

Please cite this paper as:

Melyukhina, O. (2011-02-10), "Risk Management in Agriculture in New Zealand", *OECD Food, Agriculture and Fisheries Papers*, No. 42, OECD Publishing, Paris.
<http://dx.doi.org/10.1787/5kgj0d3vzcth-en>



OECD Food, Agriculture and Fisheries
Papers No. 42

Risk Management in Agriculture in New Zealand

Olga Melyukhina

OECD FOOD, AGRICULTURE AND FISHERIES WORKING PAPERS

The working paper series is designed to make available to a wide readership selected studies by OECD staff or by outside consultants and are generally available only in their original language, English or French.

The present document has been declassified by the Working Party on Agricultural Policies and Markets of the OECD Committee for Agriculture.

Comments on this series are welcome and should be sent to tad.contact@oecd.org.

OECD FOOD, AGRICULTURE AND FISHERIES WORKING PAPERS
are published on www.oecd.org/agriculture

© OECD 2011

Applications for permission to reproduce or translate all or part of this material should be made to: OECD Publishing, rights@oecd.org or by fax 33 1 45 24 99 30.

Abstract

RISK MANAGEMENT IN AGRICULTURE IN NEW ZEALAND

by

Olga MELYUKHINA *

This report analyzes the agricultural risk management system in New Zealand, applying a holistic approach that considers the interactions between all sources of risk, farmers' strategies and policies. The policy analysis is structured around three layers of risk that require a differentiated policy response: normal (frequent) risks that should be retained by the farmer, marketable intermediate risks that can be transferred through market tools, and catastrophic risk that requires government assistance. The risk management policy in New Zealand is focused on prevention of pest and disease incursions. Assistance related to natural catastrophes is delivered within the Adverse Events Framework programme. The government contributes to knowledge and information systems to support private risk management efforts.

JEL: Q18

Keywords: Agricultural policy, risk perceptions, risk management, bio-security, Adverse Events Framework, industry good organisations, levy organisations, co-operatives

* Agricultural Policy Analyst, OECD Trade and Agriculture Directorate.

FOREWORD

The OECD project on risk management policy in agriculture (www.oecd.org/agriculture/policies/risk) developed the framework and methods originally published in *Risk Management in Agriculture: a Holistic Approach* (OECD, 2009). These were then applied to the analysis of the risk management policies of five countries: Australia, Canada, Netherlands, New Zealand and Spain.

All five country studies which resulted from this project followed the same process of preparation. The key inputs to these reports were: responses by governments to a detailed questionnaire prepared by the OECD Secretariat; a background report drafted by a national expert; an OECD Secretariat visit to the country with the participation of national and international experts; and a report on the country visit by an international expert.

The OECD Secretariat would like to kindly acknowledge financial, information and organisational assistance of the Ministry of Agriculture and Forestry of New Zealand (MAF) in preparation of this and other components of the project.

This project was led by Jesús Antón. The author of this report is Olga Melyukhina. The experts preparing the background report and the visit report for this study were, respectively, Nicola Shadbolt from Massey University (New Zealand) and Vincent Smith from Montana State University (United States). Statistical assistance was provided by Christine Le Thi. Editorial work was done by Michèle Patterson. The authors would also like to acknowledge the useful comments and discussions with several OECD colleagues.

Table of contents

Abbreviations.....	6
PART I. RISKS, STRATEGIES AND POLICIES	7
1. Assessment of agricultural risks.....	7
Context: natural conditions and policy environment	7
Key risks in agriculture	10
Ranking of risks in farmers’ perception	17
Quantitative assessment of agricultural risk: the case of New Zealand meat and wool farms.....	21
Information and communication on risk and risk management	27
2. Risk management strategies and government policies	28
Boundaries between risk layers: catastrophic, marketable and normal risks	29
Strategies at farm household/community level	31
Government measures related to farm household/community strategies.....	37
Market instruments.....	39
Government measures related to marketable risks	45
Catastrophic risk management	46
Overall assessment of government risk management measures.....	48
PART II. SPECIAL FOCUS ISSUES	51
3. New Zealand’s On-Farm Adverse Events Framework.....	51
4. The role of farmer collective action in risk management	57
Producer co-operatives.....	57
“Industry good” bodies (levy organisations).....	62
PART III. POLICY IMPLICATIONS	66
5. Policy recommendations and concluding remarks	66
Policy recommendations for New Zealand	66
Policy lessons beyond New Zealand.....	69
Annex 1. List of institutions and persons visited during the OECD mission to New Zealand.....	71
Annex 2. Recent adverse events and assistance provided	74
Bibliography	75

Tables

Table 1. Farmers’ perception of risks: types of risks and their ranking by importance	18
Table 2. Farmers’ perception of uncertainties as generating opportunities and threats	20
Table 3. Correlation matrix of meat and wool prices, 1999-2007.....	24
Table 4. Correlation matrix of meat and wool gross margins	24
Table 5. Risk management strategies having specific importance in New Zealand	29
Table 6. Risk management strategies and their ranking in farmers’ perception	32

Table 7.	Equalisation Schemes: deposits and refunds.....	38
Table 8.	Events and types of damage for which insurance is not available or limited in New Zealand	39
Table 9.	MAF’s expenditures on risk-related programmes, 1999-2008.....	48
Table 10.	Government measures related to farm risk management in New Zealand.....	50
Table 11.	Adverse Events Framework: key blocks of assistance, eligibility and division of government responsibility.....	52
Table 12.	Adverse Events Framework: a decision matrix to determine the scale of adverse events	53
Table 13.	Adverse Event Framework: the sets of assistance measures according to scale of adverse event.....	54
Table 14.	Co-operative return and risk management strategies	59
Table 15.	Key activities of Dairy New Zealand.....	64

Figures

Figure 1.	Climate maps of New Zealand.....	8
Figure 2.	Share of exported output of key New Zealand’s agricultural products.....	10
Figure 3.	New Zealand’s share in global exports	10
Figure 4.	Dairy export prices and farmer payouts, 1986-2009.....	11
Figure 5.	Risk scores in dairy farmers’ perceptions: changes between 1992 and 2004	19
Figure 6.	Coefficients of variation of meat and wool prices, 1999-2007	22
Figure 7.	Coefficients of variation of gross margins per stock unit for meat and wool, 1999-2007.....	23
Figure 8.	Correlation between agricultural revenue, production costs and off-farm income for meat and wool farms.....	25
Figure 9.	Decomposition of income variance.....	26
Figure 10.	Use of risk management strategies by dairy farmers.....	33
Figure 11.	Importance scores of risk management strategies for dairy farmers	34
Figure 12.	Share of farms receiving off-farm income	45
Figure 13.	Share of off-farm income in total farmer cash receipts.....	45
Figure 14.	Market shares of the largest supply and marketing agricultural co-operatives in New Zealand, 2005	58

Boxes

Box 1.	Structural changes in New Zealand’s agro-food sector.....	9
Box 2.	Variations in commodity prices and exchange rates in New Zealand.....	12
Box 3.	Pasture condition as an important farming risk in New Zealand	13
Box 4.	New Zealand recent national environmental initiatives	16
Box 5.	Lake Taupo Project: a case of regional tradeable pollution permit.....	16
Box 6.	Feed management and irrigation as farmers’ strategies to manage output risk in New Zealand	34
Box 7.	Diversification of agricultural production in New Zealand farms	35
Box 8.	Exchange rate hedging strategies in different agro-food sectors.....	43
Box 9.	Flood risk management review in New Zealand.....	47
Box 10.	New Zealand’s Rural Support Trusts	52
Box 11.	Fonterra’s system of payouts to milk producers	60

Abbreviations

BNZ	Biosecurity New Zealand
BSE	Bovine Spongiform Encephalopathy
CME	Chicago Mercantile Exchange
ETS	New Zealand's Emissions Trading Scheme
FMD	Food and Mouth Disease
FMG	Farmers Mutual Group
GHG	Greenhouse gas
GNS	Institute of Geological and Nuclear Sciences
IPCC	Intergovernmental Panel on Climate Change
MAF	New Zealand Ministry of Agriculture and Forestry
NDA	Nitrogen Discharge Allowance
NIWA	National Institute for Water and Atmospheric Research
NZX	New Zealand Stock Exchange
RMA	Resource Management Act (1991)
RST	Rural Support Trust
SNZ	Statistics New Zealand
SRM	Special Recovery Measure

PART I. RISKS, STRATEGIES AND POLICIES

1. Assessment of agricultural risks

Context: natural conditions and policy environment

This section describes the overall nature of agricultural risk in New Zealand. It discusses the climate, natural endowment, and other geographic and economic features that shape its farming system and generate certain types of risks. An analysis of the overall policy context and society's perception of the degree to which farming risks should be shared concludes this section.

Climate and economic geography

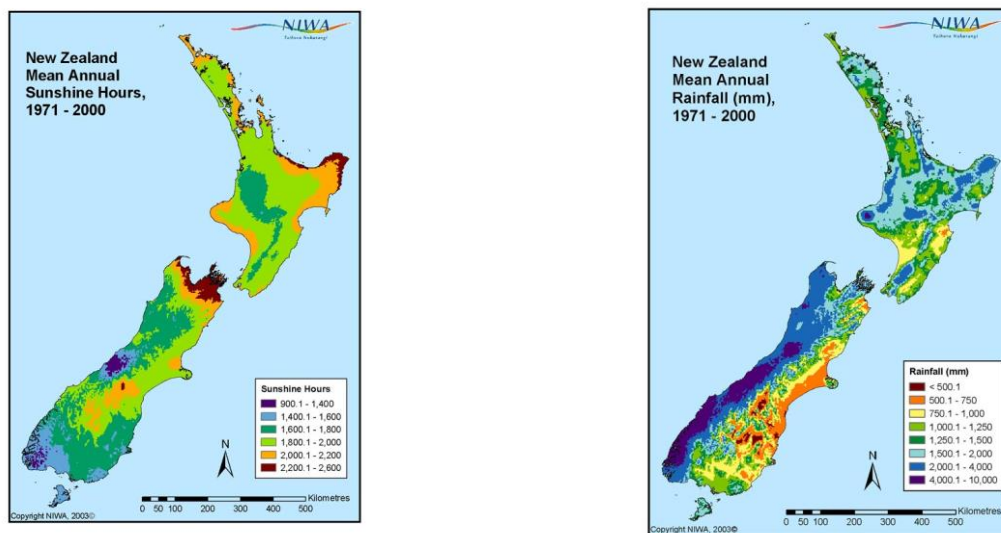
New Zealand's climate is temperate, with relatively mild temperatures, moderate rainfall and abundant sunshine. There are distinct regional variations, however. The two main islands that form the country – North Island and South Island — stretch approximately 1 600 kilometres from north to south, with a varied landscape including mountain ranges and large coastal planes. The North Island is hotter while the South Island is colder. The east coast of both islands is dryer and prone to droughts with the west coast having more abundant rainfall and a higher occurrence of floods. Compared to neighbouring Australia, where climatic risks are dominated by droughts that affect large territories, New Zealand is exposed to more diverse and localised climatic risks that are less systemic.

New Zealand's dominant agricultural activity is pastoral farming based on year-round outside grazing. Of the 14.7 million hectares of agricultural land, around 76% is grazing land, which in many locations is steep or hilly land (SNZ, 2003). Better quality land, both in terms of contour and soil, is used for intensive pastoral enterprises that include dairying, finishing lamb, beef and deer, and the cultivation of forage crops. Steeper and poorer quality land is used for sheep, beef and deer breeding with limited scope for intensification, or for the cultivation of forage crops. Some flat land can be irrigated, but pasture irrigation is economically justified only for the most profitable activities (e.g. dairying). Dairying utilises nearly 20% of agricultural land area, although the total area suitable for dairy farming is limited by location, contour and soil quality. Arable cropping and horticulture are restricted to small areas of higher quality land where the climate is favourable. For example, the drier east coasts of the North and South Islands are suitable for grain and small seed crops and vineyards. The dominance of pastoral farming means that the overall profile of production risks in New Zealand agriculture is largely characteristic of livestock farming.

New Zealand's geography is peculiar as no other OECD member has such a striking combination of small size and remoteness. In terms of total land area (269 thousand km²) and population (4.3 million), New Zealand is roughly comparable to the state of Colorado in the United States. The country's average distance to its key markets is more than double that for the OECD area on average. This distance "burden" is close to, but still larger, than that borne by Australia (OECD, 2008a).

A relatively small and remote economy, New Zealand relies strongly on overseas markets for both supplies and outlets for its domestic economy. Exported goods account for almost one quarter of the country's GDP, with agro-food items accounting for over one half of this share (OECD 2009b). This dependency on international outlets makes risks linked to international trade particularly important in New Zealand agriculture.

Figure 1. Climate maps of New Zealand



Source: NIWA, 2009.

Policy context

The history of New Zealand's extensive economic reforms in the mid-1980s is well-known. Prior to these reforms, government had provided a wide range of incentives for agricultural production, viewing agriculture as the main driver of overall economic growth and the source of currency earnings. Beginning in the mid-1960s, the support schemes were expanded as the sector went through successive periods of falling incomes. On the eve of the reforms, New Zealand producers received price supports for key export commodities, credit and tax concessions, input subsidies, and direct income payments, along with periodic recourse to exchange rate adjustments to support agricultural exports. When the Labour government took office in 1984, the budgetary cost of agricultural support was estimated at 3.2% of GDP (Gow, 1999). Continuing such policies in a situation of large fiscal deficit and monetary imbalances as New Zealand was facing at the time was no longer possible. The elimination of agricultural subsidies became a major component of the government's economic programme, but also involved measures that helped to reduce agricultural input costs, such as large cuts in tariffs, elimination of

import quotas and labour market reform. Important reforms also concerned other sectors, including the removal of subsidies in the energy sector, considerable financial deregulation, and tax reform.

These reforms, inspired by economic liberalism and supported by society as a whole, opened the way to comprehensive and lasting economic restructuring in New Zealand and the development of “modern, if not world-leading, institutions and policies in many areas” (OECD, 2009d). The agricultural sector continued to be the economic mainstay, but was now viewed as a business that should be self-reliant and market-oriented, where investment incentives and returns were in line with returns obtained on world markets. The policy reforms prompted considerable structural adjustments in the agro-food sector (Box 1).

Box 1. Structural changes in New Zealand’s agro-food sector

The removal of farm subsidies created an upheaval as farmers, processors and exporters adjusted to the realities of the open market. The more heavily subsidised industries declined (e.g. sheep numbers dropped from 70 million in the mid-1980s to 35 million today) and were replaced by industries able to compete in global markets. Farms increased in size, declined in number, and focussed on production efficiency. Today, the same quantity of sheep meat is produced from a flock half the size of 25 years ago. Farmland values fell when subsidies were removed, but then increased as more profitable enterprises replaced those supported by subsidies.

The dairy industry has grown steadily since farm subsidies were removed. In the last ten years, milk solids production has increased by 58.3% and now accounts for 30% of New Zealand’s exports. The average dairy herd size has tripled in the last 30 years, and has increased by more than 100 cows in the last eight years. Since the removal of subsidies, cow numbers have nearly doubled and there are 25% fewer herds.

The distortionary effect of subsidies was also reflected in processing capacity. As the number of sheep fell, the resulting overcapacity in the meat industry led to significant restructuring which is still in progress. Processing plants have focused on improved efficiencies, and are now fewer and larger in size.

The wine industry has more than doubled the area of vineyards in the last ten years (although it still occupies approximately 6% of the land area used in crop production) and New Zealand has become the twenty second largest wine producer in the world. In 1986, it exported 1 million litres of wine; in 2009 the amount was 105 million litres. In the last eight years, the volume and value of wine exports has increased six fold and five-fold, respectively.

Source: Shadbolt, 2009c; SNZ, 2003; LIC, 2009.

The principle of self-reliance is broadly accepted by the farming community in New Zealand, be it individual farmers, their business associations, or lobby groups. During the country visit, OECD mission repeatedly heard farmers’ views that “operating in a situation of high dependency on government is to operate in a highly risky environment” and “at the end of the day, we are better to have the right price”. Such thinking is partly nourished by the difficulties experienced in the years following the reform, when the withdrawal of subsidies led to substantial decreases in farm asset values and output prices. Many farms suffered significant losses and a systemic inability to service debts. Although the government implemented debt restructuring to help farmers adjust (with considerable debt write-off), “the initial shock was quite dramatic and precipitated some significant attitude changes” (Gow, 1999). The spirit of free entrepreneurship seems to be strong and pervasive in the farming community today. Farmers regard self-reliance as a key principle of operating business and are proud of their independence from government protection. Many farmers also consider that risk is a normal part of business and provides not only threats but also opportunities.

The above perspective is important in understanding the farm risk management system in New Zealand. Consistent with the liberal economy strategy adopted, farmers are viewed as almost fully responsible for assuming their business risks. Such a strategy clearly delimits participation of society as a whole in sharing with farmers the costs for agricultural risks. There is little public acceptance of intervention in markets and the provision of subsidies to farmers, including subsidies explicitly related to farm risk management. Public participation in agricultural risk management is limited to increasing knowledge and awareness about agricultural risks, as well as dealing with natural disasters and with pest and disease risks that are perceived to have a potential effect on the whole economy.

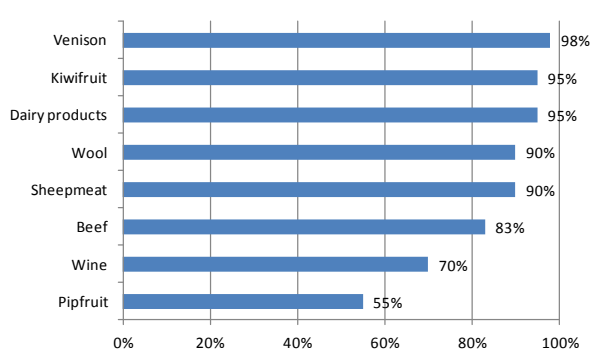
Key risks in agriculture

New Zealand farmers, like farmers in other countries face diverse risks that originate from markets (for outputs, inputs, land, labour and capital), natural events, the policy environment, and social and personal circumstances. This section highlights features of farming risk specific to New Zealand, without attempting to be an exhaustive account of all risks that face agricultural producers.

Price risks

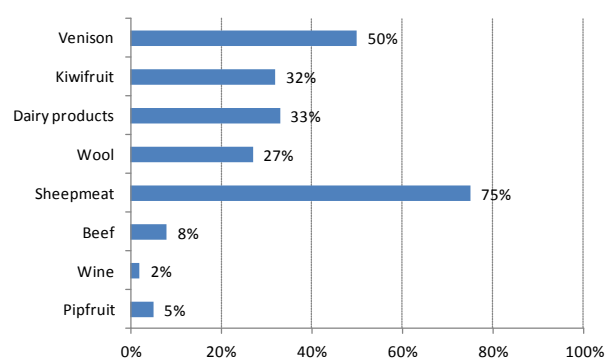
New Zealand agriculture is one of the most export-oriented economic sectors in the world. Over 80% of the total production of key livestock products and over 50% of horticulture and wine are destined for export (Figures 2 and 3). The internal market is small and there are no government policies to buffer or stabilise domestic prices. Farm prices in New Zealand are therefore largely determined by world market prices and fluctuations in shipping costs (basis), and the volatility of domestic prices derives from two principal sources: fluctuations in international commodity prices and variability in the value of the New Zealand dollar.

Figure 2. Share of exported output of key New Zealand's agricultural products



Source: Shadbolt, 2009c.

Figure 3. New Zealand's share in global exports



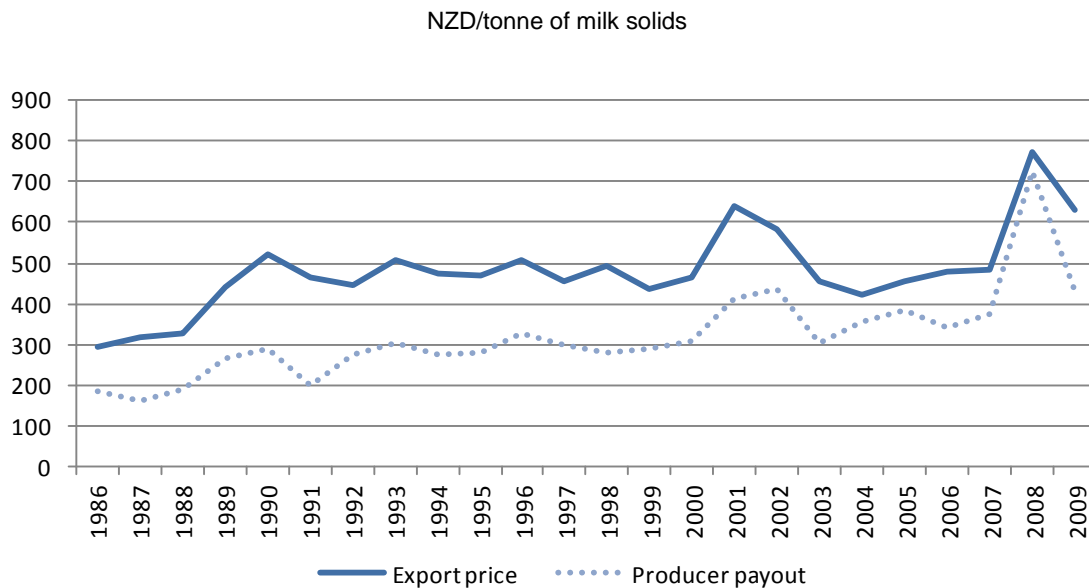
The close relationship between variations in world prices (which also incorporates the exchange rate effect) and prices received by New Zealand producers is illustrated in Figure 4. One can see that payouts to dairy farmers are constantly adjusted to follow changes in export prices. The exchange rate volatility alters export price signals in New Zealand dollar terms, putting exporters at a disadvantage when the national currency

is strengthening, and an advantage when it is weakening. Some analysts suggest there is significant co-variation between commodity prices and the exchange rate in New Zealand. The argument is that primary industries are responsible for over 60% of the country's export earnings, so any change in commodity prices is reflected in the exchange rate. They argue that such co-variation often produces a stabilising effect on domestic prices. However, the evidence from the available studies is somewhat ambiguous – it is either limited to only one specific commodity or shows mixed results if it concerns a number of commodities (Box 2).

The cost of international shipping is also a trade-related source of agricultural price variability. These costs can be likened to an export tax whose impact on domestic prices is particularly important for a remote country such as New Zealand. Evans and Meade (2006) note that traders in countries like New Zealand are exposed to market power arising from scale economies and co-ordination/consolidation issues in international shipping, given that much of the nation's agricultural output is destined for time-sensitive overseas markets.

Finally, there are risks arising from market access policies of importing countries, including the ability of governments to impose technical barriers to trade, import quotas, and introduce changes in tariffs which may reach prohibitive levels.

Figure 4. Dairy export prices and farmer payouts, 1986-2009



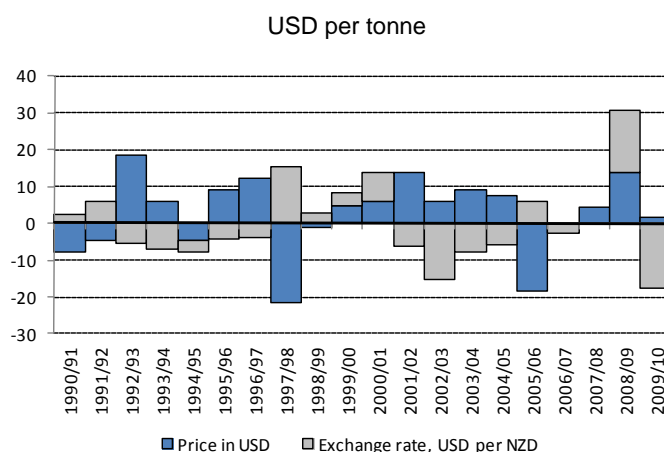
Export price is calculated as the value of milk solids (fat and milk proteins) contained in one tonne of raw milk, where the values of fat proteins are derived from export prices of butter and SMP, respectively.

Source: OECD, Aglink database; OECD, PSE/CSE database; LIC, 2009.

Box 2. Variations in commodity prices and exchange rates in New Zealand

Davison and Gonzalez-Macuer (2009) decomposed annual changes in the export price of lamb by two drivers of change – overseas market price in US dollars and the exchange rate. The figure below shows that during the 20-year period studied, variations in the exchange rates typically counter-balanced variations in world prices, with the exception of only four years.

Changes in lamb prices received by producers in New Zealand, decomposed by variations in world price and exchange rate



Source: Davison and Gonzalez-Macuer, 2009.

O'Donovan and Stephens (2009) studied commodity price data over a 17-year period and found that for dairy, lamb, and horticultural prices (as well as aluminium) standard deviations of export prices expressed in NZ dollars were smaller than for the same prices expressed in US dollars. They concluded that by offsetting global market swings, exchange rate fluctuations have reduced the overall volatility of prices received by New Zealand producers and that policies to stabilise the exchange rate would harm, not help, these sectors. However, exchange rate movements were not found to be stabilising for beef, wool, seafood and forestry products, implying that the exchange rate has indeed been a source of volatility in these sectors.

Climatic and other natural risks

Adverse climate events in New Zealand are varied and include floods, drought, hail, severe frosts, storms and heavy snowfalls. Droughts and floods can be severe. In 2004, heavy storms caused significant flooding in the lower North Island, destroying infrastructure and causing widespread landslides. In 2008, a prolonged drought occurred, affecting large parts of the country and producing substantial economic loss.

The studies on climate change in New Zealand suggest that it will likely have mixed impacts on farming. Over the next 100 years, growing conditions may be improved in some regions and longer growing seasons may be expected. However, some regions may be exposed to more frequent and severe extreme events, such as storms and droughts (OECD, 2010c).

The importance of different types of climatic risks varies among broad aggregates of farmers and by location. Horticulture and grain (wheat and barley) producers are primarily concerned with drought, hail, frost and wind events; floods are a concern for producers of field crops, such as potatoes and tomatoes. For beef, sheep and dairy

producers (pastoral farmers), regular and reliable rainfall feeding pasture is a highly important climatic factor affecting production and prices. In the South Island, snow events that limit access to pasture for livestock also represent an important risk (Box 3).

Box 3. Pasture condition as an important farming risk in New Zealand

Apart from the extreme weather event, “bad weather” is a relative term. Dry conditions that frustrate pastoral farmers please cropping farmers in late summer, with the converse being the case during the planting season in spring. A pastoral farmer requires consistent rainfall throughout the summer to maintain the quality and quantity of feed, yet wants no rain during the days of silage/hay making or shearing. In the pastoral systems of New Zealand, rainfall variability has a critical effect on production levels.

Pasture conditions heavily influence supply and demand for both store stock and finished stock, with significant effects on price levels. For example, favourable spring conditions lead to a surplus of pasture on finishing farms and an increased demand for stock to harvest that pasture. This so called “grass market” leads to increased prices paid for store stock. Conversely, a dry summer can result in less demand for store stock which reduces prices paid. A summer of high rainfall can reduce the number of stock sent to slaughter, often leading to a procurement war amongst processors for whom profitability is strongly correlated to throughput; the result is higher prices for farmers. A dry summer leads to a large number of stock sent to slaughter, putting pressure on killing space and a drop in prices paid.

Source: Shadbolt, 2009c.

New Zealand is young in geological terms and somewhat fragile; earthquakes are not uncommon and in some parts of the country there is constant geothermal and volcanic activity. Most volcanic activity in the last 1.6 million years has occurred in the Taupo Volcanic Zone in the North Island, which is extremely active on a world scale: it includes three frequently active cone volcanoes (Ruapehu, Tongariro/Ngauruhoe, and White Island) and two of the most productive calderas in the world (Okataina and Taupo). For example, a sequence of eruptions took place in 1995-96 with ash damaging crops and livestock, as well as affecting pasture and rural infrastructures (GNS Science, 2009), and, most recently, a strong earthquake occurred in the Christchurch area in South Island.

Animal health, pests and diseases

Pastoral farming is the core of New Zealand agriculture, and risks related to animal health constitute an important part of farming risk. They arise from animal sickness (not necessarily due to major contagious disease), harm caused to animals by insects, air temperature, feeding (*e.g.* presence of pests or poisonous plants in pasture), and various accidents.

New Zealand is free of many of the world’s major contagious animal diseases. Nevertheless, the possibility of large scale animal disease outbreaks, such as foot and mouth (FMD) and BSE diseases, are viewed by the Ministry of Agriculture and Forestry of New Zealand² among risks with the largest potential production and revenue loss. A study on the macroeconomic impacts of an FMD outbreak estimated possible damage at up to NZD 6 billion in the first year and NZD 10 billion after two years from losses in export volumes, and price and exchange rate shocks. This study by the Reserve Bank of New Zealand and Treasury underscores the fact that possible disease outbreaks are perceived as a threat with serious macro-economic implications (RB, 2003). All farm organisations and farmers interviewed during the OECD mission identified invasive

². Further referred to as MAF.

species and “exotic” diseases incursion among the major national risks, even though to date there has been no actual experience of a large scale outbreak of animal disease in New Zealand.

Labour risks

Pastoral farmers interviewed by OECD identified the availability of hired labour as an increasingly important concern. They could not be certain whether, at any reasonable wage, they would be able to hire adequately trained on-farm labour, either as shepherds, in their dairies, or for more general and less specialised work around their farms. Another type of labour risk identified by farmers, and largely reflecting the owner-operator status of many farms, consists of human health risks, such as injuries due to accidents and work disability resulting from illness, in particular when this affects farm operators.

Financial risks

According to a representative of the Federated Farmers, the largest farm advocacy organisation, farmers increasingly regard their farms as a financial system and focus on managing cash flows, rather than just on the physical production process. The key financial risks identified by farmers were the risk of debt financing in general, and in particular interest rate risks, and changes in land (and land rental) prices. Although market instruments exist to deal with some of these risks (e.g. interest rate hedging), they are more often dealt with by individual farm strategies, e.g. arrangements with banks, family budget management, business consulting, outsourcing financial management to specialised companies, etc.

Financial risks have increased in recent years as farm debt levels rose significantly. Between 2004 and 2009, outstanding debt in agriculture more than doubled in value terms, driven by the expansion of existing farms and the entry of new operators, particularly in dairy farming. In the recent crisis period, as commodity and land prices fell, farms continued to draw heavily on bank credit to meet their working capital needs. Although the cash position of farmers has since improved, the agricultural sector continues to be highly leveraged, with two-thirds of the total outstanding agricultural debt carried by dairy farmers (RB, 2010).

Policy uncertainties

A source of uncertainty for farming in New Zealand is the development of environmental regulations. Rapid agricultural growth and a shift to more resource-intensive activities, such as dairy farming and horticulture, have contributed to placing greater pressure on the environment. According to IPCC, agriculture currently accounts for about one half of total national greenhouse gas (GHG) emissions. Some estimates show that agriculture has become the largest source of nutrient pollution of natural waters and there are also signs that water use is approaching its limits in certain parts of the country (OECD, 2007). Public awareness of environmental issues has increased considerably in parallel with the growing conviction that economic growth must occur within acceptable environmental conditions. Over the past two decades, regulations have been strengthened in New Zealand in response to growing societal demands for a clean environment and sustainable growth.

At the national level, a series of new strategies, policy statements and environmental standards have emerged with direct implications for farming. These regulations concern areas such as air quality, waste management, soil conservation, and biodiversity. There

has also been much attention in recent years on water quality and water management (Box 4). Among other national initiatives is the enactment of a national Emissions Trading Scheme in late 2008. New Zealand is the first country to have included agriculture in such a scheme. However, uncertainties exist on the implementation of this scheme and the induced costs for farmers. To date, the base level for the reduction of emissions and the pricing principle for the tradable emissions have not been established. The starting date for the implementation of the commitments as related to agriculture has been recently postponed as has the date when farmers are to incur full costs of compliance. The fact that the commitments are subject to uncertainties has led to expectations among some farmers that agriculture may be withdrawn from the national scheme.

There are also uncertainties on how environmental regulations will develop at the regional level. In the early 1990s, New Zealand introduced an administrative reform which devolved the key responsibility for the management of natural resources to regional authorities, which now regulate issues of fundamental importance to agriculture. Under the 1991 Resource Management Act, regional authorities have the power to control land and water use within their territories in order to protect soils, water and air quality, as well as maintain biodiversity. As an operational instrument, regional and district councils develop resource use plans in which they can introduce and enforce relevant regional norms and regulations to implement environmental objectives. Regional authorities also issue land-use and water consents and other permits to users of natural resources.

As the *OECD Environmental Performance Review for New Zealand* noted, the full effects of this major institutional reform were felt only in the late 1990s (OECD, 2007). At present, regions have formulated their resource management objectives, and a “second generation” of the regional resource use plans has been launched for 2009-19. Over the coming years regional authorities will become more focussed on developing various policy instruments to underpin their environmental targets. The thrust of this process will likely be to internalise environmental costs as part of farming activities via new (or stricter) environmental standards, taxes, resource use charges, and tradable permits. Indeed, several regional authorities have introduced new environmental performance requirements (e.g. concerning manure management, stocking density, and water abstractions) and market mechanisms, such as permit trading schemes. A prominent example is the introduction of a Nitrogen Discharge Allowance (NDA) in the Waikato region to deal with water pollution (Box 5). Given the increasing environmental pressures and demands from society to address environmental issues, further regulatory changes will most likely evolve towards a broader application of similar or other economic instruments by regional authorities that will affect the structure and costs of the farming enterprise in New Zealand.

Such changes are an inevitable and legitimate development in a society increasingly concerned with environmental sustainability. Farming, as with any other economic activity, must adjust to the environmental constraints and to policies that impose such constraints. However, in terms of farming risk, the issue in New Zealand concerns the considerable uncertainty of farmers as to the exact nature such regulations will take and the costs to be incurred.

Box 4. New Zealand recent national environmental initiatives

Sustainable Water Programme of Action and Accord on Dairying and Clean Streams (2003)

There are signs that water use is approaching its limits in certain parts of the country, whereas in other locations there is a quality problem due to polluting nutrients that flow in from various sources, including agriculture. A Sustainable Water Programme of Action was implemented as of 2003 and a national policy statement on freshwater management and two national standards on water were developed in 2005. A Dairying and Clean Streams Accord was concluded between the dairy industry and the central and regional governments. It includes both voluntary initiatives (e.g. to exclude cattle from waterways) and a commitment to comply with regional council effluent management requirements. The recent snap shot of progress with respect to the Dairy and Clean Streams Accord highlighted that the number of dairy farmers in full compliance with resource consent requirements for effluent management fell from 64% in 2007/08 to 60% in 2008/09, with the number significantly non-compliant rising from 13% to 15% (Fonterra-MAF 2010). This underscores that in addition to new regulations, enforcement of existing environmental requirements is also an important task of environmental authorities.

New Zealand's Emissions Trading Scheme

New Zealand's contribution to global GHG emissions is only 0.3%, but in terms of per unit GDP, the country is the second-highest GHG emitter in the OECD area behind Australia and has the 12th highest per capita emissions in the world. New Zealand is a signatory of the Kyoto Protocol, with a commitment to reduce its GHG emissions to 1990 levels, on average, by 2012.

An Emissions Trading Scheme (ETS) covering all sectors of the economy was enacted in September 2008 by Parliament. The scheme is to be applied also to agricultural gases, according to current terms, starting from 1 January 2015 (compared to 2013 set initially). The ETS imposes costs on businesses, which will be obliged to purchase units of CO₂-equivalent emissions. The initial point of obligation for the agricultural sector is at the processor level, e.g. fertiliser manufacturers, and dairy and meat processors. As in the other sectors qualified as "emission-intensive and trade-exposed industries", agricultural processors will receive a free allocation of units equivalent to 90% of their emissions in a base year, which is yet to be determined. This free allocation is to be phased out at 1.3% per annum from 2016 (this implies a substantial prolongation of the phasing-out period compared to the initial terms). The allocation will be provided on an output intensity basis using an industry average emission per unit of output.

The emissions baseline is yet to be established, but it will be based on the industry average of emissions per unit of output during a chosen reference period. There is a great deal of uncertainty as to the amount businesses will have to pay. Most likely, the carbon price will be volatile and difficult to predict, as the carbon emissions market is still immature and fragmented.

Source: MAF, 2009e; OECD, 2009d; OECD, 2007.

Box 5. Lake Taupo Project: a case of regional tradable pollution permit

An example of the increased engagement of regional authorities in environmental protection was provided to OECD by the Waikato regional and district council officials. Lake Taupo is a UNESCO World Heritage Site. It is the largest freshwater lake in Australasia located in a highly scenic area of New Zealand's North Island. It is a tourist destination and highly valued by environmental groups. However, the quality of water has declined over the past three decades due to increased nitrogen inflows. According to MAF, most of the pollution originates from non-agricultural sources. However, an estimated 37% come from pastoral farming and is caused by nitrogen leaching from urine patches into the groundwater. This source of pollution accounts for over 90% of "manageable" (i.e. human-induced) inflows. After approximately ten years of negotiations with interested parties, including pastoral farmers, a Nitrogen Discharge Allowance (NDA) was introduced. The principle of NDA is to regulate the leaching of nitrogen at the output level and leave some flexibility to farmers with respect to their farming practices as long as they observe pollution limits. Around 100 livestock farms operating in the Lake Taupo catchment area are now being allocated their discharge allowances based on the measurements of the nitrogen they are leaching. The NDAs can be traded among farmers.

The feasibility of the NDA scheme was contingent on developing a technical system able to monitor the nitrogen leaching at the individual farm level. This underscores one important feature of pollution trading schemes, such as NDA: they typically enable cost-effective solutions for specific environmental problems, but can be demanding in terms of design and administration.

Source: OECD, 2008; OECD, 2009d; OECD interview with Waikato regional and district officials.

Ranking of risks in farmers' perception

This section looks at how farmers perceive the relative importance of these various risks. Since the mid-1980s, a series of studies in New Zealand have focussed on this issue. Although covering different farm/industry types and done in different economic and policy situations, these studies help to understand the relative importance of farming risks and to see how the farming risk environment has changed over time. All the available studies focus on livestock farming, but are sufficiently illustrative of the overall agriculture given the prevalence of livestock farming in New Zealand.

According to farmers, the most important sources of market risks are changes in output and input prices and the world economic situation (Table 1). Output price risk invariably scores highest among all risks identified by the various studies. The most important production risks are associated with weather, and more specifically, rainfall. Finally, accidents and health problems are also a recurrent risk in the top-five group, but typically score behind market and production risks. Financial risks, related to credit and land market conditions are generally of lesser concern to farmers, although in the most recent (2005) study of dairy farmers, interest rate risks emerge among the top five risks.

Pinochet-Chateau *et al.* (2005) compared the risk perceptions of New Zealand dairy farmers with the study by Martin (1994), which shows how farmers' perceptions of risk have changed over time (between 1992 and 2004) as indicated by the overall ranking of risks and changes in the average levels of significance of risks (from very to not important).

The highest ranked risk source in both 1992 and 2004 continued to be changes in product prices. Interestingly, the second and third-ranked risk sources in 2004 – changes in the world economic and policy situation and changes in input prices – both scored lower in 1992. The fourth highest ranked risk in 2004 was accidents and health, and marked increase from its 1992 ranking. The fifth highest source of risk in 2004, changes in interest rates, also increased from its 1992 ranking.

Changes occurred in some of the components of production risk over the twelve-year period. For example, perceived risks from rainfall variability declined between 1992 and 2004, whereas risks from pests and diseases increased. Importantly, farmers' perception of regulatory risks and risks from hired labour and contractors increased between 1992 and 2004. As expected, changes in producer board policies as a source of risk in 2004 was of low relevance as compared to 1992.

Table 1. Farmers' perception of risks: types of risks and their ranking by importance

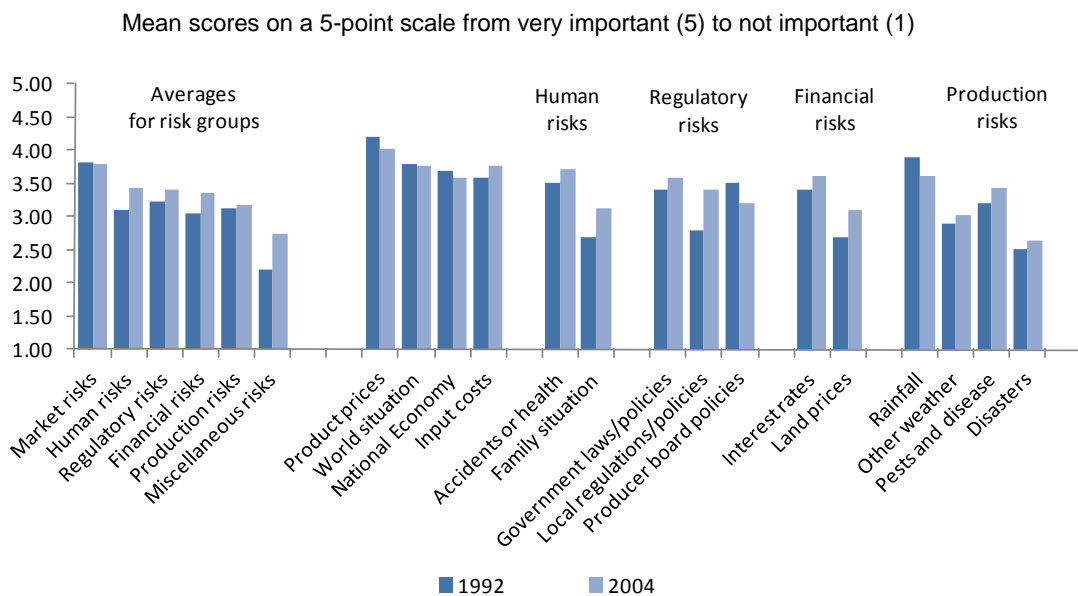
Livestock farmers Bogges <i>et al.</i> (1985)		Livestock farmers Patrick <i>et al.</i> (1985)		Sheep and beef farmers		Deer farmers Martin, (1994)		Dairy farmers		Dairy farmers Pnochet-Chateau <i>et al.</i> (2005)					
1	Product prices	M	Product prices	M	Product prices	M	Product prices	M	Product prices	M	Product prices				
2	Weather	P	Input costs	M	Input costs*	M	Global economy	M	Weather (rainfall)	P	World situation				
3	Pests and diseases	P	Weather	P	Global economy*	M	Changes in law s and policies	L	Global economy	M	Input costs				
4	Input costs	M	Pests and diseases	P	National economy*	M	Pests and diseases	P	National economy	M	Accidents or health problems				
5	Accidents or health problems	H	Accidents or health problems	H	Weather (rainfall)*	P	Accidents or health problems	H	Input costs	M	Interest rates				
6	Inflation	M	Inflation	M	Accidents or health problems*	H	National economy	M	Changes in producer board policies*	L	Rainfall				
7	Global economy	M	Global economy	M	Changes in law s and policies	L	Changes in producer board policies	L	Accidents or health problems*	H	National economy				
8	Capital equipment	M	Interest rates	F	Interest rates	F	Input costs	M	Interest rates*	F	Changes in law s and policies				
9	Theft	H	Capital equipment	M	Pest and diseases	P	Interest rates	F	Changes in law s and policies*	L	Pests and diseases				
10	Changes in law s and policies	L	Changes in family situation	H	Changes in producer board policies	L	Weather (rainfall)	P	Pests and diseases	P	Local law s and policies				
11	Changes in family situation	H	Changes in law s and policies	L	Weather (other factors)	P	Theft	H	Weather (other factors)	P	Changes in producer board policies				
12	Changes in technology	T	Use of leverage	F	Changes in family situation	H	Changes in local law s and regulations	L	Changes in local law s and regulations	L	Changes in family situation				
13	Interest rates	F	Credit availability	F	Changes in local law s and regulations	L	Weather (other factors)	P	Changes in land prices*	F	Labour/contractors				
14	Use of leverage	F	Changes in agricultural programs	L	Changes in land prices	F	Changes in family situation	H	Changes in family situation*	H	Land prices				
15	Labour/contractors	H	Changes in technology	T	Theft	H	Changes in land prices	F	Disasters*	P	Weather (other factors)				
16	Credit availability	F	Labour/contractors	H	Disasters	P	Changes in technology	T	Theft*	H	Theft				
17	Changes in agricultural programs	L	Leasing of land	F	Labour/contractors	H	Disasters	P	Labour/contractors	H	Disasters				
18	Leasing of land	F	-	-	Changes in technology	T	Labour/contactors	H	Changes in technology	T	Changes in technology				
19	-	-	-	-	Inability to meet contracts	L	Inability to meet contracts	L	Inability to meet contracts	L	Inability to meet contracts				
Grouping of perceived risks by type															
Market risks (M)			Production risks (P)			Financial risks (F)			Human risks (H)			Social and legal risks (S/L)		Technological risks (T)	
Product prices			Weather			Interest rates			Labour/contractors			Changes in (government) law s and policie: Changes in technology			
Input costs			Pests and diseases			Changes in land prices			Accidents or health problems			Changes in local (body) law s and regulations			
Global economy			Disasters			Credit availability			Changes in family situation			Changes in producer board policies			
National economy						Use of leverage			Theft			Inability to meet contracts			
Inflation						Leasing of land						Changes in agricultural programs			
Capital equipment															

Asterisk (*) indicates that risks received equal ranking score.

Source: Based on Shadbolt, 2009.

A comparison of risk study findings in 1992 and 2004 also sheds light on the changes in the level of significance of perceived risks. Respondents in both studies were asked to attribute scores to various types of risks based on a five-point scale – from 1 (not important) to 5 (very important). Mean scores were calculated for each individual type of risk and for each group of risks (Figure 5). The results show that the mean scores for all groups of risks, with the exception of market risks, increased. Market risks continued to exhibit the highest mean score (3.8 points) compared to other types of risks, and decreased only marginally over the period under study. The scores also indicate that the risks with most important rises in the level of significance were human risks, financial and regulatory risks.

Figure 5. Risk scores in dairy farmers' perceptions: changes between 1992 and 2004



Source: Pinochet-Chateau *et al.*, 2005.

Gray *et al.* (2009) discuss possible reasons for the change in farmers' risk perceptions. They suggest that the increased importance of accidents and health problems as a source of risk could reflect both the predominantly sole-operator nature of the farm business and increased awareness of laws related to health and safety. The reduction in the perceived risk associated with rainfall variability could be due to more farmers using strategies to manage rainfall risks. Risks from pests and diseases are perceived to be greater possibly because farmers still feel themselves threatened by animal health issues. A decline in risk perception of changes in producer boards could be due to deregulation of the industry, whereas the introduction of the Resource Management Act (RMA) may have been behind farmers' increasing perception of risks associated with changes in local laws and regulations. The tightness of the labour market, particularly in the South Island, and the problems this has created for both the recruitment and retention of labour is suggested as a reason for the higher score for risks associated with problems with hired labour and contractors in 2004.

The above surveys considered only the negative side of risk. Recent research in progress by Shadbolt *et al.* (2010) on dairy farmers introduces additional dimensions to risk analysis. This study explores not only farmer's perceptions of risk, but also their

opinion on the likelihood of such events occurring; the research also examines the extent to which farmers view risks as an opportunity or a threat, and how the time frame influences farmers' perceptions of risk.

The results are still exploratory in nature, but suggest that in the short-term (within a season) farmers expect many positive impacts from uncertainty and few negative impacts. However, over the longer term, although several types of uncertainty are perceived to have high positive impacts, farmers also perceive uncertainties that create high negative impacts. The study further develops the “uncertainty scores” by multiplying the impact score (positive or negative) of a particular uncertainty by its likelihood score. Table 2 summarises the uncertainties that received the highest “uncertainty scores”.

Table 2. Farmers' perception of uncertainties as generating opportunities and threats

Short-term		Long-term	
Opportunities	Threats	Opportunities	Threats
Business relationships	Input costs	Skills and knowledge	Input costs
Skills and knowledge	Product prices	Product prices	Local body laws and regulations
Interest rates	Weather conditions	Interest rates	

Source: Shadbolt *et al.*, 2010.

Interestingly, the uncertainties that seem to be easiest to manage are viewed as providing the greatest opportunities (business relationships, skills and knowledge of those in or associated with the business, and interest rates), while those less easy to manage are seen as the greatest threats (e.g. weather conditions). It is also remarkable that the perception of whether uncertainty generates opportunity or threat depends on the time horizon. For example, variations in product prices are viewed as a negative uncertainty in the short-run, but as providing opportunity in the longer term. This shift in perception may be related to the ability to manage the risk: farmers may feel that in the long-term they can develop strategies and instruments to benefit from the price variations. Finally, the study also suggests that some risks treated as negative in previous studies, such as variations in interest rates, can be viewed by farmers as something that could generate business opportunities. Since 2004 product prices have improved and interest rates decreased so it may be that current attitudes to risk reflect present conditions rather than a longer term view of the likely changes. It should also be noted that the results of the study may possibly reflect a sample bias: the farmers surveyed were all average to above average managers and so would be confident in their ability to leverage skills and knowledge to best effect.

In summary, variations in product prices and weather conditions feature permanently as the top farmers' risk perceptions. However, recent analysis suggests that farmers may not always view product price risk as a threat, but rather as an opportunity. Human risks, related to accidents and health, represent another permanent top source of risk. Recently, uncertainty about local laws and regulations has moved up in farmers' ranking. The perception of risk level has generally increased, i.e. farmers tend to estimate the same risks as more important than previously. New Zealand farmers distinguish risks that generate threats and those that generate opportunities, with the dividing line between the two likely being the ability of the farmer to manage the risk. As this ability may change in the long run, their perception of risk as an opportunity or threat may also change with time.

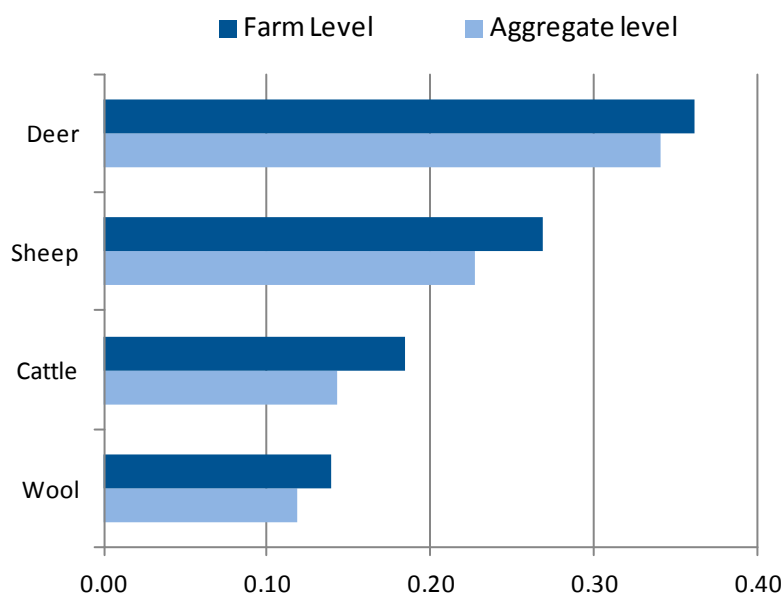
Quantitative assessment of agricultural risk: the case of New Zealand meat and wool farms

This section provides a quantitative assessment of farming risks in New Zealand. The analysis is based on the method developed by OECD for the cross-country study of farm level risk analysis (OECD, 2010a). Variations and correlations of prices, costs and returns are estimated using the farm-level data. These indicators are used to evaluate farmers' risk exposure and the relative importance of the various sources of risk.

Several introductory remarks concerning the data availability are warranted. The New Zealand data covers only specialised meat and wool farms, thus the analysis for this country focuses on risks in livestock farming³. This differs from other countries where databases include mixed farms, and the risk assessment is mainly focussed on crop farming.⁴ The fact that data for New Zealand concerns only livestock farms somewhat limits the scope of the analysis. Thus, no attempt has been made to assess output risks, as was done for other countries, due to the difficulty of disentangling “normal” variations in the numbers of livestock sold that arise from stock cycles from any other output variations. The farm-level risk analysis for other countries also included stochastic simulations of risk management strategies; this is not done for New Zealand as the model used is not adapted for livestock farming simulations. These limits notwithstanding, the analysis of farm-level data provides interesting insights into farming risks in New Zealand.

Figure 6 shows coefficients of variation of prices for the principal livestock products at the farm and the aggregate levels. New Zealand livestock farmers operate in an environment of relatively high price instability. Over the period of 1999-2007, prices for cattle, sheep and wool fluctuated roughly between 14% and 27% around their means observed at farm levels, while this fluctuation reached 36% for deer farmers. Consistent with findings for other countries, the variability of prices at the farm level in New Zealand is higher than at the aggregate level. However, the divergences between the farm-level and the aggregate-level variability are not significant. In the relatively small and integrated New Zealand agricultural markets it can be expected that disparities in price movements across locations are not large.

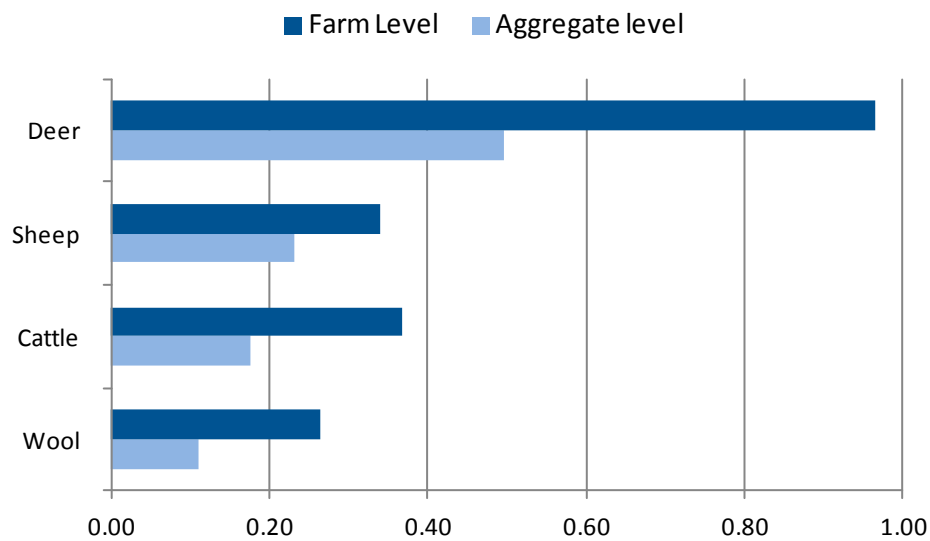
-
3. The micro-data used in this section originates from the *2006-07 Sheep and Beef Farm Survey* by the industry organisation Beef and Lamb New Zealand (former Meat and Wool New Zealand). The sample covers a panel of 100 farms with observations for the period between 1999 and 2007, which have at least 70% of the farm revenue derived from sheep, or sheep plus beef cattle and with at least 80% of the stock units on the property being sheep and/or beef cattle stock units.
 4. Other countries for which farm-level risk analysis was carried out include Australia, Estonia, Canada, Germany, Italy, the Netherlands, Spain and the United Kingdom.

Figure 6. Coefficients of variation of meat and wool prices, 1999-2007

Source: OECD based on NZ *Sheep and Beef Farm Survey* data.

It is also instructive to examine the variability of producer gross margins, which represent a closer proxy of producer income.⁵ Figure 7 shows coefficients of variation of gross margins for various livestock products expressed per stock unit (a stock unit is equivalent to one ewe head⁶). During the period 1999-2007, the farm-level margins for cattle and sheep breeding (including wool) fluctuated between 26% and 37%, while deer breeders experienced extremely high instability of their returns with fluctuations reaching 100%. The survey data also shows that margin variations at the individual farm level are much more significant than the variations of aggregate margins. For wool, cattle and deer the farm-level coefficients of variation are more than double than those measured at the aggregate level; for sheep only, the divergence between the farm and aggregate-level volatility is somewhat smaller. This implies that the margins across individual farms may move in different directions with the result that fluctuations of the aggregate margin are reduced.

5. Gross margin is defined as the value of sales, adjusted for changes in livestock numbers between open and close of the year at market value, less direct expenses (e.g. shearing, dipping and animal health expenditures) and less the opportunity cost of capital involved with livestock enterprise (the opportunity cost is estimated as the interest that would be associated with purchasing of an extra stock unit at prevailing overdraft interest rates or alternatively, the interest revenue foregone by not investing that money elsewhere).
6. The following ratios are applied in the *2006-07 Sheep and Beef Farm Survey* to convert actual animal numbers into stock units: for cattle the ratios vary from 5.5 to 3.5 stock units per animal head depending on the type and age of cattle; for sheep from 0.7 to 1.0; for deer from 2.2 to 1.2; and goats from 0.5 to 0.8 units per animal head.

Figure 7. Coefficients of variation of gross margins per stock unit for meat and wool, 1999-2007

Source: OECD based on NZ Sheep and Beef Farm Survey data.

The fact that individual farms see different patterns of margin fluctuations is supported by the estimates of the coefficients of correlation of margins across farms. Although the correlation is positive on average, for three products out of four (cattle, deer and wool) the coefficients are small and vary between 0.22 and 0.26. It is only for sheep that the correlation of unit margins across farms is relatively important (at 0.52). These results are consistent with the conclusions drawn from the comparison of margin variation at the farm and aggregate levels.

Differences in the direction of farm-specific margins may be partly attributed to specificities of the production systems and/or climatic conditions affecting, for example, the nature of the changes in unit costs and therefore in unit margins across farms. Margin movements are also a reflection of differences in production, cost management and marketing strategies applied by individual farms. More generally, these results suggest the high importance of on-farm risk management strategies in New Zealand.

Diversification of output allows differences in variations of returns for different products to be exploited. A combination of products whose returns are not perfectly (or even negatively) correlated reduces the variability of total income. Product prices are one determinant of producer returns. The observation of correlations between prices for different products can therefore provide some idea on the potential of output diversification to reduce income risk. Table 3 contains a matrix of price correlations for principal livestock products using individual farm data. As can be expected, all product price correlations are less than perfect and in the majority of cases coefficients do not exceed 0.50. However, lamb prices are more or less strongly correlated with sheep and cattle prices. Wool (as part of sheep breeding) may be an important diversification option for cattle producers, as correlation between the prices in the two activities is very low. Deer prices are virtually de-linked from sheep product prices (lamb and wool) and are weakly correlated with cattle prices. From the standpoint of price correlations, diversification into deer farming can be a potentially effective strategy to reduce income risks for pastoral producers. In fact, pastoral farms in New Zealand have diversified their activities into deer breeding over the past decades, although it is more likely that the

principal driver of this trend are the new business opportunities rather than income risk reduction as such.

Table 3. Correlation matrix of meat and wool prices, 1999-2007

Average coefficients at farm level

	Cattle	Lambs	Sheep	Wool	Deer
Cattle	1.00	0.58	0.47	0.19	0.38
Lambs		1.00	0.73	0.50	0.10
Sheep			1.00	0.46	0.04
Wool				1.00	-0.03
Deer					1.00

Source: OECD based on NZ Sheep and Beef Farm Survey data.

Price correlations provide only partial evidence on the potential of output diversification because output and cost correlations across different products are not taken into account. A more complete picture can be obtained from the correlations between gross margins as they reflect price, output and cost variations. Table 4 presents correlations between the gross margins per livestock unit in the three principal pastoral activities — cattle, sheep and wool, and deer breeding. The estimates show that all margin correlations are relatively weak. Moreover, gross margins in the sheep and deer breeding are negatively correlated. These results are congruent with the evidence from price correlations, implying that even within pastoral farming diversification across different livestock types may have important income-stabilising effects.

Table 4. Correlation matrix of meat and wool gross margins

Average coefficients at farm level

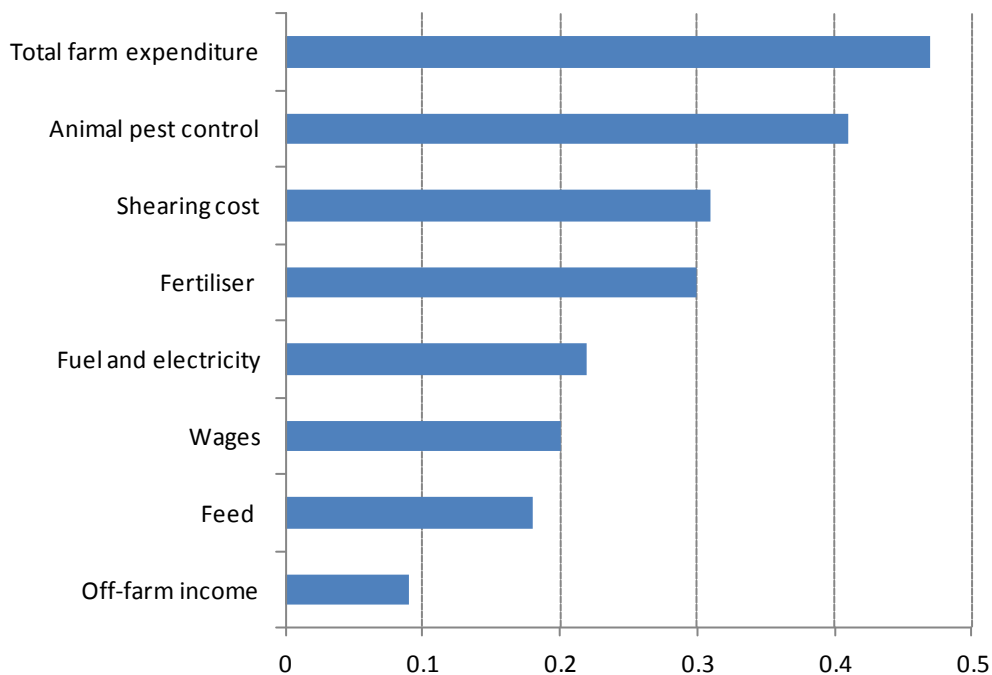
	Cattle	Sheep and wool	Deer
Cattle	1.00	0.32	0.20
Sheep Wool		1.00	-0.10
Deer			1.00

Source: OECD based on NZ Sheep and Beef Farm Survey data.

To understand income risk, it is also important to consider the interaction between various components of income. The variations in individual income components are typically not isolated. For example, changes in production costs tend to be associated with changes in agricultural revenue (through adjustments in output and prices). If costs and agricultural revenue are positively correlated, the variance of income is reduced. Figure 8 shows that there is in fact a positive correlation between agricultural revenue and all principal variable costs in the sample farms; the positive correlation is particularly evident with respect to the total farm expenditure (which includes all working expenses and depreciation). This suggests that there is an apparent transmission of changes in production costs to agricultural revenues in livestock farming, with stabilising effect on farm incomes.

Another important co-variance is between agricultural revenue and off-farm income.⁷ It can be assumed that off-farm income is negatively correlated to agricultural revenue, i.e. farmers tend to compensate falls in farm receipts by off-farm earnings and in such a case, off-farm income would play the role of stabiliser of total farm income. However, this is not confirmed by the farm data. As can be seen in Figure 8, agricultural revenue and off-farm income are weakly but positively correlated. These results should be taken with care though: as highlighted further in the discussion of off-farm income in section 2.1, data on off-farm income may be incomplete. It is derived from farm budgets and may not capture that part of off-farm income which is not recorded in farm accounts.

Figure 8. Correlation between agricultural revenue, production costs and off-farm income for meat and wool farms



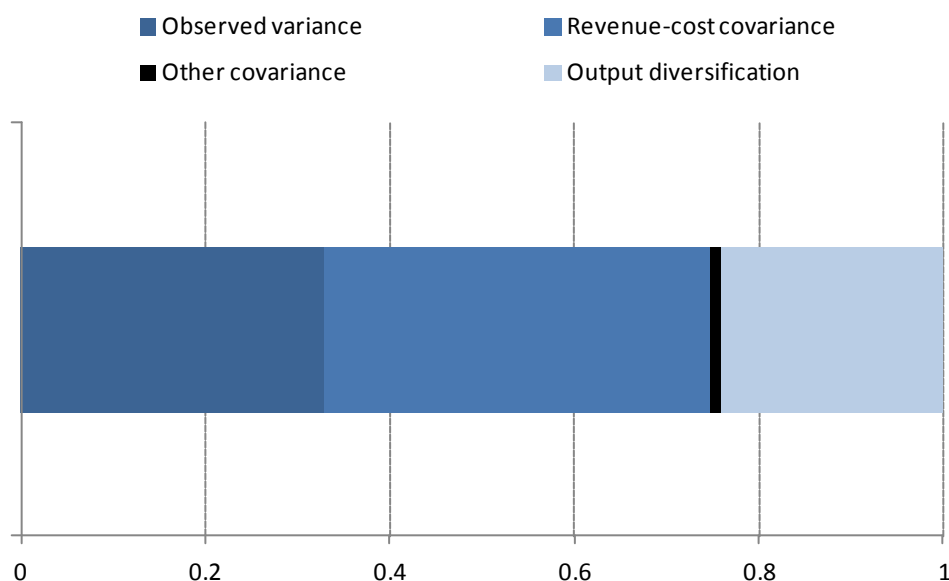
Source: OECD based on NZ *Sheep and Beef Farm Survey* data.

The variance of total farm income originates from many sources, such as fluctuations in revenue and costs and product composition. Income variability is also affected by co-variation between various income components.⁸ How important is the contribution of each individual source to the variation of total income? In order to answer this question, a methodology developed at (OECD, 2010a) was applied to New Zealand micro-data.

7. In fact, approximately 83% of farms in the sample received off-farm income.
8. Other principal sources of income risk that are not explicitly analysed here are variations in output and output-price co-variations. As noted earlier, this is due to the difficulties in measuring output variations for livestock farming.

Figure 9 presents the results of this decomposition. With output diversification, the income variance is reduced by almost 25%⁹, and revenue-cost co-variance brings income variance down by another 40%, while the effect of other co-variances (between off-farm income and revenue and off-farm income and costs) is marginal. In sum, the observed variance of farm income is reduced by more than two thirds due to revenue-cost correlations and output diversification. These results are generally consistent with the findings for other countries reported in OECD, 2010a.

Figure 9. Decomposition of income variance



Source: OECD based on NZ Sheep and Beef Farm Survey data.

Overall, farm data confirm that New Zealand meat and wool farms operate in relatively integrated output markets, but which are characterised by price and margin instability. Farms are visibly differentiated by the behaviour of individual unit margins even where they face relatively similar market conditions. The data suggest that unit margins across farms often move in different directions, with the result that the variations in the aggregate-level margins are reduced. Thus, income variability at the aggregate level disguises the actual risk exposure of farms. The differences in the fluctuations of unit margins across farms also indicate the importance of on-farm strategies in managing income risk.

9. A contribution of output diversification into the income variance (Var I) is estimated as follows. A variance of income assuming sheep monoproduction is calculated (Var ISH), and the difference between Var ISH and Var I is assumed to be the contribution of output diversification into the income variance. In order to estimate variance of income with sheep monoproduction, a group of 52 farms in the total sample of 100 farms was selected which keep only or predominantly sheep (sheep comprising not less than 90% of the total headage on farm). The average income variance across these farms was estimated and assumed to correspond to the variance under sheep monoproduction. The distribution of the remaining farms in the sample is the following: on 31 farms 81% of animals were sheep, 11% deer and 8% cattle; on ten farms, 58% of the animals were sheep and 42% were cattle; and seven farms kept only cattle.

The analysis shows that the contribution of output diversification to reduce income variations is relatively important. These results are noteworthy in that they are obtained from farms that represent specialised units. The findings for meat and wool farms may be reinforced by broader evidence from other sectors. In fact, it is reasonable to assume that product mixes in other farm types are also characterised by imperfect and possibly weaker price and margin correlations, as other types of farms generally have possibilities to diversify across a broader range of commodities and which do not represent substitutes.

Another important finding is that co-variation between farm costs and revenue is shown to be a significant factor in stabilising farm income. The results underscore the importance of “automatic stabilisers”, such as market adjustments between prices, output and costs, in reducing the farm income risk in New Zealand.

Information and communication on risk and risk management

No level of government in New Zealand has any formal responsibility for advising farmers on agricultural risks, but government agencies do perform other tasks that generate information relevant to farmers in assessing risks, especially with respect to adverse events. Information concerning market and financial risks is largely provided by private companies and farmer organisations in New Zealand.

Non-government providers

Agri-Fax is a wholly owned subsidiary of the New Zealand Stock Exchange that provides access to a wide range of commodity price information. In most cases, data is available on a weekly, monthly, quarterly or yearly basis and is available on a user-pays basis.

Information on a range of exchange rates is available from the global standard VIX index and is reported in all newspapers and fluctuations are reported as national news.

Farming publications play an important role in New Zealand. Farmers receive most of these publications for free as they are largely funded through advertising. The *Farmers Weekly*, for example, is delivered free to all farms every week and contains up-to-date information on prices, exchange rates and interest rates. It also provides analysis and commentary on issues of relevance to farm businesses. Much of the information published is sourced from AgriFax.

Analysis and commentary on information is also offered by farm consultants nationwide who are usually hired by farmers/growers on a regular basis. Advice is provided by input advisors (from fertiliser cooperatives, specialist rural bankers, and stock and station firms).

Farmer associations (“industry good” bodies) carry out research, sometimes directly focused on farming risks. Industry good bodies provide data on movements of input and output prices, basic statistics, information on animal diseases and risk factors, and advice on how to cope with adverse conditions arising from drought, floods or snow storms. For example, an industry good body of meat producers provides analysis of market prices and on-farm profitability. They are able to forecast the impact of climatic events (droughts or snow storms) and price changes (due to exchange rate or overseas market prices) on individual regional “typical” farms and the aggregate industry. By monitoring stock killing patterns, they predict changes in the national flock and herd composition. Their

interpretation of trends in supply and prices provide important information to both farmers and processors/exporters.

Government

A number of public agencies represent unique sources of information on natural risks. The publicly-owned National Institute for Water and Atmospheric Research (NIWA) provides nation-wide weather forecasts which are freely accessible to the public. This includes forecasts of a range of climate variables, such as soil moisture deficit days, rainfall, snow fall, hail, frost, sunshine hours and temperature, with early warnings of extreme weather events. NIWA carries out research in key areas concerning water and climate, including climate change.

The Institute of Geological and Nuclear Sciences (GNS) is another publicly-owned research centre that carries out research on a wide range of issues; those relevant to farming include assessing and monitoring the risks and impacts from earthquakes, landslides, volcanic eruptions and tsunamis.

A MAF agency, Biosecurity New Zealand, is responsible for prevention and mitigation of the incidence of invasive species and exotic diseases, and undertakes most research related to these issues. It provides information to regional governments and the general public on the potential risks of exotic diseases and pests, as well as on the status of existing diseases and pests.

Regional governments provide public information on flood protection and most operate warning systems on river levels to inform farms/households that are located in risk areas. More generally, as part of their planning process, regional government councils are required to take account of natural hazards in their region and thus provide useful information to farmers in assessing their exposure to adverse natural events.

As noted, most of the business and market information and analysis in New Zealand is provided by farmer organisations and private companies. However, MAF regularly monitors the commodity sectors and provides forecasts for key commodity markets. As a result, yearly price data on a range of inputs and outputs is generated and can be used by farmers and others to help inform price risk assessments.

2. Risk management strategies and government policies

This section examines risk management strategies and government policies that support them. The strategies are classified according to criteria following the analytical framework introduced in OECD (2009c); that is, whether the strategy reduces the probability of risk occurrence (risk reduction); whether it reduces the magnitude of the damage (risk mitigation), and whether it reduces the impact on consumption (risk coping). Another distinction between various strategies relates to the institutional level at which the main action takes place: some risks are managed by the means available within a farm household/community; others are dealt with through markets; and some risks require public action. Table 5 adopts this two-dimensional classification. The table highlights the strategies which have special relevance in New Zealand, but does not attempt to be exhaustive. The purpose is to facilitate an effective comparison of risk management in the countries covered by the thematic reviews. However, the discussion that follows considers New Zealand's risk management strategies in a more comprehensive way.

The mapping of the risks and strategies to deal with them is specific to the risk and institutional environment of each country. However, there exist some connection between the types of risks and the types of institutions through which different risks are managed. There are risks that arise from acts of nature and are typically beyond the farmer's capacity which because of their *catastrophic* character (low probability and high damage) are barely manageable at the farm level or through risk markets; they typically require public action and the underlying government policies. There are risks that can be regarded as *normal* (with high probability and low damage) which are typically managed at the level of farm (as business entity and/or household) and without significant involvement of markets or government. Finally, there are risks with medium probability and medium damage that are more appropriately managed through risk transactions through *market* instruments.

This section analyses how the boundaries between the three risk layers – normal, marketable and catastrophic – are developed in specific risk and policy environments of New Zealand. It then examines the strategies used at the farm/household level and the policies related to this risk layer. Next, market instruments for risk management are considered, as are the policies in this area, followed by a discussion of government measures that deal with catastrophic risk. The concluding section provides an overall assessment of risk management policies in New Zealand.

Table 5. Risk management strategies having specific importance in New Zealand

	Farm household and community	Market	Government
Risk reduction	<ul style="list-style-type: none"> Pasture management Building feed reserves Irrigation 		<ul style="list-style-type: none"> Regulatory framework Macroeconomic policies Biosecurity policy
Risk mitigation	<ul style="list-style-type: none"> Financial management 	<ul style="list-style-type: none"> Vertical integration Exchange rate hedging 	
Risk coping	<ul style="list-style-type: none"> Community aid to families: Rural Support Trusts 		<ul style="list-style-type: none"> Adverse Event Framework (disaster assistance)

Boundaries between risk layers: catastrophic, marketable and normal risks

Catastrophic risk

There is no formal definition of an adverse event in New Zealand based on assessed probabilities of occurrence or other quantitative criteria, for example threshold levels of damage or falls in output. The only explicitly expressed characteristic of an adverse event is the inability of local communities to cope with it (MAF, 2006). Whether the community is able to cope with the event or not, as well as the scope and scale of

assistance, is established in each case through a determined procedure. Importantly, the assessment concerns the economy-wide impacts and is not specifically focussed on farming. An adverse event is therefore an *ad hoc* notion in New Zealand, implying that the boundary of the catastrophic risk layer is flexible and not determined *ex ante*. Biosecurity risks are regarded as potential catastrophic risks and protection against such risks is the main agriculture-related policy of the central government.

Marketable risk

Risks in this layer are more frequent but with a smaller magnitude of damage. Typically, specific arrangements exist to enable farmers to transfer such risks to other parties or pool them; for example, through the insurance market, futures markets, forward contracting, or risk pooling within co-operatives. The insurance market in New Zealand operates without policy support and this market is relatively limited. Few risks, generally consisting of damage to farm structures and equipment, are insurable. Risk related to losses in livestock and crop production are typically dealt with outside the insurance system. In particular, biosecurity policy plays a key role in New Zealand in containing crop and animal risks that arise from pests and diseases. Some important natural risks, such as floods, are virtually non-insurable. The small size of the New Zealand market and the small number of potential traders prevent the emergence of a commodity futures markets in the country, while trading on such markets overseas is limited by large basis risks for hedgers in New Zealand. As a result, most market related risks are managed through various forms of contracting in input and output markets as well as through vertical integration; in some sectors this occurs predominantly within a co-operative framework. All these arrangements, which can be labelled as institutions of “secured contract”, are the core of the marketable risk layer in New Zealand.

Normal risk

Normal risks are relatively frequent and associated with relatively small losses. Farmers are able to manage such risks individually by using on-farm techniques and other means available to farm households, or general economic mechanisms, such as tax, credit or social security systems. Assuming that the degree of development of a “secured contract” largely sets the limits of marketable risks in New Zealand and that this degree varies by different commodity sectors, the boundary between marketable and normal risk layers is also sector-specific. Farmers in the sectors where contractual and vertical integration arrangements are relatively limited (e.g. meat and wool) rely on individual strategies to manage various risks – particularly, price risks – to a greater extent than in the sectors where contractual arrangements prevail (e.g. dairy). However, irrespective of sectoral differences, the importance of on-farm risk management is relatively high in New Zealand due to the policy environment which creates little expectation amongst farmers that the costs of their business risks will be systematically shared by society.

Strategies at farm household/community level

The studies on farmers' risk perceptions discussed in section 1.3 also looked into farmers' risk management strategies. They do not identify the types of risk management techniques in a consistent way, which limits the scope for comparison but nevertheless provide some insights into the risk management strategies used by farmers in New Zealand.

The farm level is typically where the majority of output risks are managed. Earlier studies by Boggess *et al.* (1985), Patrick *et al.* (1985) and Wilson *et al.* (1993) focus on the relevant techniques used by farmers (Table 6). This analysis shows that the preferred actions were enterprise diversification, production practice diversification, maintaining feed reserves and flexibility (i.e. adjusting quickly to changes in the weather and markets). Less preferred responses were idling capacity and geographic dispersion. Martin's (1994, 1996) studies of pastoral farmers found that the highest ranked risk management response across all farm types (dairy, sheep and beef, deer) was routine spraying and drenching, a response not mentioned in previous studies; maintaining feed reserves was the second important technique. Martin (1994) concluded that New Zealand pastoral farms preferred to cope with variation in climate by adapting to the changing conditions through feed reserves and short-term flexibility¹⁰ rather than by irrigation. A more recent study of dairy farmers by Pinochet-Chateau *et al.* (2005), which compared data from Martin's 1992 survey with data they collected in 2004, confirmed that dairy farmers continued to consider routine spraying and drenching, and feed reserves as the main techniques to manage production risk (Box 6).

The results obtained by Martin and Pinochet-Chateau *et al.* are particularly instructive as they identify not only dairy farmer strategies to manage output risks, but also strategies to deal with other risks, such as marketing, financial management, and business diversification. This broader scope provides insights about the relative importance of different types of strategies. The studies suggest that financial and overall business management play as important a role as techniques to manage output risks, whereas marketing and diversification are used by farmers to a far lesser extent (Figure 10).

The majority of risk management techniques, including marketing and financial management, are applied at the farm level, while there is limited recourse to market instruments (*e.g.* forward contracts and futures markets). The finding about the relatively low importance of marketing strategies, including those applied by farmers individually, should be viewed with caution, however. The study covers dairy farms only and may reflect a certain bias related to this sector. New Zealand dairy farmers strongly rely on co-operative marketing and therefore may not rate marketing techniques as high as farmers in other sectors. In the meat, pipfruit¹¹ and grain sectors, primary producers are relatively less integrated with downstream activities and individual farm marketing strategies may be more important than in the dairy sector. This is also confirmed by OECD interviews with some of the farmers in these sectors.

10. The studies by Martin *et al.* Pinochet-Chateau *et al.* distinguish short-term and long-term flexibility. The former means adjusting quickly to weather, price and other factors to reduce risk, and the latter means an ability to make major changes in the longer term to reduce risk.

11. Pipfruit is a term commonly used in New Zealand to indicate apples and pears.

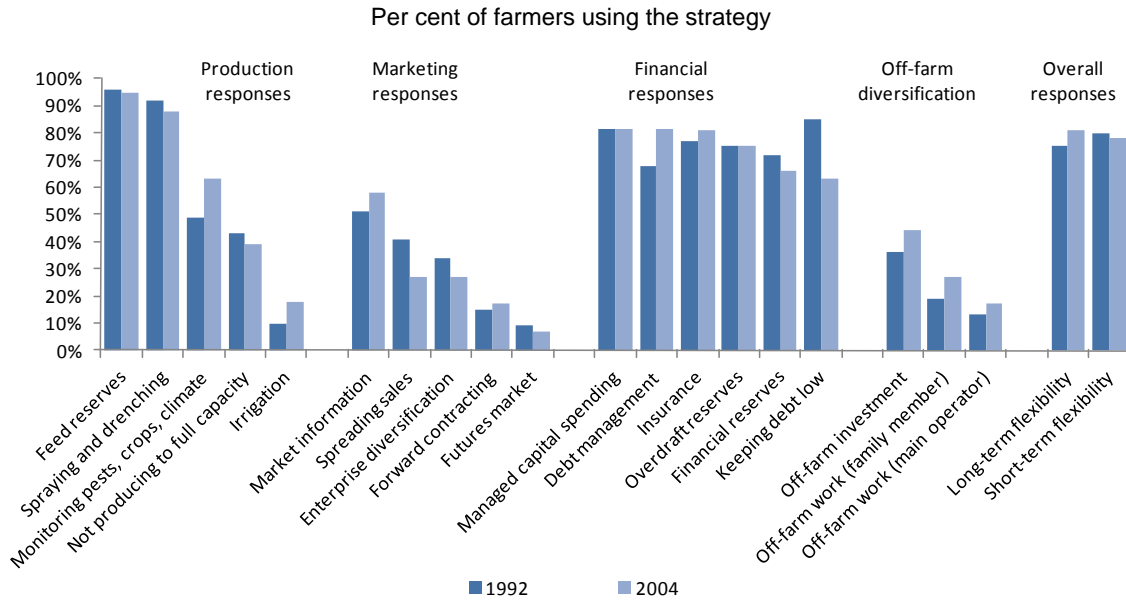
Table 6. Risk management strategies and their ranking in farmers’ perception

	Livestock farmers Boggess <i>et al.</i> (1985)	Livestock farmers Patrick <i>et al.</i> (1985)	Sheep and beef farmers	Deer farmers Martin, (1994)	Dairy farmers	Dairy farmers Pinochet-Chateau <i>et al.</i> (2005)
	1	Enterprise diversification	P Enterprise diversification	P Routine spraying and drenching*	P Routine spraying and drenching	P Routine spraying and drenching
2	Diversification of breed and techniques	P Maintaining feed reserves	P Maintaining feed reserves*	P Maintaining feed reserves	P Maintaining feed reserves	P Maintaining feed reserves
3	Maintaining feed reserves	P Diversification of breed and techniques	P Maintaining flexibility	O Diversification of breed and techniques*	P Keeping debt low	F Debt management
4	Maintaining flexibility	P Maintaining flexibility	P Diversification of breed and techniques*	P Maintaining flexibility*	O Managed capital spending	F Short-term flexibility
5	Not producing to full capacity	P Not producing to full capacity	P Not producing to full capacity*	P Not producing to full capacity	P Short-term flexibility	F Long-term flexibility
6	Geographic diversification	P Geographic diversification	P Management information systems	O Management information systems	O Financial reserves*	F Managed capital spending
7	-	-	P Irrigation	P Irrigation	P Long-term flexibility*	O Insurance
8	-	-	-	-	- Insurance	F Arranging overdraft reserves
9	-	-	-	-	- Debt management	F Keeping debt low*
10	-	-	-	-	- Arranging overdraft reserves	F Financial reserves*
11	-	-	-	-	- Monitoring pests, crops, climate	P Market information
12	-	-	-	-	- Not producing to full capacity	P Off-farm investment
13	-	-	-	-	- Market information	M Not producing to full capacity
14	-	-	-	-	- Spreading sales*	M Spreading sales
15	-	-	-	-	- Enterprise diversification*	D Enterprise diversification
16	-	-	-	-	- Off-farm investment	D Forward contracting
17	-	-	-	-	- Family member working off-farm	D Irrigation
18	-	-	-	-	- Forward contracting*	M Family member working off-farm
19	-	-	-	-	- Main operator working off-farm*	D Futures market
20	-	-	-	-	- Irrigation*	P Main operator working off-farm
21	-	-	-	-	- Futures market*	M -

Grouping of risks management responses by type				
Production responses (P)	Marketing responses (M)	Financial responses (F)	Diversification (D)	Overall responses (O)
Diversification of breed and (production) techniques	Market information	Keeping debt low	Enterprise diversification	Maintaining flexibility
Routine spraying and drenching	Spreading sales	Managed capital spending	Off-farm investment	Short-term flexibility
Maintaining feed reserves	Forward contracting	Arranging overdraft reserves	Main operator working off-farm	Long-term flexibility
Not producing to full capacity	Futures market	Debt management	Family member working off-farm	Use of consultants
Monitoring pests, crops, climate		Financial reserves		Management information systems
Irrigation		Insurance		
Geographic diversification				

Asterisk (*) indicates that risks received equal ranking score.

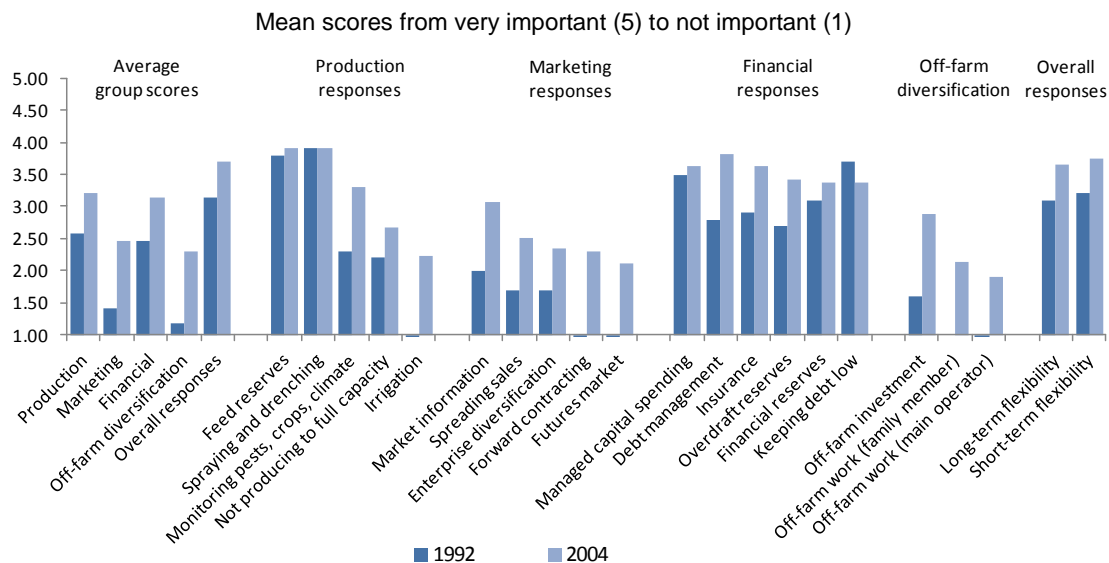
Source: Based on Shadbolt, 2009c.

Figure 10. Use of risk management strategies by dairy farmers

Source: Pinochet-Chateau *et al.* (2005a; 2005b).

The studies by Martin and Pinochet-Chateau *et al* reveal interesting changes in farmers' perception of the importance of risk management strategies over time. The mean scores of 18 of the 21 risk management strategies rose significantly over the 12-year period (Figure 11). This suggests that farmers now consider that virtually all ways for managing risks are more important. In only one instance did the mean score decline and this was for the strategy "keeping debt low". It is noteworthy that the largest increases in the importance scores were found for marketing and diversification, strategies that farmers use less widely than output and financial risk management. However, the growing appreciation of the importance of certain risk management strategies has not been coupled with actual (or a proportionate) increase in the use of these strategies by farmers.

The two studies also report some illustrative results on financial risk management strategies. The approach of keeping debt low fell from third in importance in 1992 to ninth in 2004, and fewer farmers were using debt (63% versus 85%). This, coupled with the increase in the importance of debt management as a strategy (ranked third, with 83% versus 68% farmers reporting it) and an increase in the perceived risk from changes in interest rates (Table 1), suggests that New Zealand farmers today are not afraid to become indebted, but instead are more focused on monitoring and managing debt to control this area of risk (Gray *et al*, 2009). This finding is supported by the changes in ranking of other financial responses. For instance, arranging overdraft reserves increased in ranking, while the use of financial reserves has declined. A greater percentage of farmers are investing off-farm (43% versus 36%) and have a family member working off-farm (27% versus 19%).

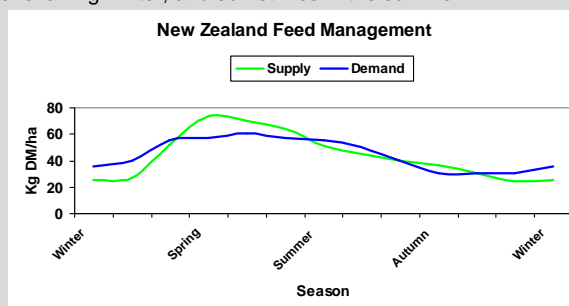
Figure 11. Importance scores of risk management strategies for dairy farmers

Source: Pinochet-Chateau *et al.* (2005a; 2005b).

Box 6. Feed management and irrigation as farmers' strategies to manage output risk in New Zealand

Feed Management

Pasture growth is fastest over the spring, slows in the summer, can lift again in the autumn, and is slowest over the winter. In order to mitigate production risk, many farmers conserve surplus feed, in the form of hay or silage, usually in the spring, to feed to animals over the following winter, and sometimes in the summer.



These feed reserves also function as emergency reserves if needed following an adverse climatic event. Farmers in drier areas (east coast of both islands) or in colder areas (especially in the South Island) often carry more than one year's supply of feed, but very seldom more than two year's supply.

There is an active market in supplementary feeds, both within the two main islands, and between islands. In recent adverse events, while feed reserves within the affected area were limited, sufficient feed was brought in from outside the area. There is also an increasing trade in imported feed, particularly Palm Kernel Extract (mostly from Malaysia), which is largely fed to dairy cows. When in 2008 a widespread drought affected most areas across the country, New Zealand imported almost 1 million tonnes of Palm Kernel Extract in calendar 2008, compared with 400 000 tonnes the previous year. Another common risk management action is to truck animals out of an affected region, to graze on other farms until there is sufficient feed available back on the home farm.

Irrigation

The eastern areas of New Zealand are much drier than the west, and there has long been interest in developing irrigation schemes in these areas in order to provide greater certainty for pasture management and minimise risks associated with production. Over the last 20 years all previously government-funded community-wide irrigation schemes have been sold to farmer groups, and while there is significant potential to increase the irrigated area, the responsibility to fund the development of the schemes (which is often significant) now lies with the farmers who would benefit. Several major schemes are being promoted, mostly in Canterbury, with some government funding being provided for technical assistance and feasibility studies. Currently approximately 500 000 hectares are irrigated in New Zealand, with potential to more than double this area, as the productivity on irrigated land is approximately three times that of non-irrigated.

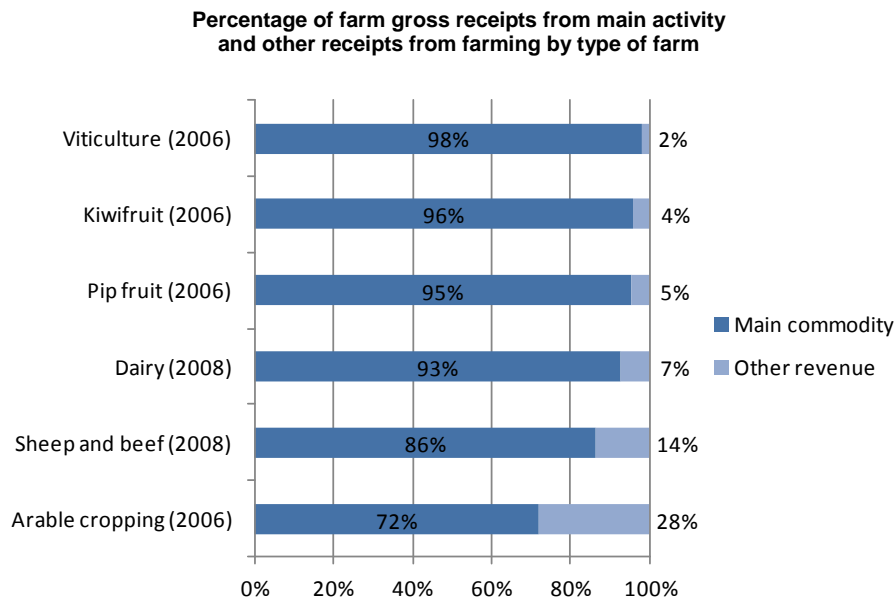
Source: MAF, 2009e.

Evidence about the role of enterprise diversification is mixed across studies and across sectors. Unlike the earlier studies of the mid-1980s (by Boggess *et al.* and Patrick *et al.*), which identify enterprise diversification as the most important risk management response. Studies in the mid-1990s and in mid-2000s either do not mention the strategy (Wilson *et al.*, and Martin) or rank it relatively low among other strategies, as in the studies of dairy farms (Pinochet-Chateau *et al.*). The finding is consistent with the falling percentage of dairy farmers diversifying on-farm operations between 1992 and 2004. Horticultural farmers indicated to the OECD that they use diversification of various kinds to manage risk. They pointed to crop and variety diversification, as well as geographic dispersion, but noted there were limits to geographic dispersion as most production is concentrated in one region (Box 7).

Box 7. Diversification of agricultural production in New Zealand farms

Diversification of agricultural production over the past two decades included a move from sheep production to beef and dairy, the development of “alternative” pastoral activities such as deer and goat farming, and diversification into horticultural production, including kiwifruit, viticulture, olives and cut flowers.

Despite these apparent diversification trends, many New Zealand farms derive the dominant part of their farm income from one principal activity. For example, a typical dairy farm receives 93% of its agricultural gross revenue from milk. A typical sheep and beef farm receives 86% of gross revenue from sheep and beef returns (of which 59% comes from sheep meat and 41% from beef). There are also some livestock farms that keep sheep, beef, and deer. Wool accounts for a very small share of farmers’ incomes from sheep breeding due to a prolonged period of low prices. Horticultural units are dominated by single species, e.g. kiwifruit, pipfruit, or grapes in viticulture, however many orchards and a small number of vegetable farms grow a range of varieties. There are a number of mixed cropping farms, but such farming systems are in the minority. Mixed farms usually combine arable crops with sheep and beef and derive over one quarter of total revenue from livestock operations.



Source: MAF, 2009b, MAF, 2009c, and MAF, 2009e; OECD, 2009e.

There is a common view that natural conditions of farming in New Zealand impose limits on farm diversification, i.e. pasture being the main natural endowment and only small and spatially compact areas in the country are suitable for crop farming. For some farms, production specialisation has played an important role in improving efficiency following the withdrawal of agricultural subsidies in the mid-1980s. In particular, dairy farming has grown into a highly specialised industry over the past decades and attracts an increasing share of the country's agricultural resources. However, the analysis of New Zealand data for meat and wool farms suggests that diversifying even across commodities that can in principle be regarded as competing commodities may have an important stabilising effect on farm income.

Preliminary results of the research in progress with dairy farmers by Shadbolt *et al.* show a further evolution in the ranking of strategies by dairy farmers, the highest scoring strategies being:

- Having a clear and shared vision or strategic purpose of operation.
- Using of practical planning steps in business.
- Managing debt: monitoring debt and working closely with lenders.
- Having short term flexibility: adjusting quickly to weather, price and other factors.

However, in common with previous studies, Shadbolt *et al.* find that the most widely adopted risk management strategies include maintaining feed reserves, having short-term flexibility, irrigation, managing debt, using futures markets (where applicable), planning the timing of capital expenditure, using insurance, as well as a range of business planning techniques. Few farmers adopt diversification, not producing to full capacity, keeping debt low, and the farm operator working off farm to add to farm income.

The findings of the risk studies are largely congruent with information collected by the OECD in interviews with pastoral farmers. These interviews also revealed other on-farm risk management practices that were not mentioned in the studies. For example, dairy farmers had developed emergency plans to deal with major disasters, including back-up power generating capacities to ensure that milking could continue and product spoilage minimised. To address risks of labour availability, farmers indicated they were increasing the degree of mechanisation in their operations and developing contingency strategies for unexpected interruptions in the availability of labour, including changes in the on-farm enterprise mix.

The OECD also had the opportunity to meet with crop farmers and extend the overview of risk management strategies beyond the livestock sector. Thus, irrigation and spraying against pests were identified as standard output risk strategies, and storage as a typical marketing strategy. Geographic diversification of marketing channels was also mentioned by a pipfruit grower who diversified his market risks by supplying both European and Asian markets. Horticulture farmers indicated vertical integration as an additional risk management strategy, addressing together output, financial and market risks.

In summary, the available evidence shows that New Zealand farmers apply multiple techniques at the farm level to address various types of risks. In some sectors (e.g. dairy) the main focus is to control output risks and farm financial management and less on market risks. Farmers in these sectors seem to implicitly outsource the management of market risks to downstream agents by virtue of the industry's vertical arrangements. In

other, less co-ordinated sectors (e.g. meat and pipfruit), managing market risks through techniques available to individual farmers seems to be as important as managing production and financial risks, although no studies exist quantifying that.

The studies reveal that New Zealand farmers attach increasing importance to almost all risk management strategies, both at the farm level and beyond the farm. Importantly, they have significantly increased their recourse to risk management techniques that require access to information (such as crop, pest, climate, monitoring, use of market information and off-farm investment). This implies that in order to manage risks at the farm level, farmers need to progressively turn outwards to obtain information, consulting or to outsource the management of some risks to more specialised companies (e.g. for financial management). There is, however, a gap between farmers' rising appreciation of risk management strategies and the actual use of such strategies. Indeed, it can happen that farmers are increasingly aware of the importance of some risk management practices, but that actually the share of farmers applying such practices is declining. This may be partly explained by the fact that such activity is outsourced by farmers to co-operatives or other downstream operators.

Government measures related to farm household/community strategies

The overall policy and regulatory framework in New Zealand deserves to be highlighted in relation to farm household risk management. The country's broad policy design is oriented at maintaining a competitive economic environment and creating as few impediments as possible to economic adjustment. The reforms of the 1980s led to the introduction of important acts with respect to fiscal, monetary, and labour areas as well as the introduction of new institutions. This created a macro-economic framework enabling adaptation. Successive governments have continued the broad market orientation of economic policy. In a market-oriented and relatively stable macro-economic framework, farmers have substantial flexibility to adapt their production through access to competitive financial, credit and service markets and to develop appropriate marketing strategies.

In terms of traditional market price regulation, the government does not apply measures which are explicitly intended to support or stabilise producer prices or income. Reforms implemented in New Zealand over the 1980s led to deregulation. Statutory marketing boards have been abolished along with the accompanying system of marketing and price regulation. There continues to be limited export regulation in the dairy sector in cases where importing countries apply specific market access restrictions, but all remaining restrictions on the export of dairy products is to be eliminated by the end of 2010. There are also specific provisions for exports of kiwifruit which give automatic export rights to the dominant exporter, whereas the others must obtain approval (except exports to Australia).

No policies are applied to alter prices of inputs or production factors, such as credit concessions, preferential pricing for inputs or services, or direct subsidies.

A specific tax provision allows farmers to smooth income over time. The Income Equalisation Scheme is available to those who receive more than 50% of income from farming, forestry or fishing under which they can deposit a part of their total income received in a given year into a special (income equalisation) account.¹² This amount is

12. This scheme is also available to the fishery and forestry sectors.

excluded from the taxable income until it is withdrawn from the deposit, at which time it becomes taxable (as does the interest earned). The deposit cannot be made for less than 12 months but cannot be maintained for more than five years. Funds left on deposit for more than 12 months earn 3% per annum on amounts. This standard Income Equalisation Scheme is available upon request to farmers as part of normal business. A variant of the Income Equalisation Scheme for adverse events is also available to farmers who have suffered adverse events and were forced to sell livestock. They can deposit proceeds from such sales to a special adverse event income equalisation account. The adverse event scheme is based on the same principle as the standard scheme. The income placed in the former is excluded from taxable income in the year of the adverse event. The difference between the two schemes is that deposits in the adverse event scheme earn 6.5% per annum, but the funds cannot be kept on this account for more than 12 months (if not, they are transferred to the standard Income Equalisation Scheme). A farmer can open an adverse event deposit upon his own request, but has to provide proof that he has experienced an adverse event and has had material damage. The Adverse Event Income Equalisation Scheme is also part of the measures foreseen under the disaster assistance (which is discussed further as a special focus issue for New Zealand).

Table 7 shows the amounts of income deposited under the standard and adverse event Income Equalisation Schemes. It is interesting to note the movement of funds in the standard scheme, which indicates that farmers indeed use this facility for income smoothing. Thus, deposit withdrawals were substantially increased in 2004/05 when many farmers suffered from severe floods. In the drought year of 2008/09, this scheme was used actively, both for withdrawals and deposits, the latter consisting of proceeds from forced livestock sales due to difficulties with feed availability. In contrast, the adverse event scheme has been only marginally used.

Table 7. Income Equalisation Schemes: deposits and refunds

	NZD million				
	2004/05	2005/06	2006/07	2007/08	2008/09
Standard scheme					
Deposits	51.35	53.27	27.21	65.45	290.43
as % of agricultural sector income	2.02	4.29	2.08	1.75	20.14
Refunds of principal	102.46	82.42	86.42	58.73	137.12
Refunds of interest	1.56	1.18	1.05	2.81	0.62
Adverse event scheme					
Deposits	-	-	0.08	1.25	0.59
as % of agricultural sector income	-	-	0.01	0.03	0.04
Refunds of principal	0.32	0.03	0.12	1.25	0.49
Refunds of interest	0.00	0.00	0.00	0.01	0.00

Source: Inland Revenue; MAF, 2009d.

Social security provisions also help individuals and families to obtain a certain minimum level of income. The provisions form a general social security policy, but farmers can benefit if they satisfy income and other criteria for such assistance. For example, the Working for Families package offers various tax credits, childcare and accommodation payments to families with children who are below a certain income level.

Market instruments

This section discusses risk management practices that require specific institutional arrangements beyond the farm. These institutions are designed for sharing risks, specifically, or as part of a broader rationale and include insurance, futures and options markets, co-operation, forward contracting, vertical integration, and other arrangements.

Insurance

Six insurance companies offer services to rural clients in New Zealand: Farmers Mutual Group (FMG), AMI, Insurance Australia Group (IAG), VERO, TOWER, and ZURICH. The first two are mutual groups (owned by their New Zealand policy holders). FMG is the largest and the only niche rural insurer in New Zealand, offering policies that cover a wide range of production and legal risks. According to company's own estimate it holds 35% of the rural insurance market liabilities. FMG is a mutual fund, owned by its policy holders who are predominantly farmers. AMI is a fire and general insurer. The other four are public companies; IAG and VERO are based in Australia, TOWER is based in New Zealand, while ZURICH is a Swiss multinational insurance and reinsurance company. In addition, there are a number of insurance brokers in the market whom farmers may approach instead of dealing directly with an insurance company. Some banks also serve as insurance brokers, but the actual underwriting is done by insurance companies. For example, the National Bank, a major lender in the rural sector, sells rural insurance policies on behalf of VERO. A typical insurance brokered by banks concerns mortgage loans.

Commercial insurance is a traditional risk management instrument used by farmers in New Zealand. Unfortunately, no official statistical information shows the extent to which farmers use insurance and what kinds of risks are most frequently insured. However, according to MAF, insurance largely concerns structures, equipment and vehicles, as well as crops and forage (most often, against hail). Only a small percentage of farmers insure livestock, considering the premiums too high and, by default, the risk too low.

The New Zealand insurance market offers policies that cover a broad range of disasters that can affect farm buildings, equipment and vehicles. For certain elements of infrastructure, however, no or only limited insurance against damage caused by natural disasters is available (Table 8).

Table 8. Events and types of damage for which insurance is not available or limited in New Zealand

Damage to infrastructure related to natural disasters
— tracks and races
— essential water supplies, drainage, effluent ponds, and silt removal
Damage related to drought or flooding
— of pasture and plantings (re-establishment costs)
— deterioration in crop and livestock performance
Earthquakes, volcanic eruptions, hydrothermal activity, tsunami
Damage from exotic diseases
— deterioration in crop and livestock performance

Source: MAF, 2009e.

Insurance is available for livestock and crops, covering many but not all types of adverse events; some events are covered selectively across companies. While coverage is available for flooding that damages farm buildings and equipment, insurance cannot be obtained for either flooding or drought that affect pasture, plantings, livestock and crops. The exception is wheat, which is the only crop that can be insured against floods. Companies variably offer insurance against geological events, such as volcanic eruptions, earthquakes and tsunamis. Others do not include such calamities in their policies (e.g. TOWER, VERO and AMI), and some include them only for certain crops (e.g. FMG for horticulture), while some only for livestock (State brand IAG).

No insurance is available in New Zealand against damage from exotic disease to livestock and crops, or for variations in farm income due to market conditions.

In terms of personal risks, insurance is available for income protection against illness/accidents, along with cover for disruption to business. Furthermore, there is a compulsory accident scheme administered by the Accident Compensation Commission (ACC) and which is funded by compulsory levies paid by all employers, employees and those who are self employed, including farmers. It provides a comprehensive coverage on a no-fault basis for personal injuries to farmers, their family members and employees.

In the past, a number of common insurance schemes for specific commodity sectors operated in New Zealand, funded by self-imposed farmers' levies. Today, most of these schemes have ceased to exist, as farmers considered moral hazard risks to be too high – that is, too many were paying for the few who did not undertake appropriate risk management strategies. The only two “sectoral” insurance schemes existing currently are for wheat and kiwifruit producers.

The wheat scheme covers a relatively small farming group, as only around 50 000 hectares of wheat are grown in New Zealand. An association of wheat growers, the United Wheat Growers, collects a compulsory levy on all wheat sold by producers. This levy is determined annually and is used exclusively for disaster relief insurance and the administrative costs of this insurance. FMG provides the insurance policy. The contract is standard for all wheat producers and covers multiple natural disasters (in this specific scheme it includes flooding), certain mechanical accidents, and physical loss of grain in silos or transit. Compensation is set at a fixed rate per tonne of yield loss. The United Wheat Growers acts as the single agent on behalf of the farmers in contracting this insurance with FMG, including negotiating the terms of insurance.

In the kiwifruit sector, the Zespri company which accounts for the vast majority of exports, obliges its suppliers to take out standard hail and marine cargo insurance. The terms of these insurances are set annually and included in the supply agreements. The cost of insurance is deductible from the final fruit returns payable to suppliers.

According to MAF, if farmers perceive risks to be low or medium, they appear to be reluctant to take out insurance for on-farm infrastructure or other production-related items, such as crops or livestock. The farmers interviewed by OECD also indicated that apart from insuring structures and machinery, they have little incentive to take up other types of policies. In 2006, MAF commissioned a survey of pastoral and cropping farmers looking at their strategies to deal with adverse events (MAF, 2009e). It showed that farmers attach relatively low importance to insurance as an instrument of managing such risks. For example, crop insurance scored the lowest among all risk strategies investigated (1.8 points on a five-point scale); animal loss and income protection insurance (related to health and accidents) received 2.5 and 2.7 points respectively. The only type considered

important was insurance of farm structures and machines (3.4 points) – the second highest score after creation of financial reserves (4.0 points).

Lack of insurance for certain risks in New Zealand sometimes reflects the past record of low up-take by farmers of such insurance. Farmers have generally shown little incentive to take out flood or other disaster insurance. For example, in 1999, FMG offered insurance against flooding and other natural disasters, but the product did not attract much interest from farmers except for those who were known to be at high risk. Consequently, the product failed to generate a sufficient risk pool; the company suffered substantial losses and withdrew it after 18 months. Similarly, in 2001 the same company introduced livestock insurance to cover Foot and Mouth Disease, but this lapsed due to lack of interest by farmers. A recent study by FMG concluded that the key risks farmers are facing were “not insurable”, possibly meaning that insuring them could not yield sufficient commercial returns. The study suggested that the company’s strategy should increase its focus on other services to farmers to manage risks, such as the provision of information, training, and business advice.

The situation with crop and livestock insurance indicates that insurers are confronted with the problems of insufficient risk pools and risk premium levels. This may be indicative of adverse selection leading to failure of an insurance product. Insurers must have sufficient knowledge on risk probabilities and potential damage to set actuarially sound insurance premiums, in particular differentiate the premiums according to various risk groups.

Futures and options markets

The evidence across the world indicates that only a relatively small number of farmers are directly involved in futures/options trading, but this instrument is used actively by companies operating up- or downstream in the food chain. Importantly, futures markets are not only risk hedging institutions, but also a price discovery mechanism. As such, they perform a key function in risk management by providing market information to all participants of the agro-food chain, including primary producers.

Commodity futures and options markets

Currently, there are no futures markets for agricultural commodities in New Zealand. Past attempts have been made to establish wool and lamb futures, but with no success. A number of factors explain the absence of commodity futures in New Zealand. One is that the potential number of players is too small to ensure sufficient market liquidity. This is particularly relevant for dairy and meat commodities where there are few traders (for dairy, in part reflecting the past history of single seller export arrangements). For the principal crop commodity group, horticulture, the establishment of futures trading is also problematic due to the lack of a standardised product. Agro-food business in New Zealand must turn to commodity futures markets abroad (e.g. in Australia and the United States) in order to hedge commodity price risks.

When interviewed by OECD, although curious about commodity price hedging, farmers said they had no practical knowledge of this instrument which they considered better suited to downstream actors. However, without being involved in price hedging as such, farmers use price information from international commodity futures. For example, wheat farmers use movements in the United States and Australian wheat futures prices as a guide to the prices they might expect in the future.

Unfortunately, no detailed information is available on the use of commodity futures trading by downstream operators. Some analysts indicate that the disparities in movement of overseas futures and domestic market prices may be substantial in such trading, creating important basis risks for hedgers in New Zealand.¹³ However, New Zealand's largest dairy co-operative Fonterra is a sophisticated price hedger that trades in dairy futures on the Chicago Mercantile Exchange (CME). The CME is currently the only exchange which trades a range of dairy products, including skimmed milk powder, cheese, butter, milk and whey. However, CME prices do not correlate sufficiently with Fonterra's global sales prices (it sells to 140 countries) and the company hedges only a proportion of their product on the CME, and relies on (short, medium and long) contracting strategies to capture opportunities from volatility in the markets. The possibility of a futures for milk products was investigated by the New Zealand Stock Exchange (NZX), a proposal actively promoted by the dairy industry. The argument is that basis and foreign exchange risks are so substantial that the existing dairy-related futures markets located in the United States do not provide sufficient risk protection. Hence, it would be helpful if New Zealand based futures contracts were to be developed. A futures contract for the whole milk powder (denominated in US dollars) has been recently launched at the NZX. The new market is targeted to global players, in particular, dairy processors and food manufacturers. It is also foreseen to launch contracts for skim milk powder and anhydrous milk fat. However, the fact that international traders would face the basis risk associated with New Zealand, may create challenges for such a market.

Exchange rate and interest rate hedging

Financial hedging is used more often by farmers and agro-business in New Zealand than commodity price hedging. Various financial futures and options contracts are available on the New Zealand Stock Exchange, on-line foreign exchange companies such as NZ Forex, and financial futures markets abroad.

OECD's interview with NZ Forex provided important insights into the role of financial hedging in risk management by New Zealand farmers and agri-business. According to NZ Forex, two tendencies are observed in farmers' involvement. First, farmers are generally more focussed on managing debt and the associated interest rate risk than on managing currency risk. Indeed, the interest risk management activity has significantly increased over the past five years. Second, the use of exchange rate hedging by farmers depends on how far a farmer is integrated into the food chain. Those who run a sufficiently large and vertically integrated business – “from paddock to plate” – will undertake hedging as would any company as part of general risk management activities. In contrast, farmers who sell at the farm gate typically do not hedge. For producers who are members of a co-operative, the co-operative hedges on behalf of its members on a “same price for all” basis. The strategies of exchange rate hedging differ by sector and depend on the marketing profiles and the types of currencies these activities are exposed to (Box 8).

13. Basis is the differential between the spot price of a product and its futures price. Basis risk occurs due to a mismatch between the changes in spot prices and futures prices.

Box 8. Exchange rate hedging strategies in different agro-food sectors

The meat industry most commonly takes cover for the risk of changes from the time they have paid farmers for the product to when they in turn have been paid by on overseas market and spot market prices will reflect the exchange rate of the day. They hedge week to week to forward-sold positions, with a minimum of long term contracts. Which currencies are hedged is determined by the structure of export markets and therefore differs by type of meat: beef is primarily sold in USD, based on the grinder beef price on the North American market; lamb is marketed in EUR, GBP and USD under various quota systems, while venison is marketed largely in euros.

The dairy industry typically takes 12-15 months rolling cover which reflects both the gradual supply of milk year-round and its marketing in various forms off shore. Fonterra co-operative is the dominant player in the dairy industry with a global market reach, selling in 50 currencies. It is a sophisticated risk manager in foreign exchange and funding and interest rate hedging.

In the pipfruit sector, different business models exist corresponding to various arrangements between growers, processors, logistics suppliers, exporters, exporter associations, brokers, agents and overseas joint venture partners. This sector's product is perishable and most is shipped with no prior knowledge of what price it will receive. There are "tree-to-consumer" schemes, where growers act as exporters. However, the industry is notable for many intermediaries who will only settle contracts with growers at the spot rate once they receive payment for the shipment. For this reason, many growers hedge their exchange rate risks based on options or non-deliverable forward contracts. Particular timing strategies are determined by the seasonal marketing cycle.

The kiwifruit sector has a similar risk profile to that of the pipfruit sector, but is more cohesive. The bulk of New Zealand's kiwifruit is destined for export and traded through Zespri, a private exporter. It also operates a long-term hedging profile which is designed to smooth currency volatility for its growers.

Source: Poppe, 2009; Schadbolt, 2009c.

Farmers' collective action: co-operatives

Farmer co-operatives play an important role in New Zealand's agro-food system, accounting for large shares of activities up- and downstream of agriculture, such as input supplies, handling, processing and marketing of agricultural products. As an institutional arrangement, a co-operative provides a secured contract for its members, which may cover a broad range of business aspects. Co-operatives thus perform a number of essential functions related to management of farmers' risks, which is a part of the rationale for this institution. The risk management function of farmer co-operatives is a special focus issue for New Zealand, which will be discussed in the second part of this report.

Forward contracting and vertical integration

As noted above, much contracting in New Zealand occurs within co-operatives. This sub-section discusses forward contracting that takes place outside the co-operative framework. However, the distinction between contracting with a co-operative and with private companies in the agro-food chain is not always clear in New Zealand (because there is no strict delineation between a co-operative and non-co-operative business in legal and functional terms).

Forward contracts on price, quantity and quality have been in place in many sectors for some time. Typically, supply contracts provide the farmer with the certainty that he will receive a minimum price for his product in any given month and year. The buyer provides an estimate of returns based on international prices and exchange rate fluctuations, and over the marketing year maximises those returns through differential pricing across markets, with the intent of paying a premium at the end of the year. The purpose of the contracts is to directly average out returns over a season, and is once again a means of smoothing incomes.

Increasingly, contracts have become more diverse in scope. Sophisticated international supply chains and strong relationships characterize many New Zealand food industries. There are a plethora of on-farm quality assurance schemes in place, some specific to retailers (e.g. Tesco UK); others to processors (e.g. Fonterra). Such schemes have evolved beyond product specification to include the production system itself. There is an increased focus on the environmental impact of production systems which has a direct effect on farm management as it determines what is and is not acceptable farming practice. In essence, meeting contractual specifications is seen as an entry ticket to many markets.

Horticultural growers contract with packhouses/coolstores, some of which are cooperatives and others private companies. These contracts are usually annual and, given that packhouse/coolstore capacity is limited, the contracts offer a guarantee of the fruit being packed and stored, thereby reducing income risk to the growers.

The wool industry provides an interesting example of forward contracts in agriculture. Wool is a non-perishable and storable product which can be marketed over time and can be easily transported. The product is inherently heterogeneous — ranging from “strong wools” (74% of production, used in carpets) through to fine wool types (Merino, used for fashion garments), with numerous variations in key characteristics. These differences reduce the commonality of producer interests that lowers incentives to cooperate compared to producers of more homogeneous products such as milk. Wool marketing has therefore been left to private firms. The New Zealand Merino Company is one such marketing organisation which has developed direct links with customers through producer contracts that require specific quantities of wool of certain specifications.

In the meat industry, although forward contracts are available, many farmers prefer to operate on the spot market and to supply a range of companies, despite two of the biggest companies being cooperatives. Farmers often regard the contract prices as a base from which they can then “auction” their stock to another company for a higher price.

Off-farm income

For many farms, off-farm income was a necessity following the economic restructuring during the 1980s, but the need to rely on off-farm income has diminished. Figure 12 shows that the percentage of farms reporting off-farm income (including from off-farm work and from off-farm investments) has substantially declined since the early 1990s. A notable exception is kiwifruit farms, where recourse to off-farm income has not fallen as much, with almost 76% of farms in 2008 having income outside farming. A relatively high share of dairy farms (46%) also have off-farm activity.

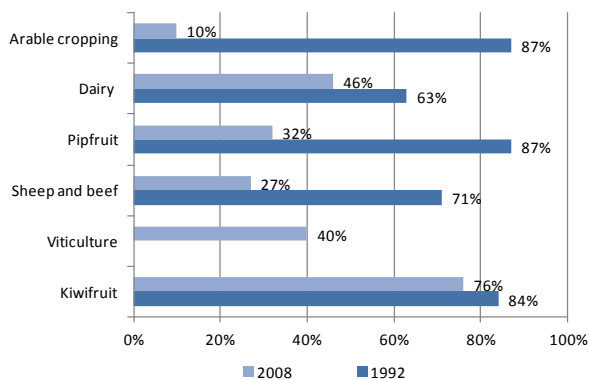
The variation in the degree to which farmers have recourse to off-farm income in different time periods and economic conditions is an indication that off-farm activity represents an important risk management strategy, with the majority of farmers using off-farm earnings during times of economic hardship.

For many of the more intensive farming sectors, e.g. dairying or horticulture, some form of off-farm work is easier to find due to proximity to towns and cities. Obtaining off-farm work is more problematic for sheep and beef farmers, given the greater distance to urban centres and the very slow internet speeds in rural areas which inhibit working from home. Many farming wives have higher education and often find professional work in urban centres, e.g. teaching or nursing, whereas male farmers who work off-farm often do so in farm-related occupations, e.g. hay-making or shearing.

It is difficult to estimate accurately the contribution of off-farm earnings to total farm household receipts. The data on off-farm income available from the farm budgets show that off-farm income is small compared to cash receipts from farming; the exception is kiwifruit farms, where such income rises to 13% of the aggregate of on- and off-farm receipts (Figure 13). These figures most likely underestimate the contribution of off-farm earnings because they capture only the income coming from activities integrated from the accounting standpoint either fully or partly within the farm business. However, studies on rural diversification indicate that the majority of alternative enterprises of agricultural households are financially and structurally independent of the farm business (OECD, 2009e).

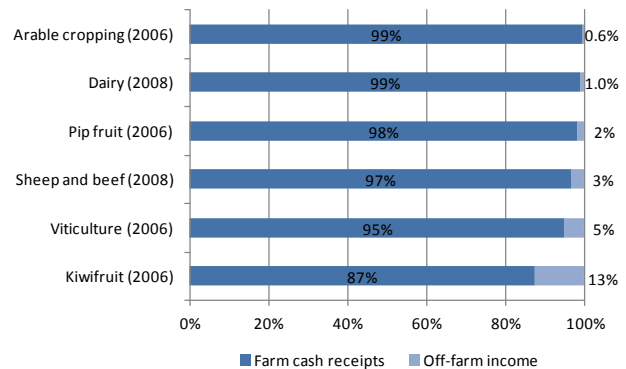
Most farmers use off-farm income to cover their living expenses. For example, around 20% of living expenses of those households involved in dairying and sheep and beef farming originate from off-farm income (MAF, 2009e). Apart from improvements in farm household personal consumption, off-farm income has implications for farming risk. During low farm income periods, income received off-farm reduces the need to withdraw funds from the farm business and hence acts as a financial buffer. To the extent off-farm earnings are stable, over the long-run they provide the farmer with more flexibility in decisions concerning farm investment and its timing.

Figure 12. Share of farms receiving off-farm income



Source: MAF 1995; MAF 2008.

Figure 13. Share of off-farm income in total farmer cash receipts



Source: MAF, 2009b, and MAF, 2009c.

Government measures related to marketable risks

The insurance market in New Zealand is open to competition and subject to general competition law and oversight by the Commerce Commission. Outside the general competition law, government plays virtually no role in the rural insurance market. One exception is the insurance provided by the Earthquake Commission, which is a public agency offering insurance against damage caused by geological disasters, but this concerns only personal property (homes and contents).

Insurance companies in New Zealand receive no government subsidies; they are subjected to general company tax regime with no tax benefits or charges specific to this type of business. Government does not have any form of partnerships with insurance providers. There are no known arrangements between the insurance companies to share information related to agricultural insurance except, according to FMG, the information related to life insurance.

Other market institutions that deal with risk management, such as co-operatives, financial futures/options markets, forward contracting are operating in a similar policy-neutral environment.

Catastrophic risk management

Biosecurity measures

Biosecurity is one of the most important areas of New Zealand's agro-food policy. Biosecurity New Zealand (BNZ) is the largest department in MAF, accounting for about 80% of MAF's total budget of NZD 360 million. BNZ's primary responsibility is protection against potential impacts of invasive species and non-indigenous (exotic) diseases.¹⁴ The agency carries out a range of pre-border (offshore) and border measures. Thus, all agro-food products entering the country are subjected to rigid sanitary and phyto-sanitary requirements and strict import controls. There is also a range of post-border activities, many based on partnerships involving the central government, private stakeholders, and local governments. One such activity is the National Bovine Tuberculosis Pest Management Strategy, with an annual budget of NZD 82 million, of which one-third is financed by the central government and the rest by private partners and regional councils. In terms of cost, this is one of the largest MAF programmes (Table 9). Bovine tuberculosis is treated seriously in New Zealand; if a cattle or deer herd becomes affected, costly restrictions on its movement and sale apply, and infected animals are slaughtered at a much reduced value. Farmers are obliged to have annual bovine tuberculosis testing for all cattle and deer, and additional restrictions apply to cattle and deer in movement control areas. The programme to combat bovine tuberculosis has been successful and there is the prospect of achieving a "technical freedom" from this disease.

Animal identification systems represent another biosecurity activity. One scheme currently operates within the bovine tuberculosis programme as a public-private partnership, another scheme concerns tracking imported animals and is managed by MAF. There is also a scheme for animal breeding managed by the Livestock Improvement Corporation. Currently, a project is underway to create a broad National Animal Identification Scheme for tracking of animals from birth to post-mortem inspection and slaughter.

One of the important biosecurity areas is the in-country surveillance of pests and diseases. Recent initiatives in this area have been focused on integrating other stakeholders in this process so as to increase efficiency of detection and response. Finally, the development of a "contract" for biosecurity responses is underway; the general idea to build a network of providers from the central and local governments and private stakeholders to act immediately in the case of a pest or disease alert. This activity is likely to be integrated into the Adverse Events Framework (discussed below).

Soil and water management

The central government operates several funds to assist regional and local authorities in implementing projects on conservation and sustainable resource use. These funds are

14. It should be noted that the responsibility of BNZ extends beyond agriculture. This agency deals with all sanitary and phyto-sanitary issues, including protection of human health and the country's natural resources.

intended for environmental improvements, but they also have relevance for farming risks associated with natural disasters.

Two funds concern erosion and landslide problems. Heavy rains and other adverse weather events increase the risks of erosion in the hill country; erosion leads to flooding, which can have devastating consequences for farming (OECD, 2010c, Box 3.14). The Sustainable Land Management – Hill Country Erosion Fund provides funding to regional councils for projects that treat erosion prone land. An essential part of the programme is to raise farmer awareness of the extent to which erosion exacerbates the risks of flooding and landslips. The East Coast Forestry Project seeks to raise awareness of the erosion risk in the Gisborne district and to persuade farmers through various incentives to plant trees or take other measures to reduce erosion. Two other funds, the Sustainable Farming Fund and the Community Irrigation Fund, finance technical assistance and local capacity building for the preparation of projects related to irrigation and sustainable farming practices, and fund-raising for such projects.

Box 9. Flood risk management review in New Zealand

The Ministry for the Environment led a two-year review of management of flood risks and river control in New Zealand, which was completed in June 2007. The Ministry worked closely with local governments and other government agencies, including the Ministry of Civil Defense and Emergency Management, MAF, Department of Internal affairs, and the Department of the Prime Minister and Cabinet.

Over 100 New Zealand cities and towns, along with some of most productive farmland, are located on floodplains. The challenge which faces New Zealand is how to best reduce damages and losses from flooding. The review covered three key issues:

- the role of central and local governments and communities to ensure the adoption of good practices in managing rivers and flood risks;
- funding and affordability: who benefits, who pays and who can afford flood risk mitigation;
- current risk management practices and their present and future appropriateness.

The review found that the current flood risk framework is not fundamentally flawed, but that important issues needed to be addressed. The central and local governments need to improve their practices to manage flood risk and adapt to future climate change. Funding and affordability are real concerns for smaller, less wealthy communities. The role played by the communities, and central and local governments are broadly correct, although the central government could be more active in reducing flood risk.

The risk of floods will likely increase with climate change. The central government currently concentrates most of its investment in flood risk management on the response and recovery following the event. Investment in the reduction and mitigation of flood risks, i.e. in providing information, guidance assistance, and funding – would help local governments to manage flood risks more effectively and prepare for climate change.

Source: OECD, 2010c based on New Zealand's response to the OECD questionnaire at www.oecd.org/water.

Flood control and prevention is largely a responsibility of local governments in New Zealand. After the major floods in 2004, this issue has received a special attention. A review of flood risk management was undertaken in 2005-07, led by the Ministry for the Environment with participation of local governments and other central government agencies, including MAF and the Ministry of Civil Defence and Emergency Management and others. One of the important conclusions of the review is that the central government's activity has been largely focussed on the response and recovery measures, but more investment is required to support local governments' activities on reduction and mitigation of flood risks (Box 9 above).

Response to adverse events and recovery measures

The On-Farm Adverse Events Recovery Framework programme is specifically designed to cope with natural disasters. It is a multi-dimensional package of disaster assistance to families, embodies a number of "good policy" principles, and is distinct in terms of institutional arrangements. The Adverse Events Framework is an issue of special focus in the New Zealand review and is discussed in Chapter 3.

Table 9. Central and local government expenditures on risk-related programmes, 1999-2008

1 000 NZD

Year ended 30 June	Adverse events		Flood control and drainage	Control of bovine TB vectors	Quarantine	Pest control: regional councils	Sustainable farming fund	Soil conservation	East Coast forestry project
	MAF	Other ¹							
1999	493	n.a.	7 183	19 053	21 823	19 746	0	9 388	3 132
2000	94	n.a.	6 913	19 800	28 741	18 049	0	12 675	3 257
2001	27	n.a.	13 741	22 695	26 652	22 199	1 038	11 998	2 367
2002	0	n.a.	12 729	29 084	52 817	21 662	5 532	15 442	1 801
2003	18	n.a.	13 175	32 120	54 209	20 657	7 414	12 791	3 348
2004	5 650	n.a.	14 608	32 124	65 428	27 616	6 122	12 127	3 423
2005	41 358	n.a.	39 204	33 767	65 440	21 366	10 142	13 787	3 372
2006	7 517	0.5	55 256	34 222	73 894	23 727	10 713	18 316	2 050
2007	497	1.1	54 085	29 116	68 867	28 285	9 585	22 407	1 710
2008	779	0.6	59 585	30 778	78 932	27 009	8 444	26 587	4 953
2009	575	na	58 826	30 112	87 710	26 129	7 179	29 104	1 085

1. The figures include assistance funded by the Ministry of Social Development and Ministry of Civil Defence and Emergency Management, but only where assistance is given to farm families.

Source: MAF, 2009e; OECD, PSE/CSE database.

Overall assessment of government risk management measures

This section summarises the policies discussed throughout the report by making a distinction between measures that (i) help create markets for risk sharing; (ii) modify incentives to increase risk sharing through risk markets or through the use of general instruments, such as tax and credit; (iii) reduce the probability of an adverse event or to mitigate its impacts; and (iv) ensure minimum consumption requirements of households once other measures have been exhausted. Another key dimension of risk measures is temporal. By definition, measures facilitating market creation and modifying market incentives are *ex ante* policies, e.g. they are in place irrespective of whether risk occurs or not. In contrast, measures to reduce, mitigate, or cope with risks can be both *ex ante* and *ex post*. Table 10 summarises risk-related policies following this two dimensional approach, which allows one to highlight several general features of New Zealand's policies.

One feature concerns the broad dichotomy of policy objectives: increasing welfare (efficiency of resource use) versus improving distribution (equity). Risk management policies in New Zealand fall predominantly under the efficiency objective. These measures are largely focused on reducing transactions cost (by establishing regulations conducive to competition and adaptation, and creating a stable macroeconomic framework); addressing the problem of asymmetric information (e.g. through research and information); and addressing the problem of externalities (e.g. biosecurity measures). The measures pursuing the equity objective – presented under the dividing line of Table 10 – consist of various kinds of financial assistance to rural and farm households. They are far narrower in scope and involve smaller fiscal cost.

The second feature of New Zealand's risk-related policies is that they focus predominantly on two risk clusters: risk assessment/communication and dealing with catastrophic risks. The first includes research in areas related to climatic and production risks, generation and dissemination of related information, market analysis and forecasting. Most other policy measures deal with catastrophic risk. As articulated by MAF, the government's policy priorities for risk management in agriculture consist of raising the awareness of primary producers of the importance of their own risk management in view of adverse events and climate change; and educating producers about the government's on-farm recovery assistance with respect to adverse events. Furthermore, it is explicitly stated that the government has no role to play with respect to farmers' price/ market risks (i.e. marketable and normal risks), considering this a "private matter for the farmers" (MAF, 2009e).

Finally, in terms of the choice between measures creating markets, altering incentives, and smoothing incomes or consumption, the policy set in New Zealand is generally free from measures that alter incentive prices in the system. Overall, New Zealand producers operate in a market environment guided by world market signals. This policy choice follows from the broad economic strategy which sets limits on government interventions in the agricultural system.

Table 10. Government measures related to farm risk management in New Zealand

	Market creation	Modifying market incentives	Risk reduction and mitigation (income smoothing)	Coping with risk (consumption smoothing)
<i>Ex ante</i>	<ul style="list-style-type: none"> • Free market framework • Stable macro economic framework • Explicit limits of government's responsibility concerning farming risks • Research • Information 		<p>Biosecurity policy</p> <ul style="list-style-type: none"> • Flood and soil erosion protection (local government) • Sustainable Land Management Fund • Technical assistance and capacity building (Community irrigation fund, Sustainable farming fund) 	
<i>Ex post triggered ex post</i>			<ul style="list-style-type: none"> • Taxation: Income Equalisation Scheme 	<ul style="list-style-type: none"> • Health and rehabilitation insurance assistance (ACC)
<i>Ex ante / Ex post</i>			<p>Adverse Events Framework</p> <ul style="list-style-type: none"> • Taxation: Income Equalisation Scheme (for adverse events) • Preferential procedures for tax declaration and payment • Labour assistance for restoration and clean-up • Special Recovery Measure • New start-up grants • Technical & financial advice • Restoration of essential community services • Financial support to Rural Support Trusts (RST) • Rural Assistance Payments (RAP) • Special-emergency family benefits • Other family assistance: Working for families package 	

The line delimiting “efficiency” and “equity” in this table indicates the likely underlying rationale for the policies listed: to tackle market failure (efficiency) or redistribution in favour of specific groups of individuals (equity).

PART II.

SPECIAL FOCUS ISSUES

3. New Zealand’s On-Farm Adverse Events Framework

The On-Farm Adverse Events Recovery Framework (referred to as Adverse Events Framework) is an integral component of a wider government disaster assistance to local communities. Farmers are eligible for various types of assistance, ranging from initial emergency response and psychological help to more general types of aid as provided by the New Zealand welfare system (Table 11). This component of the Framework reflects the social and equity rationale for policy action. As expressed by the government, its “initial concern is always focussed on the health and safety of the people, and ensuring that their immediate welfare needs are met” (MAF, 2006).

In addition to community-wide assistance, this Framework incorporates elements that are oriented specifically to farming families. The rationale for policy action in this case is largely driven by considerations of economic efficiency, in particular the necessity for a quick recovery of the rural economy and the minimisation of spill-over effects into the rest of the economy. Indeed, it is explicitly stated that one of the objectives of this policy is to “enable economic recovery to occur at optimal speed” and that assistance is delivered “efficiently and minimises the Crown’s fiscal risk” (MAF, 2006). The “farm” component of the Framework contains a broad scope of measures, including fiscal arrangements, social assistance, adjustment aid, technical assistance and cost-sharing in farm restoration. However, according to MAF, farming businesses only receive the assistance to the extent that it is regarded as necessary for the recovery of the wider regional/national rural community (as will be seen below, the triggering of the farm component assistance is determined by the scale of the estimated damage).

The Adverse Events Framework therefore represents a diverse policy package in terms of its rationale, the beneficiaries targeted, and the scope of assistance. It embodies both a territorial dimension by its principal action at the local community/family level and a sectoral dimension by having a special focus on farming population.

The Framework foresees joint action between central and regional governments and local communities. Several ministries are involved on the part of the central government, with MAF co-ordinating the overall action and taking responsibility for implementing most of the farm-specific blocks within the Framework. The other ministries – the Ministry of Social Development, Inland Revenue (New Zealand’s tax authority), Ministry of Civil Defence and Emergency Management – oversee their respective blocks of assistance. Regional and district councils ensure territorial cohesion. Rural communities are also involved and are represented by the Rural Support Trusts (RST) which play a critical role in ensuring local outreach and feedback (Box 10).

A National Adverse Events Committee is the operational vehicle for consultations and plays the role of coordinator. In addition to the central and regional governments and

RSTs, the Committee also includes representatives from a range of farmer groups, as well as agencies responsible for climate monitoring (e.g. NIWA). The Committee is convoked on an *ad hoc* basis following an adverse event. One of its key tasks is to provide input to MAF, which in turn will advise the central government on the scope of assistance needed, while the declaration of an adverse event is the prerogative of the central government.

Table 11. Adverse Events Framework: key blocks of assistance, eligibility and division of government responsibility

	Eligibility	Responsibility	Key blocks of assistance	Policy rationale
On-Farm Adverse Events Framework	Community-wide assistance	MCDEM	Emergency measures (evacuation, food assistance, etc.)	Equity (families in psychological and financial stress)
		MSD	Labour assistance (clean-up, repairs, etc.)	
		MSD	General social assistance to individuals and families	
		MSD, RST	Psychological help and personal advice	
		MSD	Social assistance to farming families (Rural Assistance Payments)	
	Assistance specific to farming families	IR	Tax relief	Efficiency (quick economy recovery)
		RST	Business advice	
		MAF	Technical assistance	
		MAF	Exit aid	
		MAF	On-farm restoration	

Acronyms: MSD – Ministry of Social Development; IR – Inland Revenue Department (Tax Authority); MCDEM – Ministry of Civil Defence and Emergency Management; MAF – Ministry of Agriculture and Forestry; RST – Rural Support Trusts.

Source: MAF, 2009e.

Box 10. New Zealand's Rural Support Trusts

Rural Support Trusts emerged in the late 1980's when the farming community was going through a difficult period of adjustment following the deregulation of agriculture, with the first Trust created in North Canterbury as a mutual aid group for people and families in that area. The Trusts are charitable organisations set up by rural people, its members chosen for their reputation of trusted and respected persons who often have extensive farming experience.

In July 2007, the government introduced a programme to incorporate existing RSTs into the Adverse Events Framework and to provide financial support so that such groups could be created in regions where they did not exist. There are now 16 RSTs that operate across the country. RSTs play an important role within the Adverse Events Framework by providing the first alert and the preliminary information on damage, as well as offering initial advice to the victims. RSTs also have a role at the recovery stages by providing on-the-ground advice and counselling (e.g. informing on the range of assistance available, helping to apply for assistance, providing business options to cope with the damage, etc.). RSTs also run management advice seminars and field days, and help oversee some of the government assistance measures. RSTs receive funding from the government to undertake activities related to the Adverse Events Framework (although this is not the only financial source for some of the RSTs, as their scope may be broader than just participation in the Adverse Events Framework). Trustees receive a per hour pay during and after the adverse event for carrying out their functions. According to MAF, and the farmers interviewed by OECD, RSTs have proved to be valuable in coping with recent adverse events. However, much depends on the commitment and availability of appropriate people and some Trusts work much better than others.

Source: MAF, 2009e; OECD's interview with the North Canterbury RST.

As noted above, there are no pre-set quantitative criteria for an adverse event and the triggering of assistance depends on the result of the assessment of each particular case. At the initial stage, active consultation with all parties takes place, including within the National Adverse Events Committee, and information is gathered and assessed. An important point in the process is to determine the scale of the adverse event, i.e. to categorise it as a small, medium or large event. The criteria applied are as follows: (i) availability of risk management options; (ii) likelihood of the event occurring again; (iii) geographic scale of the physical damage; (iv) geographic scale of the economic impact; and (v) geographic scale of the social impact (Table 12).

This decision determines the scope of assistance that will be provided. There is a pre-determined set of measures specific to the scale of the event. Table 13 indicates that the more severe the event – i.e. the larger the parts of the country affected and the greater the economic impact – the greater the assistance and the higher the levels of government that will provide assistance.

When an event is assessed as large-scale, a Special Recovery Measure (SRM) can be triggered. In this case, the government undertakes to partially cover the costs of restoration of on-farm infrastructure, but on the condition that no commercial insurance is offered (this is called “non-insurable” infrastructure in the programme). SRM also provides for partial compensation of costs to re-establish “non-insurable” pasture, crops and forestry.

In the special case of a possible large scale biological incursion that would be categorised as a “large event”, SRM would not be implemented, meaning that even if livestock or plants could not be insured there would be no compensation for loss related to infected animals or plants. According to MAF, such compensation would reduce the incentive to quickly notify authorities of an exotic disease. Farmers would be compensated for losses due to the destruction or restriction on movement of animals or plants that are not infected. Under the Biosecurity Act (1993), BNZ may take such actions to eradicate or control the spread of an exotic disease.

Table 12. Adverse Events Framework: a decision matrix to determine the scale of adverse event

Themes	Criteria	Small-scale (the majority of the criteria sit within this column)	Medium-scale (the majority of the criteria sit within this column)	Large-scale (the majority of the criteria sit within this column)
		Assessment/classification of the event		
Risk management options	Availability of options	Readily available	Moderately available	No practical options available
Magnitude of event	Likelihood of the event	Frequent	Infrequent	Rare
	Scale of physical impact	Local level	District level/ multi-district level	Regional/ national level
Capacity of community to cope	Degree of economic impact	Local level	District level/ multi-district level	Regional/ national level
	Degree of social impact	Local level	District level/ multi-district level	Regional/ national level

Source: MAF, 2009e.

Table 13. Adverse event framework: the sets of assistance measures according to scale of adverse events

SMALL-SCALE ADVERSE EVENT (SSE)		MEDIUM-SCALE ADVERSE EVENT (MSE)	LARGE-SCALE ADVERSE EVENT (LSE)
Initial clean-up	<ul style="list-style-type: none"> • <i>Task Force Green</i>: labour assistance for initial clean up 	<ul style="list-style-type: none"> • Enhanced Taskforce Green: “enhanced” labour assistance for clean up and repairs 	Same set of measures as for MSE
Tax relief	<ul style="list-style-type: none"> • Acceptance of late estimates of provisional tax • <i>Income Equalisation Scheme</i> (for adverse events) • Late payment and late filing of tax and tax outstanding 	Same set of measures as for SSE	Same set of measures as for SSE/MSE
Individual and family support	<ul style="list-style-type: none"> • <i>Emergency Unemployment Benefits</i> (short-term) for workers for whom work (and income) is not available. Income and asset tests apply. • <i>Seasonal Work Assistance</i>: grants to workers unable to work due to poor weather conditions. Income and asset tests apply. • <i>Special Needs Grants, Recoverable Assistance</i>: a one-off, ad hoc aid, for example food grants. • <i>Working for Families</i> tax credits for families with dependent children with incomes below given thresholds. 	Same set of measures as for SSE	Same set of measures as for SSE/MSE
Local recovery assistance		<ul style="list-style-type: none"> • <i>Psychological recovery</i> assistance • <i>Civil Defence payments</i>: for food, accommodation, clothing, loss of livelihood • <i>New Start Grants</i>: one-off aid to permanently leave commercial farming when it is no longer viable as a result of the adverse event • <i>Rural Assistance Payments</i> to farm families when their business cannot meet essential living needs. • <i>Rural Support Trusts</i>: funding for provision of financial advice and welfare support, and provision of local recovery facilitators • <i>Technology transfer</i>: funding for education and technical advice on recovery options • <i>Agricultural Recovery Facilitator</i> • <i>Volunteer costs</i>: travel and accommodation • <i>Media communications</i> 	Same measures as for MSE
Special recovery measure			<ul style="list-style-type: none"> • <i>Special Recovery Measure</i>: cost-sharing in restoration of on-farm infrastructure, pasture, crops and forestry.

Source: OECD presentation based on MAF 2009a, MAF 2009e.

Once an assessment has been made, if an event crosses the threshold from small to medium a convention is applied to automatically upscale assistance measures. When an event crosses the threshold from medium to high, it triggers consideration of an SRM but not necessarily its adoption. It is therefore possible for a medium or large event to be covered by the same set of assistance measures, as was the case with a major drought in 2008.¹⁵

The incidence of adverse events and the scope of assistance provided is summarised in Annex 2. In the past 15 years, only two events have been qualified as large-scale: flooding which affected the lower half of the North Island in 2004 and the 2008 drought which affected most of the country.

The bulk of the financing for adverse events assistance comes from the central government which made the most important allocations between 2004 and 2006, the largest amount spent following the 2004 flood (NZD 41 million, or USD 29 million). If one excludes these three years, the average annual spending by the central government within the Adverse Events Framework since 1999 amounted to a relatively modest NZD 0.20 million (USD 0.12 million) (Table 9). Local/regional governments also provide some financial assistance, in general for the restoration of public infrastructure, such as roads and water supplies.

A review process of the Adverse Events Framework took place in 2006. It was prompted by the experience of the recovery measures taken in the early 2000s, which were criticised for the distortionary ways on-farm assistance was provided and substantial over-compensation. The review process included consultations with farm groups, agri-business, local governments and public consultations meetings across the country and concerned all aspects of the Framework, but with a particular focus on the configuration of on-farm recovery assistance (the SRM). The issues presented for discussion with respect to SRM were whether direct business assistance to commercial farms was appropriate or if compulsory insurance was a preferable option. The public was invited to comment on ways of providing direct business assistance (e.g. as a concessional credit, as a general cash grant, or a targeted grant). For each option, advantages and disadvantages were outlined for public consideration. The current characteristics of the programme (in particular the SRM) reflect the feedback received from this review process. The Adverse Events Framework is therefore a *broadly consulted* assistance framework which seems to reflect current public consensus concerning provision of such assistance. The OECD interviews showed there is general appreciation by the farming community of the Adverse Events Framework, although some members of this community questioned the fact that the SRM was not automatically triggered.

The Adverse Events Framework is a *targeted policy* by design because assistance is tied to a specific location. Its primary beneficiaries are (rural) families who are subject to income and asset tests and other explicit criteria in order to receive the majority of the payments. The outreach at the local/individual family level is ensured through local

-
15. After consultations with industry bodies, local government officials, RSTs, and inspection of climatic data, MAF recommended to government that this drought be declared a “large” adverse event, which requires consideration of an SRM. MAF’s assessment in this case took into account independent scientific reports on the prospects for recovery of pasture and crops once the drought was over. As they suggested that prospects for a full recovery were good, MAF concluded there was no need for an SRM, even though the event was qualified as “large”.

governments and the Rural Support Trusts which enables more efficient targeting of assistance.

A particular feature of the programme is a combination of *flexibility* and *rigidity* with respect to its potential scope of assistance. This is achieved by means of a menu of possible measures, which is adjustable to the scale of the event, the scale of which is based on a set of criteria. This programme represents an interesting example of a policy that is both *ex ante* (because the set of potential assistance measures is pre-determined) and *ex post* (because the choice of a concrete set is determined following the event and based on the assessment of particular conditions). This decision-making process allows *interaction amongst stakeholders* (of the National Adverse Events Committee) and it is therefore well-informed, and may take into account the various positions of the stakeholders.

The programme incorporates principles that address *moral hazard* problems. For example, it clearly mentions the primary responsibility of the individual to be prepared for an adverse event and any recovery actions that necessarily follow. The Framework outlines possible strategies for farmers to pursue and draws their attention to the necessity of developing contingency plans. Indeed, one of the objectives of the Framework review in 2006 was to ensure that farmers were aware that they had the primary responsibility for managing their farming risks. A more “operational” principle to address the moral hazard problem is the fact that the SRM is not triggered automatically and in each case is subject to a specific government decision. In principle, this maintains a farmer’s incentive to pursue risk strategies.

The Adverse Events Framework is a *comprehensive* and variable policy package in terms of the types of assistance it provides. It foresees various ways to meet the most urgent needs of the families affected (including critical material and financial help, advice, and psychological aid); it also offers various facilities to recover from an adverse event, the emphasis being on business recovery. The package contains measures that enable *structural adjustment*. Rural Assistance Payments are set at the level of emergency unemployment benefits to help viable producers stay in business. At the same time, New Start-up grants are available to businesses which have become non-viable; these grants facilitate their exit from farming.

Despite a number of positive design features, the Adverse Events Framework involves issues that deserve further consideration. The first is linked to the fact that in spite of the availability of various assistance instruments, some are not used or used only marginally. An example is the Income Equalisation Scheme regime for adverse events which farmers have made very limited use of (Table 7). This could imply that there is either limited awareness among the potential beneficiaries about this option or that this scheme provides few additional incentives to farmers as compared to the standard Income Equalisation Regime.

According to MAF, there has been virtually no uptake of the New Start-up Grants over the past 20 years. It would be useful to explore the reasons for the lack of uptake of the New Start-up Grants, which could be related to overly strict criteria for access by potential beneficiaries or to the levels of the grants.

Finally there is an issue related to SRM. As noted, this facility provides partial compensation for the restoration of “non-insurable” infrastructure, pasture and plantings. The rationale for this support is that insurance for such damage is not available to farmers on the commercial insurance market. However, this creates a typical crowding-out

problem: the fact that such damage could be covered by the government for an adverse event reduces incentives for insurance companies to develop the appropriate contracts and for farmers to ask for them. MAF is aware of the crowding-out problem, but considers SRM the “least worse” policy in the event of a major disaster because the conditions and the limits to assistance are set in advance; this helps to avoid *ad hoc* policy responses under pressure “to do something”.

4. The role of farmer collective action in risk management

This section discusses the role of farmer co-operatives and “industry good” organisations, two forms of farmer collective action in New Zealand.

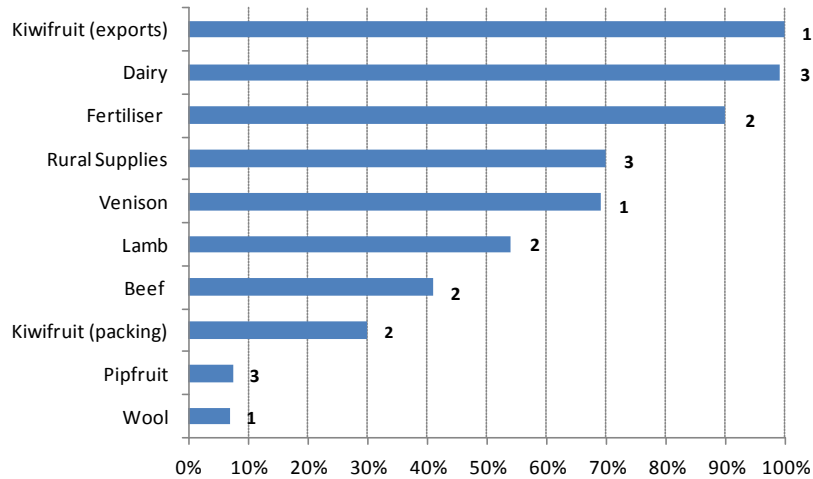
Producer co-operatives

A comprehensive study of New Zealand agricultural co-operatives was carried out by Evans and Meade in 2006. Although they concluded that the market shares of cooperatives are not systematically greater in New Zealand agriculture than they are in other countries, they estimate that there is considerable co-operative activity in key agricultural sectors (Figure 14)¹⁶. Virtually all milk in New Zealand is processed and marketed by three co-operatives, with Fonterra accounting for around 90%. Approximately 30% of kiwifruit is packed by two co-operatives and 99% of exports are channelled to overseas markets through Zespri, an investor-owned company controlled by the growers (although Zespri is legally not a co-operative). Two co-operatives handle around 40% of beef and 55% of sheep meat marketed, and one co-operative almost 70% of venison meat. In some sectors, however, co-operatives are much less prominent; for example, in the pipfruit and wool sectors. The study highlights product characteristics as an important factor explaining the degree of development of co-operatives in different sectors. Less homogeneous and less perishable products (like pipfruit and wool) reduce the commonality of farmer interests, and therefore incentives for co-operation.

Evans and Meade highlight the flexibility afforded to co-operatives under New Zealand legislation, which enables them to overcome some traditional constraints of co-operative form both to improve capital utilisation and to enhance integration through the supply chain. The study did not find evidence that co-operative dominance of certain agricultural sectors constrains sector performance. Furthermore, it suggests that where this does occur, it can be suggested to underpin sector performance.

16. However, as the authors stress, the estimation of co-operatives’ market shares is complicated and can only be approximate. First, because there are various legislative acts in New Zealand under which co-operatives may organise themselves into legal forms other than co-operatives. Second, co-operatives are not formally required to identify themselves as such. These facts complicate the identification of those organisations in New Zealand that are legally, let alone functionally, co-operatives.

Figure 14. Market shares of the largest supply and marketing agricultural co-operatives in New Zealand, 2005¹



1. Figures next to the bars indicate the number of co-operatives corresponding to the estimated shares.

Source: Evans and Meade, 2006.

The co-operative organisation offers multiple ways to enhance economic performance. Peterson and Anderson (1996) distinguish various strategies employed by co-operatives (Table 14). There are strategies to increase members' future returns by adding competition to the market, strengthening producers' bargaining power, and reducing some costs of governance and transaction through markets. However, more important in the context of this review is that co-operatives can develop strategies that reduce uncertainties about future returns, which are often specific to this institution. This risk management capacity has been an important driver of producer co-operation.

A co-operative represents a specific institutional form of secured contract. For farm supplies and processing/marketing of the products, this implies certain guarantees to co-operative members with respect to price and quantity (supplied or marketed). In order to meet this obligation co-operatives inevitably apply direct strategies to reduce members' risks, such as pooling of prices across time and markets, developing payout regimes to smooth fluctuations of member returns and maintaining the market to ensure continuity of returns (Table 12). As discussed above, co-operatives also act as agents for farmers collectively to hedge risks in organised commodity and financial risk markets.

Apart from direct strategies to manage market risks, co-operatives also employ indirect strategies which are generally consist of diversifying members' investment risks. The most typical investment strategy is integration along the supply chain. Many other forms of diversification can also be employed, such as product and market diversification, geographic diversification and investments outside agro-food business.

Table 14. Co-operative return and risk management strategies

Return strategies (increasing future returns)	Risk-management strategies (making future returns more certain)
<p>Countering market power</p> <p><i>Competitive yardstick</i> – introducing competitive discipline on prices in an industry otherwise suffering from market power.</p> <p><i>Counter-veiling power</i> – securing bargaining strength to move market equilibrium towards the competitive ideal through horizontal integration</p> <p>Improving cost efficiencies</p> <p><i>Deal costs</i> – securing economies in contracting, monitoring, planning, communicating and enforcing exchanges</p> <p><i>Agency costs</i> – achieving economies in monitoring managers and strategies, e.g. due to direct governance participation and the monitoring value of patronage refunds</p> <p>Serving missing markets:</p> <p><i>Member demand</i> – securing information economies in communicating member product preferences where “the market” otherwise fails to meet them.</p> <p><i>Consumer demand</i> – achieving information economies in the reflection of consumer preferences in farm activities and product specifications.</p>	<p>Direct strategies</p> <p><i>Pooling</i> – averaging prices across time and markets</p> <p><i>Savings “bank”</i> – saving member returns in good times and paying them back in bad times</p> <p><i>Maintaining the market</i> – producing returns in times when non-co-operative firms would abandon market</p> <p><i>Using organised risk markets</i> – commodity and financial hedging on behalf of the members</p> <p>Indirect strategies</p> <p><i>Conservative investment</i> – restricting co-operative investment to “safe” assets</p> <p><i>Diversification</i> – expanding co-operative investment to include risk-reducing, non-member-centred assets</p> <p><i>Selective vertical integration</i> – integrating into markets with negative co-variance between co-operative and member returns (another form of diversification)</p>

Source: Presentation by Evans and Meade (2005) based on Peterson and Anderson (1996).

Fonterra represents an illustrative example of a co-operative with a strong focus on risk management. This arises from the nature of dairy operations themselves, which deal with a perishable product, supplied day and year-round and with significant seasonal variation, and whose production is costly to adjust. Risk management is essential for Fonterra also because of the enormous global outreach and variability of its products in terms of value-added and differentiation. The co-operative sells over 600 dairy commodity and speciality ingredients products to 140 countries. The prices for these products are determined by a wide range of markets that can be spot prices or previously contracted prices, the exchange rate, the movement of inventory, the cost of freight, storage and delivery and other trade related issues. As has been mentioned previously, Fonterra actively uses commodity and exchange rate hedging to reduce the price risks and most of its marketing occurs under the contractual specifications for international food conglomerates. However, the complexity of products and sales creates uncertainty around the price the co-operative can finally pay the farmer, and the co-operative applies specific pricing and pay-out mechanisms to deal with such uncertainty.

Fonterra uses a price pooling system whereby all producers supplying milk receive a unique price. An indicative price is announced before the start of the season. A special pay-out regime is set, which guarantees minimum indicative returns to producers over the

season; however final settlement is not made until there is certainty about the returns to the co-operative, usually six months after the milk is picked up from the farm. Dividends paid to members on their capital in the co-operative are spread across the season. The pay-out regime also functions as a signalling system for farmers, thus enabling them to make short-term adjustments in their variable costs (Box 11).

In the kiwifruit sector, Zespri operates as an effective “single point of entry” for export markets (other than Australia). The export returns are pooled across the various markets and allocated to growers according to their supplies; the pay-out scheme smoothes the returns across the season (there is a separate pooling system for green and gold kiwifruit, and organically produced fruit). The supplies from the growers are in large part coming under the forward contracts, which in addition to price and quantities include provisions related to quality assurance. Zespri offers a loyalty premium to growers who sign a three-year rolling contract.

The role of co-operatives is much smaller in the meat and wool sectors. Evans and Meade note that meat producers in general cannot be assumed to have a strong commonality of interest as is the case in the dairy sector, and the costs of co-operative ownership are therefore higher in the meat sector. Livestock is not a highly perishable commodity and can be economically transported to competing processors when local processors offer unfavourable terms.

Another reason that limits the role of meat co-operatives in New Zealand is linked to the fact that the industry is still in the process of re-organisation following deregulation in the 1980s. There has been considerable consolidation in the industry, with regional cooperatives merging into three large firms with overlapping regions. The co-operatives also compete against each other in the same overseas markets. Farmer members who belong to more than one co-operative have no strong allegiance to any one of them and often prefer spot sales. Farmers are able to divert deliveries to spot markets because membership in a sheep/beef meat processing co-operative does not imply high penalty risks for non-delivery. Such behaviour is possible because the meat industry is characterised by structural overcapacity and there is high competition among processors for primary supplies. Processors confronted with non-delivery choose not to make recourse to enforcement procedures considering that this would weaken their capacity to attract suppliers in the future. Other processors benefit from non-enforcement of contracts by their competitors because this provides an opportunity to attract additional supplies. At different periods each processor may find himself in both roles. On the other hand, there have also been instances during droughts where processors faced with massive deliveries of animals for slaughter have broken contracts. As a result, when supply is low and/or there is over capacity in processing there are procurement battles that destabilise the industry; similarly when supply is high and processing is tight, mutuality is compromised.

Box 11. Fonterra's system of payouts to milk producers

The method used by Fonterra to convey price signals to their farmer members is shown below. The Fonterra statement provides an indicative payout for 2009/10 set at NZD 4.55 per kilogram of milk solids before the season began. This was a significant decrease from the previous year and resulted in farmers modifying their cost structures so as to ensure they were not disadvantaged by the drop in price. The milk price of NZD 4.10 per kilogram of milk solids was to be paid in full only 16 months after the beginning of the year. The profit on members' capital in the cooperative (total value return) is also not paid in full until then but an interim payment was made in April. Since this announcement was made, world prices for milk products have improved. This, coupled with certainty around contracts and exchange rate cover, enabled the indicative payout to be increased in November 2009 and at the end of April 2010, a revised milk price was announced at NZD 6.10 per kilogram of milk solids, implying that the payout for the rest of the year will be adjusted further.

Month	2008/09 season forecast	2009/10 season forecast	
	Advance rate, NZD per kg of milksolids	Advance rate, NZD per kg of milksolids	% of projected milk price
Total mik price	4.75	4.10	
June paid July	4.10	2.90	70.7%
July paid August	4.30	2.90	70.7%
August paid September	4.30	2.90	70.7%
September paid October	4.05	2.90	70.7%
October paid November	4.05	2.90	70.7%
November paid December	4.05	3.00	73.2%
December paid January	4.05	3.05	74.4%
January paid February	4.05	3.05	74.4%
February paid March	4.05	3.05	74.4%
March paid April	4.05	3.30	80.5%
April paid May	4.05	3.50	85.4%
May paid June	4.15	3.60	87.8%
June paid July retro ⁴	4.30	3.70	90.2%
July paid August retro	4.40	3.90	95.1%
August paid September retro	4.50	3.90	95.1%
September paid October retro	4.75	4.10	100.0%
Value return component of payout			
Paid 20 April ¹	-	0.2	
Paid 20 August ²	0.20	-	
Paid 20 October ³	0.45	0.45	
Total value return	0.45	0.45	
Total payout	5.20	4.55	

1. Paid on milksolids supplied 1 June to 20 February.

2. Paid on milksolids supplied in the season.

3. Paid on milksolids supplied in the season less Interim value return payments paid on 20 April or 20 August.

4. "Retro" means that payment is based on supply of the season that has just finished (on 31 May).

Source: Shadbolt, 2009c.

Co-operatives are very important in agricultural input supplies in New Zealand, providing almost 90% of fertiliser and 70% of other rural supplies to farmers (Figure 13). Evans and Meade found that these shares are higher than in other countries. The two largest fertiliser companies in New Zealand (Ravensdown and Ballance AgriNutirents) are cooperatives, allocating profits to shareholders proportional to the amount of fertiliser sold. Another example of co-operative involvement in input supplies is the bulk purchases of inputs by large downstream operators, allowing them to bid down the prices of purchased inputs, which are then retailed to farm suppliers through company stores. Prominent examples include farmlands and the “RD1” stores operated and co-owned by Fonterra.

In conclusion, producer co-operatives in New Zealand play an important role in the system of farm risk management, although this role varies across sectors. In some, such as dairy and kiwifruit exports, co-operatives handle the bulk of the primary product and have developed multiple, and often complex, strategies to manage market risks. Through comprehensive contracts that specify the production process, they ensure other product characteristics (e.g. related to food safety, retailer specification, or exigencies of particular overseas markets) that enable these sectors to maintain existing markets or to penetrate new ones. Co-operatives in these sectors go further than just managing member’s market risks but through technology transfer and investment also address farmers’ production and financial risks. In other sectors, such as pipfruit, co-operatives co-exist with other companies which also offer primary producers contracts that address various risks.

In the meat sector, there is currently an apparent misalignment of interests between co-operatives and their members, and a lack of member commitment to co-operatives. Spot markets often offer farmers superior gains and opportunistic behaviour prevails in this sector. Poor contract discipline enables parties to realise short-term gains, but all participants face higher risks in the medium to long-term. An unreliable contract at the primary level weakens the capacity of the chain to respect quality and quantity specifications of supplies to end markets. As a result, importers may seek other supply channels. In the long-run, the lack of contract discipline diminishes the ability of the chain to maintain optimal levels of investment, and in particular to support strategic areas of business development. Overall, the ability of the sector to compete efficiently on global markets is undermined, and marketing risks are increased along the whole food chain, including the farm level.

“Industry good” bodies (levy organisations)

In New Zealand, farmers producing particular commodities can collectively finance activities that are of common benefit to them (the so-called “industry goods”). Such activities may include research, information collection, analysis and dissemination, technical assistance, advice, insurance, generic product promotion, etc. A Commodity Levy Act (1990) empowers producers to self-impose levies through a vote in order to finance the “industry good” activities. Once voted, the levy becomes obligatory for all commercial producers of a commodity and is charged on each unit marketed as a type of sales tax. Levies are collected by downstream operators and transferred to industry good bodies.¹⁷ The obligatory character of the levy is grounded by the necessity to avoid a “free-rider problem”. Everyone is obliged to pay as it is difficult to exclude non-payers

17. Only meat sector levies are collected by MAF.

from benefiting from “industry goods” just because they have the characteristics of public goods. However, this compulsory levy is introduced through voting and therefore is self-imposed. There is also a requirement to vote (every six years) the continuation of a levy; it is therefore possible that the levy can be repealed by farmers.¹⁸

The industry good bodies represent a unique institutional arrangement amongst farmers themselves, and farmers and the government. In principle, this is a form of farmer collective action for the development of specific services (Evans and Meade qualify it as a “co-operative like solution” for certain activities). However, the power of the government is exercised to enforce, through public law, the financing of this institution.

Currently, the industry goods bodies exist for all major commodity sectors, and include:

- Dairy New Zealand (an industry good organisation covering all commercial dairy farmers)
- Beef and Lamb Zealand (sheep and beef farmers)
- Deer New Zealand (deer farmers)
- United Wheat Growers (wheat farmers)
- Horticulture New Zealand (fruit, vegetable, berry fruit and olive growers)
- Fruit Growers Association (apple and pear growers).

The activities to be undertaken by the industry good body must be approved by the levy payers. An example of typical “goods” provided by an industry body can be drawn from Dairy New Zealand. Table 15 summarises key activity areas and more specific projects it currently implements. They revolve around research and development, provision of market information and analysis, technical assistance and extension, generic market promotion, etc. Dairy New Zealand carries out research and extension on dairying technologies, biosecurity issues, business management and human resource development. It provides training and consultancy for farmers in the areas they work in. This industry good body is also actively involved in advocacy for dairy farming, an increasingly important activity in view of growing public concerns about the negative environmental externalities of dairying.

18. For example, in 2009 wool producers voted against continuation of a wool levy. This happened in the context of substantial economic difficulties that the sector has been experiencing in recent years. The “against” vote, dominated by the small producers, was the expression of farmer dissatisfaction with the ability of the industry good body (Meat and Wool New Zealand) to assist the sector. The organisation received a new name “Beef and Wool New Zealand”.

Table 15. Key activities of Dairy New Zealand

Areas	Content of activity	Links to farm risk management
Biosecurity	<ul style="list-style-type: none"> • Bovine tuberculosis programme: achieving “disease free” targets • Putting systems in place to manage and mitigate significant biosecurity breach • Identification and management of endemic weeds, pests and diseases 	Animal and crop disease risks – risk assessment, communication, reduction and mitigation
Farm systems research and adoption	<ul style="list-style-type: none"> • Creating and testing options for future farm systems • Demonstrating best practice future farm systems options • Supporting farmer adoption through the Consulting officer network. 	Technology improvements and sustainable farming – reduction of on-farm production risks
Feed production	<ul style="list-style-type: none"> • Increasing quality and quantity of feed production • Increasing the number of farmers using existing technologies • Developing pasture measurement and management tools 	Technological improvements – reduction of on-farm production risks
Animals	<ul style="list-style-type: none"> • Selective breeding of dairy cows: evaluation, development and implementation of optimal approaches to breeding • Methods to increase cow productivity • Research into increasing feed conversion efficiency 	Technological improvements – reduction of on-farm production risks
Human resources	<ul style="list-style-type: none"> • Training courses and management tools to help farmers manage their staff • Campaigning amongst young people to encourage them for a career in the industry • Developing farmer-leaders 	Human resource development
Community impact	<ul style="list-style-type: none"> • Promote the contribution the dairy industry makes to the community and seek to educate the public about dairy farming, particularly farmers’ efforts in the areas of sustainable dairying and employment. 	Advocacy – addressing policy risks
Animal welfare	<ul style="list-style-type: none"> • Providing advice and information to farmers on sound animal welfare practices. • Promoting the efforts of the dairy industry to key stakeholders and decision-makers. 	Technological improvements, addressing societal concerns
Farm business	<ul style="list-style-type: none"> • Helping farmers set business goals, put in place financial systems, processes, and strategic planning • Providing key information to help farmers benchmark their performance against others • Provide farmers with better access to financial and business skills training • Providing information tools (e.g. Dairy Base) 	Progressive farm management practices and planning – on-farm market risk management
On-farm innovation	<ul style="list-style-type: none"> • Support and encourage farmers new and innovative ideas and non-traditional approaches to dairy challenges 	Technology and business innovation

Source: Dairy New Zealand, 2010.

Most activities performed by Dairy New Zealand have links to farm risk management. Some directly address farmer risks, such as the bovine tuberculosis programme and participation in the development of a system of emergency response to potential disease outbreaks. Other activities facilitate adoption of sustainable farming practices by farmers, improvement of farm organisation and business management, thereby representing actions that contribute to reduction of farmer risks. The most general function of industry good bodies with respect to risk management is the provision of information, knowledge and development of farmers' skills for their own management of risk. As has been highlighted, industry good bodies are one of the principal providers of market information and analysis for farmers (section 1.5).

The industry good bodies are also involved in the implementation of government policies related to coping with risk. As discussed earlier, these bodies are part of the National Adverse Events Committee and participate in the assessment of adverse events and the establishment of any eventual government assistance to farmers. Finally, in the wheat sector the only function of the industry good body is to act as the farmers' agent in contracting yield insurance with the commercial insurer.

PART III.

POLICY IMPLICATIONS

5. Policy recommendations and concluding remarks

Over the past two decades New Zealand agriculture has operated with no policy interventions in markets. The primary role of the government has been to develop and enforce basic rules and regulations, and to ensure that the economic system remains competitive and the macro-economic framework stable. The government also plays an active role in risk management in agriculture, but the scope of its involvement is strictly limited. Its actions – and the underlying financial transfers – are concentrated on building and maintaining a system of prevention of pest and disease incursions. Although this system serves the farming sector, the rationale for this policy is much broader as its objective is to preserve the country’s natural resources and human health. Governments at the local level are responsible for preventive and control measures related to natural disasters, but post-catastrophic assistance is largely financed by the central government. These activities are also not specific to agriculture but are part of a broader territorial policy of assistance to local communities. Finally, the government contributes to knowledge and information systems to support private risk management efforts. Overall, New Zealand policies related to risk are well inscribed in a tradition of designing and implementing policies on the basis of active interaction between governments at all levels, industry and civil society

Policy recommendations for New Zealand

New Zealand’s farming sector is confronted with pressures to remain a competitive export-oriented business and at the same time to meet growing societal demands for sustainability. The pressure for competitiveness implies intensified use of natural resources and practices associated with high production, financial and market risks. The pressure for sustainability implies constraints on the ways resources can be exploited and an increasing internalisation of the resource use costs into farming costs. The key challenge for the farm risk management system in New Zealand is to develop strategies that would reconcile these competing pressures.

The situation in New Zealand is unique in that there are no apparent political claims for the provision of transfers to support the farming business. Moreover, strong political restraints on such policies exist stemming from the country’s past economic experience and the overall public perception of farming as a “normal” and lucrative business. This is fully applicable to the risk area where the management of risks in the farming business is viewed as falling largely outside government responsibility, in particular market risks. It is reasonable to assume that this political economy context will be maintained and any

discussion of policy issues on risk management in New Zealand must take this into account.

The recommendations presented below concern areas of research, information, and extension, the principal areas of responsibility of the New Zealand government in what concerns agriculture. These recommendations concern the government and farmers collectively, or “the industry”, as the latter plays a key role in providing research, information, and extension in New Zealand.

1. ***Strengthen a whole-enterprise view of farming business***, focussing on interactions between commodity markets and various farm activities.
 - a. *Investigate the potential of output diversification to reduce farm income variability.* The results obtained in this study for the meat sector suggest that output diversification may have an important impact on reducing farm income variations in New Zealand. These results are partial, and it is recommended to extend farm-level risk analysis to other farm types and larger samples. Other forms of diversification, in addition to the output diversification, could be analysed, such as spreading production across locations and diversifying trade across overseas markets. There are inevitable trade-offs between specialisation to reduce costs and diversification to reduce income variability. The choice of a particular strategy will depend on individual farm business features and farmer risk preferences. However, such choices would be more informed if they were supported by broader empirical analysis of the trade-offs between the two strategies.
 - b. *Strengthen cross-sectoral approaches to the provision of information, advice and extension services.* The so-called “industry good” bodies (or levy organisations) are the principal providers of these services. A commodity principle is at the heart of their organisation, with the result that an individual farmer producing several commodities is served by several bodies, each concerned with specific product. This limits the approach to management of farm risk in an enterprise with multiple activities and interactions between these activities. A pooling of some parts of commodity levies to develop cross-commodity topics could be proposed to levy payers and their good bodies. The government could play a role of facilitator in this process, and may also consider some initial complementary financing for this pool in order to strengthen incentives for such a reorientation.

2. ***Increase the potential for development of agricultural insurance by improving information about risks.*** The insurance market in New Zealand operates in a subsidy-free environment and is relatively limited. Farmers see little advantage in insuring crops, animals and pasture. This reflects the fact that typically no coverage is available against key natural perils that affect crops and animals, such as drought and floods. Incomplete information on risks and their quantified impacts on farming may be an important factor impeding the development of markets for some types of insurance.
 - a. *Initiate consultations with insurers and other stakeholders with a view to identifying areas where information on risks can be improved*, in particular those that are theoretically “insurable” but for which insurance markets have hardly developed or failed.

- b. *Support further research into farming risks*, either by government institutions or through private efforts, the goal being to improve understanding of the sources and characteristics of risks faced by farmers. The government, for example, is best placed to improve information on natural risks, in particular on how these risks are likely to evolve in the context of climate change.
 - c. *Consider the feasibility of an information-sharing system on risks* involving insurers, farmers and government, which could help reduce transaction costs incurred by insurers in obtaining the information and facilitate setting actuarially sound insurance premiums for different risk groups.
 - d. *Support education of farmers as potential users of insurance and other risk management tools*. Farmers are generally perceived to have better knowledge about their risks, but they may underestimate these and choose not to be insured. There is scope to improve farmers' awareness about their "marketable" risks and how to use available instruments to manage such risks. At present, some insurers and industry associations have undertaken to better inform farmers about "marketable" farming risks, but these initiatives could be more broadly promoted and supported by government.
3. ***Assist in improving industry attitude to contract discipline***. While the problem of poor contract discipline in the meat sector is long-standing and widely acknowledged, OECD interviews showed that it may not be unique to that sector only. From the standpoint of risk management, this implies that advantages of such an important risk management instrument are not fully exploited. The lack of contract discipline does not necessarily arise from an absence of written regulations and formal enforcement mechanisms. Rather, contractors see no advantages in using these enforcement mechanisms. In the case of the meat sector, poor contract discipline is seemingly more an issue of the industry's lagged structural adjustment and the ability of food chain participants to adopt behaviour consistent with a common longer-term objective of maintaining competitiveness on the global market.
- a. *Improve the industry's understanding of the trade-offs between short-term gains and longer-term consequences of poor contract discipline*. Evaluate how the ability of the sector to compete efficiently on global markets is undermined by lack of contract discipline and how this increases market risks along the food chain, including at the farm level. Both the industry and the government could play a role to undertake the relevant analysis, underpinned to the extent possible by quantitative evidence. Better awareness on long-term gains could increase the industry's incentive to act against bad practice.
 - b. *Strengthen and diversify the incentives incorporated in supply contracts to farmers*, for example by offering greater flexibility of the pricing provisions, as well as other incentives, such as the provision of input supply, and veterinary or advisory services. This lies outside the government's remit and concerns private efforts to improve the existing system of contracts.
 - c. *Consider an inquiry into the existing contract enforcement system* with a view to identifying potential areas where the use of such mechanisms could be simplified.

4. ***Reduce uncertainties on future environmental regulations.*** Developments in environmental policies will require changes in farming practices and generally imply higher costs for farmers which are unlikely to be shared by New Zealand taxpayers. From the perspective of risk, the issue in this respect is not about the appropriateness of introducing new (or stricter) environmental regulations. It is about giving farmers more certainty about their future business costs. The central government could play a facilitating and guiding role in the process of developing environmental instruments at the regional level.
 - a. *Provide assistance to regional governments in their assessment and design of alternative policy instruments.* These tasks require considerable analytical input which some regional authorities may be lacking, such as methods and economic models to evaluate the impact of changes in farm practices on the environment, the farmer costs involved in adopting pro-environmental practices, and the effectiveness of various policy instruments to achieve environmental targets.
 - b. *Developing and providing environmental information to support policy design,* as information uncertainties are considerable at each stage of this process. The definition of environmental targets, for example, requires the establishment of reference levels, which in turn depends on the availability of sufficient environmental data.

Policy lessons beyond New Zealand

5. ***Markets provide opportunities to manage risks which can be successfully exploited.*** New Zealand is a rare developed economy where the farming system functions without traditional intervention by government in markets and it provides instructive evidence on the risk management opportunities embedded in well-functioning markets. The farm-level data analysis shows that variations in farm income have been substantially reduced because of the correlations between output, prices, and costs within and between commodity markets. These mechanisms work efficiently if market signals are well transmitted to market participants and there are no impediments in responding to these signals. Policy reform in New Zealand has enabled the establishment of such conditions.
6. ***Farmers have a high capacity to adjust*** in a subsidy-free environment ***and the ability to develop individual and collective risk strategies.*** Farmers can be flexible and actively absorb information on markets, climate and production techniques. Where there is sufficient convergence of interests, they can also act collectively to generate, collect and analyse information and to implement collective risk management strategies. Farmers see opportunities associated with risks and are willing to act on these opportunities.
7. ***Transfer or pooling of risks does not necessarily require specific risk institutions.*** Few preconditions exist in New Zealand for the operation of futures trading in agricultural commodities and there is currently limited scope for agricultural insurance. However, alternative arrangements to manage marketable risks have been developed consisting of various forms of secured contracts along the supply chain, in particular within the framework of farmer co-operatives. The regulatory

framework should allow enough flexibility to traditional market institutions to develop the necessary risk management functions.

8. ***Governance of catastrophic assistance can be improved by finding a balance between ex ante and ex post rules*** for provision of such assistance. A “framework” approach defining principles and types of assistance may be an effective way to achieve such a balance. It allows the government to explicitly delimit its responsibility in advance of any catastrophic event, as well as to tailor assistance according to the severity of the event when it occurs. This eases political pressures, simplifies the decision-making process to provide catastrophic assistance, and reduces uncertainties associated with budgetary costs. The boundary between *ex ante* and *ex post* rules, i.e. what actions can be agreed to in advance and what is decided following the catastrophic event, are likely to be specific to each country.
9. ***Consultations with stakeholders and public in designing the ex ante rules for catastrophic assistance*** facilitate informed and balanced decisions, increase transparency of public policy and its buy-in by stakeholders. ***Consultations can also be part of the ex post decision process*** to tailor catastrophic assistance, however, this may be better suited to smaller counties with simpler administrative structures.

Annex 1.

List of institutions and persons visited during the OECD mission to New Zealand

Meeting with the Minister

Honourable David Carter, Minister of Agriculture, Forestry and Biosecurity

MAF Policy

Phil Journeaux
National Manager, Adverse Events Policy, Chairman of National Adverse Events Committee and Manager, North Island Regions

BIOSECURITY NEW ZEALAND (MAF)

Division of MAF charged with the New Zealand biosecurity system: keeping out, removing, or effectively managing the harm that pests or diseases can do to the economy, the environment and health, including establishment of policy, standards and regulations, effective interventions, encouragement of wider participation and collaboration.

Dereck Belton, Director International, BNZ and others

INLAND REVENUE

Jim Gordon, Policy Manager

ENVIRONMENT WAIKATO REGIONAL COUNCIL and WAIKATO DISTRICT COUNCIL

Environment Waikato Regional Council manages land, water, soil, air, coastal and geothermal resources in the central North Island of New Zealand. One of its functions is environmental regulation, education, consultation and co-ordination, environmental information. Waikato District Council is an elected body responsible for managing resources and providing planning and new directions which will sustain and benefit the needs of the Waikato district in the present and future. The Council undertakes a broad list of activities to ensure the sustainability and safety of the district for its residents.

Regional Council

Scott Fowlds Group Manager, River & Catchment Services Group

Tony Petch Group Manager Policy, Chris Mclay, Group Manager Resource Group Use

District Council

Alan Turner, Environmental Planner

NATIONAL INSTITUTE OF WATER AND ATMOSPHERIC RESERACH (NIWA)

Andrew Tait, Centre Leader, Climate Variability, National Climate Centre

FEDERATED FARMERS

It is the largest and influential farm union in NZ. It ensures access of farmers at the local level to government drought and flood assistance. Together with MAF, the Federated Farmers has set up Rural Support Trusts to provide assistance to rural communities in times of hardship, including during adverse events such as drought and floods.

Mark Ross, General Manager, Policy and Advocacy

DAIRY NZ

DairyNZ is the industry good organisation, representing New Zealand's dairy farmers. It implements an extensive pest control programme to reduce bovine Tb. Farmers and the public can obtain free data on movements in the national average yearly milk solids price for up to 20 years from its publication New Zealand Dairy Statistics, available on its website,. Information is also provided on how to cope with adverse conditions arising from drought and floods based on previous experience.

Simon Tucker, General Manager Policy and Advocacy

MEAT AND WOOL NZ

Industry good body for red meat and wool.

Dr Scott Champion, Chief Executive

UNITED WHEAT GROWERS (NZ) Ltd

A wheat growers organization with two roles: the first is a political role as the "Wheat growers subsection" of The Grains Section of the Federated Farmers of New Zealand; the second is a management role of the business activities of the United Wheat Growers (NZ) Ltd, including administering a disaster relief insurance scheme, investment in plant breeding, and information transfer. Despite being a small industry body, it seems to provide its members with more comprehensive price information on which to assess market risks than the larger industry bodies. The existence of its majority-supported comprehensive disaster relief insurance scheme, the only one of its type now in existence, suggests that growers are fully aware of the range of risks they face from natural disasters.

James Sim, Chairman United Wheat Growers

HORTICULTURE NZ

Peter Silcock, Chief Executive

WAIKATO FRUIT GROWERS ASSOCIATION

Paul Christey, President

David Hart, Secretary

FOREX

NZForex is the New Zealand brand and website of OzForex, subsidiary of Macquarie Bank Limited, one of Australasia's leading financial services organisations. NZForex is part of the OzForex Group, which also includes UKForex, CanadianForex, OzForex and Tranzfers. Since its launch in 1998, the Group has grown to be one of the world's largest online foreign exchange companies by offering competitive exchange rates, technology and service.

Phillip Poppe, Owner of Forex Ltd.

SILVER FERN FARMS

As New Zealand's leading meat marketing and processing company, it currently accounts for more than one third of New Zealand's sheep meat, beef and venison exports to international markets. The company is structured as a farmer cooperative and is owned by about 20 000 farmer suppliers.

Keith Cooper, Chief Executive

FARMERS MUTUAL GROUP (FMG)

Mutual insurance company with products tailored to the rural sector. Rural, Home, Lifestyle and Business insurance packages, vehicle and equipment finance, investments. Customers are farmers and rural dwellers.

Chris Bailey, Manager, Reinsurance and Underwriting

FONTERRA

Fonterra is the world's leading exporter of dairy products and responsible for more than a third of international dairy trade. Fonterra is introducing a new internet-based sales channel for its internationally traded commodities, a world first for the global dairy industry.

Bruce Turner, Director of Commodity Risk and Trading

PASTORAL FARMER GROUP

John Greer, Team leader

NORTH CANTERBURY RURAL SUPPORT TRUST

Rural Support Trusts provide assistance to the rural community in times of hardship, including during adverse events such as drought and floods. Rural Support Trusts can provide services such as: coordinating an initial response to an event, helping farmers decide on business options, acting as advocates for financial assistance, and providing stress management services (or making referrals if appropriate).

Grant McFadden and Dough Arcbold, Trustees

Annex 2.

Recent adverse events and assistance provided

Event	Impacts	Government assistance
Small-scale events		
Gisborne flood 2005	Heavy rain resulted in localised flooding. Approximately 82 growers suffered crop losses, mostly located on floodplains in Gisborne and Tolaga Bay.	<ul style="list-style-type: none"> • Enhanced Taskforce Green • Costs for psychosocial recovery
Nationwide storm July 2008	Heavy rain and winds throughout the country, but with the biggest impact in Horowhenua and North Canterbury	<ul style="list-style-type: none"> • Welfare assistance • Tax relief
Medium-scale events		
Canterbury snowfall 2006	<p>Heavy snow affected the regions of Waimate, Mackenzie, Timaru and Ashburton.</p> <p>Approximately 3 104 farms were located in the affected zone</p> <p>The main concerns were animal welfare issues resulting from a loss of feed.</p>	<ul style="list-style-type: none"> • Enhanced Taskforce Green and volunteer costs • Funding for four Rural Support Trusts and an Agricultural Recovery Facilitator • Costs for psychosocial recovery • Technology transfer • Media and communication costs • Welfare assistance • Tax relief
Large-scale events		
Lower North Island floods 2004	<p>Storm event caused significant flooding in the Lower North Island, destroyed infrastructure and caused widespread slipping.</p> <p>700 farmers were badly affected.</p>	<ul style="list-style-type: none"> • Agricultural Recovery programme (Special Recovery Measure) • Enhanced Taskforce Green • Funding for the Rural Support Offices • Funding for an Agricultural Recovery Facilitator • Technology transfer • Welfare assistance • Costs for psychosocial recovery • Tax relief
Nationwide Drought 2008	<p>A significant drought affected many regions of New Zealand throughout the summer and autumn of 2008.</p> <p>Rain throughout March in most of the South Island and throughout April in much of the North Island alleviated the situation somewhat. However, there wasn't sufficient pasture cover over many parts of the country going into winter and this has exacerbated feed shortages.</p>	<ul style="list-style-type: none"> • A Special Recovery Measure was not implemented for the Drought, as a SRM provides reimbursement for infrastructure, not livestock. • A National Drought Committee was established with a National Drought Coordinator • Regional agricultural recovery facilitators • Welfare assistance, including Rural Assistance Payments • Technology transfer • Funding for community events • Tax relief • Costs for psychosocial recovery

Source: MAF, 2009e.

Bibliography

- Dairy New Zealand (2010), *Proposed investment priorities 2009-15*, www.dairynz.co.nz.
- Davison, R. and E. Gonzalez-Macuer (2009), “Meat and Wool Sector: Domestic trends,” presentation to the Meat and Wool Industry Association Conference, September 2009, New Zealand.
- EIU (2008), *New Zealand: Country Profile 2008*, Economic Intelligence Unit (EIU), London.
- Evans, L. and R. Meade (2006), *The Role and Significance of Co-operatives in New Zealand Agriculture: A Comparative Institutional Analysis*, Report prepared for the New Zealand Ministry of Agriculture and Forestry by the New Zealand Institute for the Study of Competition and regulation Inc. (ISCR), New Zealand.
- GNS Science (2009), *New Zealand's Volcanoes*, New Zealand, <http://www.gns.cri.nz>
- Goodwin, B.K. and V.H. Smith (1995), *The Economics of Crop Insurance and Disaster Aid*, AEI Press.
- Gow, N. (1999), “Case Study: New Zealand Commercial banking and the Agricultural sector – Lessons from Economic restructuring” in: *Agricultural Finance and Credit Infrastructure in Transition economies*. OECD Proceedings, Paris.
- Gray D., Dooley E., Shadbolt N.M. (2009) Risk and dairy farm management in New Zealand: A review of literature. Report prepared for DairyNZ.
- LIC, (2009) *New Zealand Dairy Statistics 2008-09*. Livestock Improvement Corporation. www.lic.co.nz
- MAF (2009a), Government Policy on Adverse Events, <http://www.maf.govt.nz>,) New Zealand Ministry of Agriculture and Forestry.
- MAF-Fonterra, (2010) The Dairying and Clean Streams Accord: Snapshot of Progress 2008/2009, Report by Fonterra Co-operative, New Zealand Ministry for the Environment, New Zealand Ministry of Agriculture and Forestry, Local Government New Zealand.
- MAF (2009b), *Horticulture and Arable Monitoring Report 2007*.
- MAF (2009c), *Pastoral Sector Overview 2009*, New Zealand Ministry of Agriculture and Forestry.
- MAF (2009d), *Situation and Outlook for New Zealand and Forestry*, MAF Policy, July 2009.
- MAF (2009e), “Thematic Review on Risk Management in Agriculture: Country Questionnaire New Zealand”, Report submitted by the New Zealand Ministry of Agriculture and Forestry.
- MAF (2009e), Climate Change Information, New Zealand Ministry of Agriculture and Forestry <http://www.climatechange.govt.nz/index.html>
- MAF (2006), “Building Resilience: A Review of the On-Farm Adverse Events Recovery Framework”, Public Discussion Document, September 2006, New Zealand, New Zealand Ministry of Agriculture and Forestry.
- MAF (2005), “Off-farm Income Survey: 1992/93 Financial Year”, Technical Paper 95/6 by D. Rhodes and Ph. Journeaux, May 1995, New Zealand Ministry of Agriculture and Forestry (MAF).

- Martin, S.K. (1996). “Risk management strategies in New Zealand agriculture and horticulture”, *Review of Marketing and Agricultural Economics*, Vol. 64(1), pp. 31-44.
- Martin, S.K., (1994). “Risk perceptions and management responses to risk in pastoral farming in New Zealand”, *Proceedings of the New Zealand Society of Animal Production*, vol. 54, pp. 363-368.
- Meat and Wool New Zealand (2010), The New Zealand Sheep and Beef Survey, 2006-07, New Zealand, <http://www.meatandwoolnz.com>.
- NB (2008), Rural Report, September 2008, National Bank of New Zealand (NB), <http://www.nationalbank.co.nz/rural/information/ruralreport/200809/default.aspx>
- NIWA (2009), *Climate mapping database*, National Institute of Water and Atmospheric Research (NIWA), New Zealand, <http://www.niwa.co.nz/our-science/climate/our-services/mapping>.
- O’Donovan and Stephens (2009), “Buffet of Buffer: Does the Exchange Rate Hinder or Help Commodity Exporters?”, Westpack Institutional Bank, New Zealand.
- OECD (2010a), *Farm Level Analysis of Risk and Risk Management Strategies and Policies: Cross Country Analysis* by Kimura, Sh., J. Antón and Ch. Le Thi, OECD Food, Agriculture and Fisheries Working papers No. 26, Paris. <http://www.oecd.org/dataoecd/15/60/45532673.pdf>
- OECD (2010b), *Guidelines for Cost-Effective Agri-Environmental Policy Measures*, OECD, Paris. www.oecd.org/agr/env
- OECD (2010c), *Sustainable Management of Water Resources in Agriculture*, OECD, Paris. www.oecd.org/agr/env
- OECD (2010d), “Farm level analysis of risk and risk management strategies and policies”. OECD Food, Agriculture and Fisheries Working Papers No. 26, Paris.
- OECD (2009a), *Agricultural Policies in OECD countries: Monitoring and Evaluation*, OECD, Paris
- OECD (2009b), *Country statistical profiles 2009: New Zealand*, OECD, Paris <http://dotstat.oecd.org>
- OECD (2009c), *Managing Risk in Agriculture: A Holistic Approach 2009*, OECD, Paris.
- OECD (2009d), *OECD Economic Surveys: New Zealand*, Volume 2009/4, April, OECD, Paris.
- OECD (2009e), “The Role of Agriculture and Farm Diversification in the Rural Economy of New Zealand”, a background report to OECD report *The Role of Agriculture and Farm Household Diversification in the Rural Economy: Evidence and Initial Policy Implications*, 2009, OECD, Paris.
- OECD (2008a), *Economic Policy Reforms: Going for Growth*, OECD, Paris.
- OECD (2008b) “New Zealand Country Section” in: *Environmental Performance of Agriculture in OECD Countries since 1990*, Paris. www.oecd.org/agriculture/env/indicators
- OECD (2007), *Environmental Performance Reviews: New Zealand*, OECD, Paris.
- Peterson, H.C. and B.L. Anderson (1996), “Co-operative strategy: theory and practice”, *Agribusiness* (1986-1996), 12 (4), p. 371-383.
- Pinochet-Chateau, R., N. M. Shadbolt, C. Holmes and N. Lopez-Villalobos (2005a). Differences in risk perceptions and risk management strategies used by New Zealand dairy farmers. Proceedings of the Annual World Food and Agribusiness Forum. Symposium and Case Conference 15: www.ifma.org/conference/2005 Conference .
- Pinochet-Chateau, R., N.M. Shadbolt, M. Holmes, and N. Lopez-Villalobos (2005b), “Risk perceptions and risk management strategies on New Zealand dairy farms according to

- ownership structure and geographic location”, in *Proceedings of the New Zealand Grassland Association*, 67: 97-102
- Poppe, Ph. (2009), “Primary Industry Risk Management”, oral presentation prepared for the meeting with OECD, 1 December 2009, New Zealand.
- RB (2010), *Financial Stability Report*, May 2010, Reserve Bank of New Zealand (RB), http://www.rbnz.govt.nz/finstab/fsreport/fsr_may2010.pdf
- RB (2003) “The Macroeconomic Impacts of a Foot-and-Mouth Disease Outbreak: an Information Paper for Department of the Prime Minister and Cabinet”, Reserve Bank of New Zealand (RB), <http://www.rbnz.govt.nz/research/0130346.html>
- Shadbolt, N.M., F. Olubode-Awosola, and D. Gray (2010), “Risk - an Opportunity or a Threat for Farmers in the Global Food Market?” Proceedings of International Food & Agribusiness Management Association 20th Annual World Symposium, Boston, USA June 19-22, 2009.
- Shadbolt N.M. (2009a) “Farming as an Investment and Farmers as Investors”, in *Proceedings of South Africa Large Herds Conference*, February, 2009.
- Shadbolt N.M. (2009b) How Risky is your Business? Proceedings of South Africa Large Herds Conference, February, 2009.
- Shadbolt, N.M. (2009c), “Risk Management in New Zealand’s Agriculture”, Report submitted to OECD.
- Smith, V.H. (2009), “OECD Risk Management Thematic Review Mission: Country Visit to New Zealand”, Report submitted to OECD.
- SNZ (2010), *Agricultural Production Statistics: June 2010 (provisional)*, Statistics New Zealand (SNZ).
- SNZ (2003), *Agriculture Statistics 2002*, Statistics New Zealand (SNZ).
- Wright, B. and J.A. Hewitt (1994), “All Risk Crop Insurance: Lessons from Theory and Experience,” in L.H. Darrell and H. Furtan, *Economics of Agricultural Crop Insurance: Theory and Evidence*, Kluwer Academic Publishers.