per cent from 1990 and carbon emission by 23 per cent since 2000. This is significant for NZ dairy sector, one of our most important emitters, and emissions from this sector have been growing. Thus the need for footprinting and reduction in this sector will become more important.

Therefore, carbon footprinting and reduction in emission is set to become standard for our markets and likely to be introduced in the next few years. Thus, to maintain these standards and reduce footprint radical changes can be seen in production of all our products over the next 15 to 20 years, and the development of new technologies to help achieve this vitally important.

Water scarcity

Issues around water scarcity are growing, fuelled partly by climate change. Water quantity is becoming an issue for both policy and market access schemes. Major retailers in the UK are stating in their policy that water quantity in production should be reduced and saving on water is becoming a real issue. There is also potential for the amount of water to produce a product being measured and used as an environmental target with some commentators stating that Water Miles may become the next issue after Food Miles. Thus the Sustainable Development Commission, an independent advisory body reporting directly to the UK Prime Minister, has recommended water footprinting, that is measuring embedded water in all products (Sustainable Development Commission 200?).

Therefore, one could certainly see a situation whereby water footprinting becomes standard over the next decade.

Water quality

There is a growing concern in the EU about the effect of nitrate pollution on the water supply. There is a current EU study entitled “The Biodiversity of European Grasslands – the Impact of Atmospheric Nitrogen Deposition”. Results from this study, published in the journal

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Science, show the impact of nitrogen on species diversity with species diversity declining as a linear function of inorganic nitrogen deposition (Stevens et al, 2004). The report concludes that the excessive use of nitrogen has led to species losses of up to 25 per cent in the UK. Member states in the EU are required to designate all areas (including lakes, groundwater and surface water) where nitrate concentrations exceed, or are expected to exceed the nitrate limit of 50mg/l, or where there is evidence of eutrophication. In the UK the Nitrate Vulnerable Zone (NVZ) covers 70 areas of around 600,000 hectares in total. To be eligible for the Single Farm Payment farmers must undertake an environmental action plan.

The rising concern about the impact of nitrate pollution can be seen with recent proposals from the Department of the Environment Food and Rural Affairs (DEFRA) to expand the current area of NVZs in the UK from 55 per cent to 70 per cent of the farmed area at an estimated cost of 48 million pounds per year (*Agra Europe*, 2273, August 2007).

Biodiversity and wildlife

Over the last few decades there has been growing concern in the EU about the impact of agriculture on biodiversity and wildlife. Clearly in a European context there is relatively little land, especially in the UK, that is not multifunctional. Thus biodiversity and wildlife are important issues on farmed land. As is well documented, CAP policies have led to much of this concern as a result of their impact on the intensification of land use. In response, the EU since 1987 has subsidised agri-environmental schemes to reduce this impact and enhance not just biodiversity and wildlife but also landscape features. Some 22 billion euro is spent on this and member states have the option to top up payments. The policies under these schemes are locally targeted but some overall ones apply, such as restrictions on stocking rates. The more specific policies include cutting forage in a bird friendly manner to allow nesting birds to escape from the field; reductions in fertiliser use; later cutting dates for forage; encouragement of mixed species on grassland; and farms required to have wildlife management plans. The impact on New Zealand exports, as noted above, is likely through the market assurance schemes required to access high value market segments. Already wildlife management plans and biodiversity are part of GLOBALG.A.P. criteria and many of the supermarket schemes include aspects of

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biodiversity and wild life protection. The Nature's Choice label of TESCO, for example, includes wildlife and landscape conservation and enhancement plans. Some sectors in New Zealand are well aware of this and adopted these plans. This is especially true in the kiwifruit sector, dairy and sheep meat are not so well prepared.

Animal welfare

The EU has also adopted an action plan to improve animal welfare that is to be implemented over five years, 2006 to 2010. In this plan, the rules governing animal welfare will be updated and extended to ensure the EU standards remain among the highest in the world. This includes an option for an EU label relating to animal welfare especially to promote products produced to certain standards. United Kingdom retailers include animal welfare in their list of requirements from suppliers. The fact that major UK retailers have or are banning battery hens and eggs from battery hens shows the seriousness of this move (given the different in cost of production of battery eggs compared to free range eggs). So the Co-op, Waitrose and Marks and Spencer have banned the sale of these products and Sainsburys is to do likewise by 2009.

NZ producers have already had to change behaviours relating to animal welfare such as no longer docking the tails of cows. There are currently calls for banning tail docking of lambs, which would have implications for farm management, as well as banning winter shearing of sheep. These are generally to meet market access requirements. There is also the wider issue that animal welfare concerns differ across countries and perceptions of consumers in markets overseas to practices in NZ may have potential to adversely affect our exports.

Therefore, concerns over animal welfare have been growing in our main premium markets. This is set to continue and be more stringent as subsidies in countries like the EU enable their farmers to meet higher standards. NZ generally lags behind the concerns that our markets have, and thus it is a risk to our exports that if any perceived or real practices were presented in the media, such as shorn sheep in the snow or dead stock, this could have an immediate impact on sales.

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Current and potential changes in consumer behaviour

Increasing attention and concerns about climate change have led to a number of other potential issues that may affect New Zealand exports. These include reductions in consumption of meat and dairy products; calls for increased seasonal consumption; and a rise in local foods markets as discussed below. Included in this section are other issues affecting consumer behaviour such as nutrition and ethical food,

Meat and dairy consumption

An issue growing in importance is a trend to reduce meat and dairy consumption due to a perceived high carbon footprint of these products. The FAO report puts livestock related greenhouse gases as high as 18% of the world's total (Steinfeld et al, 2006). Another study (Garnett, 2007) argues that UK consumption of meat and dairy account for 8 per cent of emissions and European studies show they account for half food greenhouse gas burden.

Consequently there has been a rise in the attention being given to low carbon diets. A recent report by DEFRA on sustainable consumption, for example, talks about low environmental impact diets and reduced meat consumption. They recommend intervening with supermarkets to promote quality dairy and meat consumption over quantity, although the exact form of this intervention has yet to be seen. They also state that behavioural changes should be levered by encouraging more fruit and vegetable consumption to reduce consumption of meat (Owen et al, 2007).

Studies that have sought to measure impacts have reached conflicting conclusions. Some research has shown that adopting a vegetarian diet would result in only a small reduction (5.9%) in the food and drink ecological footprint (Collins and Fairchild, 2007). Other research, however, has suggested that a healthy vegetarian diet could reduce the carbon footprint by 23 per cent compared with meat based diet (Frey and Barrett, 2006). Weber and Matthews (2008) argue that shifting to one day per week without red meat and dairy products, and eating chicken, fish, eggs, or a vegetable-based diet instead, achieves more greenhouse gas reductions than buying locally sourced food. This maybe a small change but could have important implications

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for New Zealand. The other factor to be explored is of course a change in diets would require alternative uses for the pastoral land and where the supply of replacement food and materials would be sourced. These alternatives would themselves have carbon footprints that need to be analysed. (Garnett, 2007).

Buy seasonal

There are increasing calls to eat more seasonal produce, which goes against the long-term push of consumers demanding product all year round. Eating seasonal has been suggested as a way to reduce greenhouse gas emissions as year-round consumption is associated with the need to import products from countries which can produce the food out of the domestic production season. DEFRA, have identified switching to more seasonal and local food as one of five key behaviour goals, and they recommend considering intervening with supermarkets to encourage them to prioritise stocking and promotion of seasonal and local produce.

This is clearly a threat to New Zealand exports, particularly in the high value market segments, since New Zealand producers supply off-season to the EU market. However, as the original Food Miles report shows (Saunders et al 2006), even when supplying *in* the United Kingdom season, New Zealand sourced apples have a similar carbon footprint. Moreover, the implications of this policy on diet, nutrition and also the availability of in season produce have not been investigated.

Thus, this is an important trend which is gaining momentum especially in high value segments of the market.

Alternative food networks

There has also been a rise in alternative food networks. These include farmers markets, community gardens, community supported agriculture (CSA) and food box schemes (that is where a bundle of products are delivered to consumers from local suppliers or organic suppliers). These arise for a variety of reasons but the main drivers are social and community embeddedness. They are argued to lead to greater sustainable consumption due to benefits to local communities, economies and environments. They are also cited as improving local social

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and cultural capital. Other factors are raised in their support such as rural regeneration, cutting food miles and reductions in carbon emissions. Cutting food miles is cited as major reason for purchasing local stressing the fact that the social and environmental costs of transportation are externalities (Seyfang 2008).

The consumer perceptions of the advantages of buying from alternative sources was found to be mainly supporting a local business (54 per cent who bought box schemes and 51 per cent buying at a farmers market). Better quality produce was thought to be more important by those in a box scheme at 42 per cent compared to 21 per cent from farmers markets. However, reducing food miles was thought as advantage by 22 per cent from both box scheme members and farmer market participants (Seyfang 2008). Other studies have found quality, freshness, local farmer support and community interaction (Feagan et al 2008) and another highlighted interaction between consumers and producers as important (Kirwan2004).

In the case of farmers markets, the first in the UK was in 1998 and by 2006 this had risen to 550 locations with 9500 markets per year (National Farmers Retail and Markets Association 2006). These seem set to grow, and whilst will certainly not replace the mass market, may well affect high value premium segments of the market.

CSA is where local population invests in farm or crop before harvest and guarantees income for farmers. In return investors share in harvest such as food box, which is frequently vegetables but also dairy, eggs and meat. In some schemes there are social events and even community help on the farm at various times of the year. In the US there were in 2007 over 1200 schemes, whereas in the UK there were only 30 in 2006, (Cox et al 2008).

The size of this market is difficult to estimate, it is not mainstream but it is growing and could impact upon our high value market segments.

Buy local

Related to the above is a growing trend in movements encouraging consumers to buy local produce. This is promoted for a number of reasons such as freshness, taste, community cohesion and quality, as well as to support local farmers. This is being taken up by retailers in the UK with many including in their policies the aim to increase local sources of food. This

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includes Tesco establishing local source buying offices to increase local food and ASDA (a lower price retailer) aiming to increase local food hubs and to increase the number of British farmers supplying it with food from 2,500 to 3,500.

A report by DEFRA further encourages this with recommendations to intervene with supermarkets to encourage them to prioritise stocking and promote local produce, and to provide further support for local outlets and markets for farm produce. This implies active government intervention and financial support to promote local foods. Local sourcing has also been identified as a priority for the public sector (Owen et al, 2007).

The US has also policy initiatives to encourage buying local food. The US Farm Bill has as a priority for the Business and Industry Loan Guarantee Program the aggregation and wholesaling of locally grown produce. Marketing of locally grown produce is also supported through the Value Added Product Market Development Grant Program.

In addition, Country of Origin Labelling (COOL) for meat was due to come into effect in the US by September 2008. Under this the retailer has to label meat from overseas and this will include NZ manufacturing beef even if mixed with US beef.

Nutritional food

The nutrition in food is also of concern and whilst not directly linked to sustainability the way a product is produced such as the use of pesticides is often seen as affecting both nutrition and the environment. A report published by the Hartman Group shows that US consumers are increasingly reading nutrition fact labels and it is estimated that 50 percent of consumers read nutritional labels. However, consumers often find it confusing to read these labels and express frustration to locate the nutrient information because there are so many other types of information presented on products such as expiry date, country of origin statements and product narratives. A new labelling symbol similar to the traffic light system has been considered by FDA but the industry feels that a single symbol summarising all nutritional characteristics is too simplistic, and may be misleading.

The European Commission has put forward a proposal that would require food manufacturers to display nutritional information on the front-of-pack; including energy, fat,

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saturated fat and carbohydrates with specific references to sugar and salt content. Nutritional labelling is also on the agenda in the United States.

New Zealand is well placed, compared with many of our potential competitors, to meet such schemes given our relatively high levels of education and science system, experience in providing this kind of information and well developed bureaucracies. However, exporters in NZ must be aware of these developments overseas and provide the relevant information. Often for the smaller exporters the compliance costs of doing so can inhibit their ability to target high value markets.

Thus there is a demand for food labelling, but there is a conflict between this being credible and easy to understand and yet providing enough information for choices to be made. This is an area where government regulation is most likely to occur as this is an area where government intervention has historically been.

Ethical production

Ethical consumption has grown considerably. Under this heading is included organic produce. Also fair trade is included here, this first appeared in Europe in the 1980's for coffee but has now expanded considerably to other products. There is a 'fair trade' label which is certified by the Fair Trade Labelling Organisations International and requires that farmers receive a higher price for their product.

Ethical requirements in production of food include social responsibility and are a growing requirement by retailers. Many such as Wal-Mart, have ethical standards such as no use of child labour, labour hours and health and safety provisions.

Emerging concerns and trends in consumer behaviour

New technologies

The rise in new technologies affecting food consumption and behaviour include creating individualised foods and matching genomics with nutrition. This has implications for our

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markets as has been seen with the debate over A1 and A2 milk and the potential health threats of A1 milk.

Nanotechnology in food production and processing and genetically modified foods are other new technologies. Clearly the reaction of markets to genetically modified foods has led to segments of consumers rejecting this technology. In the future the development of genetically modified food which has positive consumer attributes may change this, but in general the introduction of these has been cautious with potential to negatively affect NZ high premium markets. In case of nano-technology this caution is also operating with reviews of how nanotechnology is being used in food and food packaging. This has benefits such as anti – bacterial packaging but concerns still exist around its safety (Miller and Senjen 2008).

Functional and fortified foods

There is also growing demand for foods which provide health benefits beyond basic nutrition. This is important market in Japan with its own regulatory process recognising these foods and 400 new foods being launched each year. There is also interest from other developed countries especially as populations age and already a number of products such as cholesterol reducing margarine. These food are generally based on natural products or ingredients and thus do not raise the suspicion that new technologies do. In fact these products frequently emphasise the ‘naturalness’ and sustainability credentials of these products.

The value of the market for foods with perceived superlative health values is difficult to state. Euromonitor estimated the 2005 total world values of sales of naturally healthy, high-fibre foods at US\$25 billion (Euromonitor, 2006). Other research found estimated sales of functional and fortified foods in the United States in 2006 at US\$35.86 billion (Sloan, 2006). Low-GI foods are also a growing sector of the functional foods market.

This has potential to become a extremely important segment of market for NZ. Clearly research is needed to help develop these products and genuinely assess their benefits. There are examples of these already being exported from NZ such as manuka honey products.

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Emerging markets

The above discussion has focussed on the main markets NZ currently services such as the EU, the US and other developed country markets such as Japan. However there is growing evidence of high value premium markets in the emerging markets of Asia, Latin America and central and Eastern Europe. It is estimated that there are currently a billion middle class consumers in these markets and this is set to grow. These regions have the highest predicted growth rate in incomes per head. Also they have the greatest predicted increases in consumption of meat and dairy products. In the case of beef the growth rate in consumption is predicted to be nearly 4 per cent in China per year from 2008 to 2017 and 2.74 in India compared to falling growth rates in Japan and Australasia and static growth in Europe. Sheepmeat follows a similar trend with predicted growth to be over 3 per cent in China and Brazil and over 5 per cent in Russia. Butter consumption is predicted to increase by over 3 per cent in Brazil, China and India and nearly 3 per cent in Russia from 2008 and 2017. In China a 3 per cent rise per year from 2008 to 2017 is predicted for whole milk powder and 8 per cent for skim milk powder. This compares to static or declining growth rates in these commodities in Europe, Japan and Australasia, (OECD and FAO). However the OECD and FAO report does state that by 2017 whilst consumption and imports from developing countries will have increased this will be met from other developing countries and the share of OECD countries in the trade will have fallen.

The main change in these markets is the switch from small retail outlets to the supermarket outlets, where for example in China there were no supermarket sales at start of 1990 and in 2006 this had grown to \$100 billion (Reardon 2007). This rise is due to rising incomes, increased urbanisation, women's entry into workforce and increased access to transport and refrigeration. The growth in supermarkets have been from Western European and US multinational retailers such as Tesco, Wal-Mart, Carrefour especially in countries like China. These chains are likely to take the same requirements for their corporate responsibility for sustainability to these markets, as in others, especially as global and regional procurement grows. Moreover initiatives such as Global GAP has 80,000 suppliers in 80 countries worldwide and is in the process of accepting country specific versions It has approved Kenyagap and JGAP from Japan, as well as the meat production in Uruguay. It is only a matter

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of time before other national schemes such as ChileGap, China Gap, MexicoGap and ThaiGap are accepted. It is important for producers in these countries to sell into global networks of retailers as it also should be in NZ.

The development of supermarkets and global procurement networks in the emerging countries does present a contradictory picture to that in developed countries. This has caused some commentators to suggest there will be a polarisation of markets, not just between emerging and developed countries, but also within countries. There will therefore be the commodity based, global, low price, convenient all year supply market and the more locally based, traditional, speciality premium market (Gow H. 2008).

Food security

The recent rises in food prices and shortages on world markets have raised the issue of food security. There is growing calls for increased import substitution from some countries including the UK to reduce reliance on imports. However, there are contradictions here with the policies being followed in the EU and US which are encouraging the movement towards conservation of land and also incentives to produce bio fuels, all of which will lead to a reduction in the food supply.

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Conclusion

Therefore there are a number of changes in consumer attitudes towards sustainability that have the potential to impact on NZ over next decade or two. Market assurance schemes are likely to become standard for most markets and a summary of significant ones are presented in table 1. This can be seen clearly with carbon footprinting becoming standard for all products and reductions in carbon emission essential to obtain market access, not just to the high premium markets. This is highly likely to also include water footprinting of products to show the amount of embedded water in production, processing and distribution. This will also require reductions in water use.

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Table 1. Summary of main schemes

Label	Label Description	Size
Global Gap	Supply chain quality control standards for Goods Agricultural Practice (GAP), that address environmental impacts of farm operations worker health and safety, and animal welfare. GLOBAL GAP is a private sector body that sets voluntary international standards for the certification of agricultural products	GLOBAL GAP certification is carried out by more than 100 certification bodies in more than 80 countries with 801 000 producers
FSC	FSC certifies that products have come from forests managed according to FSC principles. These include requirements of sustainable harvest; protection of soil resources, biodiversity and the livelihood of forest communities; and restriction in use of pesticides and GMOs.	7500 certificates the value of FSC labelled sales is estimated at over 20 billion USD. More than 100 million ha forest worldwide were certified to FSC standards in April 2008, distributed over 79 countries. FSC certified forests represent the equivalent of 7% of the world's productive forests.
PEFC - Programme for the Endorsement of Forest Certification	Provides an assurance mechanism to purchasers of wood and paper products that they are promoting the sustainable management of forests. It is an international umbrella organisation for the assessment and mutual recognition of its members' national forest certification schemes.	3 861 certified companies in 2007 covering 202, 967, 286 hectares of certified forest (as at
MSC - Marine Stewardship Council	The label signifies that fish have been harvested from a fishery which meets the Marine Stewardship Council standards for sustainable and well-managed fisheries.	857 MSC-labelled seafood products making up over 7% of the world's edible wild-capture fisheries
Tesco Nature's choice	Integrated farm management scheme that is unique to Tesco. It sets environmental standards and specifies shape, size, taste, variety and shelf-life requirements.	12,000 growers
European Union Eco-label	Indicates reduced environmental impact over the product's life-cycle compared to	Currently 622 companies. Ex-factory sales value equated to

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(EcoFlower or The Flower)	products which do not meet an equivalent standard. This label was initiated and is endorsed by the EU Commission.	approximately € 800 million (2005)
Responsible Care®	Voluntary chemical industry initiative under which companies work together to continuously improve their health, safety and environmental performance, and communicate this with stakeholders. The scheme is administered by the International Council of Chemical Associations (ICCA).	Implemented by national bodies in 53 countries

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A factor which will be required by our high value premium markets particularly in the EU is biodiversity and wildlife protection. These will be required at the producer level with on-farm plans. Animal welfare requirements will continue to grow and likely to become mandatory, these may include factors such as banning of tail docking, providing shelter for stock and restrictions the transportation of animals.

Other threats such as lower meat and dairy consumption, the move to buy seasonal and local products (not just food) and support local producer's networks will have the impact of reducing the premiums we can obtain unless refuted. This may mean stressing more the ethical factors behind our production systems such as family business and marketing our products on this basis.

The growth in functional foods will continue and this will provide niche market for NZ products, especially if they can ensure the sustainability credentials of these products. The potential for this market is large and could be an area for NZ to lever value added from its agricultural sector.

The emerging markets may also provide opportunities for NZ exports with growth in middle classes in these countries and development of supermarket and global procurement chains in these countries.

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