



# Economic Impact of the 2007 East Coast Drought on the Sheep and Beef Sector

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**Appendix:** East Coast Drought Economic Impact – Value-Added/GDP Calculation

# Executive Summary

## 1. Purpose of the Report

This report provides an analysis of the medium-term economic effects within the East Coast region of the major drought which impacted the sheep and beef farming sector, during the first half of 2007.

## 2. Key Results

Table A: Key Sheep/Beef Sector and Regional Impacts of the 2007 East Coast Drought

Year	Value-Added/GDP Impacts (\$M)					
	Without Drought		With Drought		Difference	
	Sector	Region	Sector	Region	Sector	Region
2005/06	797.1	2,195.2	797.1	2,195.2	-	-
2006/07	831.5	2,289.9	917.8	2,527.5	+86.3	+237.6
2007/08	861.5	2,371.5	721.7	1,975.8	-138.8	-395.7
2008/09	933.2	2,570.0	636.3	1,869.0	-296.9	-701.0
<i>Overall Change 2005/06-2007/08</i>	<i>+136.1</i>	<i>+374.8</i>	<i>-160.8</i>	<i>-326.2</i>	-	-

Without the drought, MAF forecasts based on results from its farm monitoring programme were for East Coast region sheep/ beef farming sector Value-Added/GDP to increase by some \$136 million over the 2005/06-2008/09 period. The associated region-wide multiplier impact of this is a \$375 million increase in total Value-Added over the period.

With the drought effect and taking into account both revenue and expenditure impacts, sheep/beef sector Value-Added increases sharply in the drought year (2006/07) but falls over the next two years. The size of the overall sector Value-Added decline for the 2005/06-2008/09 period is \$161 million. This represents a 20 percent fall in sheep and beef farming sector Value-Added over the three-year period. The multiplier impact of this on the East Coast region is a \$326 million fall in total Value-Added. This is equivalent to a 15 percent decline in the sector's contribution to regional Value-Added or GDP.

Comparing the drought impact with the 'without drought' impact, the overall results for the three-year period are a \$297 million loss of Value-Added from the sheep/beef sector itself (representing an estimated Value-Added loss of \$27 per stock unit on average for the whole East Coast region) and a region-wide Value-Added loss of \$701 million.

The overall impact of the drought on the East Coast economy is indicated by expressing the losses (resulting from the drought) over the 2005/06-2008/09 period, as a proportion of the 2005/06 base year figures. The results are that:

- Total Gross Output for the East Coast economy falls by 2.3%
- Total Value-Added/GDP falls by 3.2%
- Total Net Household Income falls by 1.8% overall

### 3. Matters Covered

The themes covered in the report include a background economic profile on sheep and beef farming in the region; the range of on-farm impacts of the drought; the methodology that was employed to undertake the economic impact analysis of the drought; and the actual economic impacts of the drought in terms of the sector itself, regional industries linked to sheep/beef farming, the East Coast economy and the national economy.

### 4. Information Sources

The main base information sources for the analysis are the Ministry of Agriculture and Forestry's farm monitoring and forecasting programme for the region, Meat & Wool New Zealand documentation on the drought, Statistics New Zealand agricultural and employment data, and University of Waikato Economics Department economic impact modelling results for the East Coast sheep/beef farming sector and region.

### 5. Sector Economics

The East Coast region is a key component of the New Zealand sheep/beef farming sector, accounting for approximately 20% of all sheep/beef farms in the country, a quarter of national sheep/beef livestock numbers, 20% of the sector's national GDP and 23% of employment in the country's sheep/beef farming sector. Sheep/beef farming and meat processing together account for 12% of current 'all industry' direct Value-Added in the East Coast.

### 6. Drought Effects

The key on farm effects, farmer responses and associated financial implications of the drought, which form the basis for the economic impact assessment of the event, were as follows:

- *Drought period January-June 2007:* Deteriorating pasture growth and livestock quality; use of supplementary feed, significant livestock sales, reduced purchases of replacement stock and deferred second shearing. Total regional Net Cash Income of the sheep/beef sector increased by 19% on the 2005/06 figure in nominal terms, whilst total farm working expenditure fell by almost 4%.
- *2007/08 Production Year:* Significantly reduced production base of livestock numbers due to the previous year's de-stocking, reduced lambing and calving rates, reduced wool clip, increased cost of stock purchases and livestock feed; livestock purchases for re-stocking, reduced sales of livestock, reduced frequency of shearing, and further expenditure containment and reduction. East Coast Net Cash Income is forecast to fall by \$323 million or 33% from the 2006/07 level whilst total farm working expenditure falls a further 7%.

### 7. Economic Impact Methodology

The main elements of the methodology used to undertake the economic impact analysis of the 2007 drought were:

- Use of MAF farm monitoring/model farm financial figures as a basis for establishing the annual income and expenditure results of the drought. The results were used for the subsequent economic impact modelling process.

- Adoption of a medium-term time-frame for analysing the economic impacts of the drought, that is, the period 2006/07-2008/09.
- The Economics Department of the University of Waikato (Dr Warren Hughes, economic impact modelling specialist) undertook the base economic impact analysis, using a Year 2006 based 112-industry linear economic impact model of the East Coast economy.
- The economic impact of the East Coast drought was assessed at four different levels, namely the East Coast sheep/beef farming sector itself; the added multiplier impacts on 'backwards' (supplier) and 'forward' (user) linked industries in the region; the overall East Coast economic itself and the national economy.
- The comparative economic impacts of the drought were derived for two base scenarios, namely a 'without drought' situation (as forecast by MAF farm monitoring in 2006) and a 'with drought' situation.

## 8. Economic Impacts

Table B below presents the detailed economic impact results of the drought for Year 2006/07 and forecasts (2007/08 and 2008/09 years) for the East Coast region. The direct impacts refer to the impact of the drought on the sheep/beef farming sector only. The direct Value-Added impacts incorporate the impact of the drought on sector revenue/income and expenditure. The industry linkage impacts cover the drought's impact on 'backward' and 'forward' linked industries in the region. The total impact refers to the overall impact of the drought on the regional economy. The key impacts of the drought are noted below the table.

Table B: East Coast Region Economic Effects of the Drought Impacting the Sheep and Beef Farming Sector 2005/06-2008/09

Economic Impact Variable	Period						
	2005/06	2006/07		2007/08		2008/09	
	Base Year	Without Drought	With Drought	Without Drought	With Drought	Without Drought	With Drought
<b>Gross Output (\$M)</b>							
- Direct Impact	1,685.0	1,757.7	1,996.7	1,821.1	1,342.5	1,972.4	1,484.6
- Industry Linkages	3,530.9	3,683.4	4,185.9	3,816.2	2,813.2	4,133.1	3,110.0
- <b>Total Impact</b>	<b>5,215.9</b>	<b>5,441.1</b>	<b>6,182.6</b>	<b>5,637.3</b>	<b>4,155.7</b>	<b>6,105.1</b>	<b>4,595.6</b>
<b>Value-Added/GDP (\$M)</b>							
- Direct Impact	797.1	831.5	917.8	861.5	721.7	933.2	636.3
- Industry Linkages	1,398.1	1,458.4	1,609.7	1,511.0	1,258.3	1,636.8	1,232.5
- <b>Total Impact</b>	<b>2,195.2</b>	<b>2,289.9</b>	<b>2,527.5</b>	<b>2,372.5</b>	<b>1,980.0</b>	<b>2,570.0</b>	<b>1,868.8</b>
<b>Net Household Income (\$M)</b>							
- Direct Impact	357.0	357.0	357.0	357.0	357.0	357.0	357.0
- Industry Linkages	452.4	491.5	536.3	525.9	362.8	530.2	398.8
- <b>Total Impact</b>	<b>809.4</b>	<b>848.5</b>	<b>893.3</b>	<b>882.9</b>	<b>719.8</b>	<b>887.2</b>	<b>755.8</b>

- **Sector Impact** – The true economic impact of the drought on the East Coast economy is measured by Value-Added or GDP. With the forced sale of livestock during the drought period, total Value-Added by the sheep/beef farming sector increased during 2006/07 by \$121 million compared to the forecast increase of \$34 million without the drought impact. For the full production year following the drought (2007/08), the significantly reduced livestock production base and quality results in a \$196 million decline in total Value-Added of the sector, compared to the forecast gain of \$30 million without the drought effect. The 2008/09 period sees a forecast further fall in sector Value-Added of \$85 million as expenditure increases back to near maintenance levels. Over the 3-

year period 2005/06-2008/09, East Coast sheep/beef farming sector Value-Added falls overall by \$161 million or 20%, compared to the forecast gain of \$136 million or 17% without the drought effect. The overall impact of the drought on the sheep/beef sector at the end of the three-year period, compared to the “without drought” situation, is a Value-Added loss of \$297 million.

- **Regional Economy Impact** – When ‘backward’ and ‘forward’ industry linkages/multiplier effects are also taken into account, the overall impact of the drought on the East Coast economy is a \$326 million or 15% fall in regional Value-Added or GDP. This compares to the forecast increase of \$375 million or 17%, prior to the drought occurring. Regional Value-Added increased by \$332 million in 2006/07 but then falls overall during the next two years by \$659 million, in contrast to the forecast gain without the drought of \$280 million over those two years.
- The overall impact of the drought at the end of the three-year period, compared to the ‘without drought’ situation, is a total regional Value-Added decline of \$701 million.
- **Table C** below summarises the overall annual Value-Added impacts of the drought in the East Coast region, for the sheep/beef farming sector and for the region (including multiplier/industry linkage effects), over the period 2005/06-2008/09. The results take into account sector income and expenditure changes during the period. The overall sheep/beef farming sector impact of the drought is a \$161 million reduction in Value-Added/GDP over the three-year period, compared to the forecast of a \$136 million gain without the drought. At the wider regional level, the overall economic impact result is a \$326 million reduction in Value-Added, compared to a forecast gain of \$375 million without the drought.

Table C: East Coast Region 2007 Drought Impacts on Value-Added 2006/07-2008/09

Year	Sector Impact based on MAF Pre-Drought Forecasts (\$M)	Sector Impact ‘With Drought’ Effects (\$M)	East Coast Region Impacts based on MAF Pre-Drought Forecasts (\$M)	East Coast Region Impacts ‘With Drought’ Effects (\$M)
2005/06	797.1	797.1	2,195.2	2,195.2
2006/07	831.5	917.8	2,289.9	2,527.5
2007/08	861.5	721.7	2,371.5	1,975.8
2008/09	933.2	636.3	2,570.0	1,869.0
<b>Overall Change 2005/06-2008/09</b>	<b>+136.1</b>	<b>-160.8</b>	<b>+374.8</b>	<b>-326.2</b>
<b>Total Value-Added Loss (\$M)</b>	<b>296.9</b>		<b>701.0</b>	

## 9. Other Results

Other points to note from the main report include:

- The Napier-Hastings / Central Hawke’s Bay area was hardest hit by the drought and accounts for over half of the decline in East Coast Value-Added caused by the event, over 2005/06-2008/09.
- The impact of the drought on the East Coast sheep and beef farming sector over 2006/07-2008/09, results in a 3.2% fall in total East Coast region ‘all industries’ Value-Added, from its 2005/06 level.
- At the national level, the overall impact during the above period of the East Coast drought is a \$588 million or 15% drop in in the sector’s contribution to national Value-Added/GDP. This represents an approximate 0.4% of total New Zealand nominal GDP for the year ending June 2006.

## 1.0 Introduction

This report provides an assessment of the economic effects within the East Coast region (North Island) of the major drought which impacted the sheep and beef farming sector during the first half of 2007.

The specific objective of the report is to provide a detailed analysis of the short-medium term impacts of the drought on sheep/beef pastoral farming in the East Coast and the flow-on impacts to the wider regional economy.

The specific matters covered in the report are as follows:

- (i) *Background* – an economic profile of the East Coast sheep and beef sector, its contribution to the regional and national economies, recent economic performance and outlook, and the nature of the on-farm impacts of the drought.
- (ii) The methodology used to generate the economic impact results for the drought.
- (iii) The actual economic impact results of the drought at the East Coast and national levels.

The specific information sources used for the report are identified in the main body of the report.

For the purposes of the study, the East Coast region comprises the Gisborne and Hawke's Bay Local Government regions, as well as Tararua district and the three Wairarapa Local Government districts of Masterton, Carterton and South Wairarapa.

## 2.0 The East Coast Sheep and Beef Sector

As a background to the economic impact analysis of the drought, this section of the report provides an analysis of the current economic scale and contribution of the East Coast sheep/beef sector, recent trends in the sector's performance and the medium-term outlook for the sector. As the drought occurred during the rural production year ending June 2007, the previous 2005/06 production year is the **base year** for this profile analysis, as well as the economic impact assessment.

The main information sources for the sector profile are the Ministry of Agriculture and Forestry, Meat & Wool New Zealand, Statistics New Zealand and the University of Waikato Economics Department (Dr Warren Hughes, Visiting Professor and economic impact specialist).

### Farm Numbers

In 2005/06, the total number of commercial sheep/beef farms operating in the East Coast region stood at an estimated 2,595 or approximately 20% of the national total. The Gisborne area accounted for 15% of the region's total farm numbers, Hawke's Bay area 45% (Hastings and Central Hawke's Bay districts, which were affected most by the drought, account for over 80% of all Hawke's Bay sheep/beef farms), Tararua district 20% and Masterton/Carterton/South Wairarapa districts 20%. Meat & Wool New Zealand figures indicate an overall 11% decline in the numbers of commercial sheep/beef farms operating in the region since 2000/01, compared to -13% nationally. In terms of the broad sheep/beef farming categories in the East Coast, their respective contributions to total farm numbers in 2006 were Gisborne/Wairoa Large Hill 23%, Hawke's Bay/Wairarapa Hill Country 45% and Eastern Lower North Island Intensive Finishing farms 32%.

## Livestock Numbers

In 2005/06, total livestock numbers across East Coast sheep and beef farms stood at 10.9 million or approximately 25% of the national total. The respective figures for the 2004/05 year were 10.8 million (approximately 1% below the 2005/06 result) and 24%. Within the region, sheep accounted for 90% of the total number of livestock last year and beef cattle 10%, similar to the national profile. The East Coast was the leading region in the country in terms of sheep numbers and second in terms of cattle numbers.

Gisborne/Wairoa Large Hill farms last year accounted for 31% of the East Coast region livestock total, Hawke's Bay/Wairarapa Hill Country farms 47% and Eastern Lower North Island Intensive finishing farms the balance of 22%.

## Production

In economic impact terms, **Gross Output** measures the total current value of goods and/or services produced by an industry or sector (aggregation of industries) during the year. Alternative terms used for the same indicator are total sales or total turnover.

Economic impact modelling work undertaken by the University of Waikato for the purposes of this report indicates a total direct Gross Output value in 2005/06 for the East Coast sheep/beef farming sector, of \$1,685 million. This represents the total 'farmgate' value of production. The sector accounts for 49% of the Gross Output of all forms of agriculture and horticulture in the region, 38% of all primary production industries (including agriculture/horticulture/forestry/fishing/ mining-quarrying) Gross Output and 8% of 'all East Coast industries' Gross Output. The East Coast region last year accounted for some 25% of national Gross Output from the sheep/beef sector. Statistics New Zealand information indicates that sheep and beef farming sector Gross Output at the national level in 2005/06 was up 8.1% on the previous year and 14% on the 2001/02 year, in nominal terms.

Meat processing in New Zealand is closely linked to sheep and beef farming. East Coast region Gross Output from this industry last year was in the order of \$1,447 million or 43% of total Gross Output from all the region's processing activities. Together, sheep/beef farming and meat processing accounted last year for 14% of total 'all industries' East Coast region Gross Output.

'**Value Added**' measures the true economic contribution of an industry, as it excludes the impact of goods and services imported into an area as part of overall business or consumer/ household expenditure. In 2005/06, total Value-Added of the East Coast sheep/beef farming sector was \$800 million or 36% of total primary production industries Value-Added. Value-Added for sheep/beef farming/meat processing combined was in the order of \$1,179 million or 12% of 'all industries' Value-Added in the region. Sheep/beef farming in the East Coast accounted for approximately 20% of the national Value-Added total of the sector last year.

Just under half of the Gross Output of the East Coast sheep and beef farming activity is 'exported' outside the region (to the rest of New Zealand and overseas). This includes, for example, meat/wool being sent out of the region for processing elsewhere in New Zealand and wool exported overseas for processing. Eighty-five percent of the production of East Coast meat processing plants is also exported from the region, to the rest of New Zealand and overseas. The two industries combined accounted for almost 40% last year of total primary production and manufacturing 'exports' from the region and 35% of total industry 'exports' from the area.

## Employment

Table 1 indicates the trend in employment within both the sheep/beef farming and meat processing sectors in the East Coast region and nationally, since 2000. The base data for the table is sourced from Infometrics economic consultancy group in Wellington.

Table 1: East Coast and New Zealand Sheep/Beef Farming and Processing Employment Estimates 2000-2006

Year	East Coast				New Zealand		
	Farming	Processing	Total	% of NZ	Farming	Processing	Total
2000	8,049	3,170	11,219	20.1	36,872	18,934	55,806
2001	7,721	3,605	11,326	20.0	36,271	20,249	56,520
2002	7,985	3,615	11,600	20.5	36,100	20,517	56,617
2003	7,656	3,646	11,302	20.8	34,116	20,293	54,409
2004	7,190	3,762	10,952	20.8	32,062	20,707	52,769
2005	7,086	3,752	10,838	20.6	31,456	21,141	52,597
2006	6,964	3,173	10,137	19.2	29,797	23,008	52,805

In 2006, sheep/beef farming accounted for 69% of combined East Coast farming/meat processing employment and meat processing 31%. Farming employment has been falling in the region since 2000 and processing employment since 2004. Since 2002, total sheep/beef sector employment in the East Coast has fallen overall by 13%, compared to 7% nationally. Farming employment at the national level has fallen by 19% since Year 2000. The region accounted for 23% of national sheep/beef farming sector employment in 2006, 14% of national meat processing employment and 19% of national employment for both sectors combined.

### Pre Drought Sector Outlook

Ministry of Agriculture and Forestry forecasts in 2005/06 prior to the drought indicated steady growth in the East Coast sheep-beef farming sector over the medium-term, with total sector income expected to grow by 17% nominally over 2005/06-2008/09 and total farm operating expenses by 6%.

## 3.0 On-Farm Drought Impacts

As far as possible, the economic impact analysis of the 2007 East Coast drought provided in this report has taken into account the range of impacts of the drought at the farm level, the response of farmers to the drought and the impact of their actions on the financial situation of their operations.

### 2006-2007 Year

In terms of the **drought period** farm-level impacts, a review of MAF farm monitoring information, Meat & Wool New Zealand assessments and other documentation, indicates the impacts as including:

- A prolonged six-month period over January to June 2007 of below-average rainfall in the East Coast, particularly in the Hastings and Central Hawke's Bay districts.
- Deteriorating pasture growth during the period to well below normal levels. Cattle feed was critically short on most farms.
- Deteriorating livestock condition and quality. Most capital stock lost weight. Lambing potential was significantly impacted and finishing farms were unable to purchase normal livestock numbers.

- Autumn 2007 re-grassing programmes were hampered by the lack of rain. The arrival of significant rainfall in mid June was too late to build normal feed covers on farms before winter temperatures took effect.

The main responses of East Coast pastoral farms during the 2007 drought period were:

- Use of on-farm supplementary feed or feed brought in from local sources or from outside the East Coast area. Also, some farms sent stock (eg hoggets) to other regions for grazing.
- Selling of trading and some capital livestock (and at lower weights). Approximately 70% of East Coast farms recorded decreased livestock numbers during 2006/07.
- Reduced purchases of replacement stock (trading and capital)
- Deferred second shearing and therefore reduced wool production.
- Expenditure containment and reduction.

Across the whole East Coast region, the main short-term financial impacts during the drought year (2006/07) were as follows:

- Total Net Cash Income (product sales minus stock purchases) increased by approximately 19% in nominal terms compared to the 2005/06 base year results, due to de-stocking/increased stock sales. Total actual Net Cash Income in 2006/07 was also 14% up on the forecast figure for the year, excluding the impact of the drought.
- Total farm working expenditure fell by almost 4%. Farm expenditure in 2006/07 was 4% down on the forecast pre-drought figure for the year.

## 2007-2008 Year

The anticipated impacts of the drought on the following year's activity in the beef and sheep farming sector include as follows:

- A reduced production base of livestock due to the selling of capital and trading stock, during the drought period
- This will be exacerbated by a reduction in both lambing and calving rates, and increased loss of new-born lambs and ewes due to tight feed supplies and poor stock condition.
- Reduced wool clip
- Increased cost of stock purchases
- Significantly increased feed costs

Sheep/beef farmers' actions during 2007/08 in response to the drought include:

- Purchases of sheep and beef for restocking purposes
- Reduced sales of livestock (the focus will be on building up livestock numbers)
- Reduced hogget lambing and culling of ewes
- Less shearing activity
- Further farm expenditure containment

Table 2 provides details on the total East Coast region sheep/beef farming sector main financial variable changes for the 2007/08 production year, in comparison with the previous two years. Forecasts are also provided for the

2008/09 year. The results cover both the 'without drought' and 'with drought' scenarios. The base information for the table was provided by Ministry of Agriculture and Forestry staff based in Hastings.

Table 2: East Coast Sheep/Beef Farming Sector 2006-2009 Key Financial Impacts Associated with the 2007 Drought

Total Financial Results / Farm Categories (\$M)	Without Drought				With Drought			
	Production Year Ending June				Production Year Ending June			
	2006	2007	2008	2009	2006	2007	2008	2009
<i>Gisborne/Wairoa Large Hill Sheep/Beef Farming</i>								
• Net Cash Income	223.32	237.08	235.71	255.4	223.32	270.38	168.21	191.31
• Farm Operating Expenditure	150.81	156.20	159.70	167.19	150.81	141.88	138.93	159.16
<i>HB/Wairarapa Hill Country Sheep/Beef Farming</i>								
• Net Cash Income	394.90	388.98	423.58	461.34	394.9	421.27	327.54	372.00
• Farm Operating Expenditure	249.36	244.06	243.87	257.80	249.36	237.61	218.44	251.13
<i>Eastern Lower North Island Intensive Finishing Sheep/Beef Farms</i>								
• Net Cash Income	213.65	241.74	239.78	258.20	213.65	294.53	167.36	170.03
• Farm Operating Expenditure	138.09	138.64	140.42	147.11	138.09	138.45	124.69	138.80
<b>Total All Farms</b>								
• Net Cash Income	831.87	867.8	899.07	974.97	831.87	986.18	663.11	733.34
• Farm Operating Expenditure	538.26	538.9	543.99	572.10	538.26	517.94	483.06	549.09

The results from the table for the 2007/08 year were:

- Total Net Cash Income for the East Coast sheep and beef farming sector with the drought impact, is forecast to be down some \$323m or 33% on the 2006/07 year, compared to the forecast of a \$31m or 3.6% gain made prior to the drought.
- Total income for Gisborne/Wairoa Large Hill farms falls by \$102m or 38%; by \$94m or 22% for Hawke's Bay/Wairarapa farms; and by \$127m or 43% for Eastern Lower North Island intensive farms.
- Total income for all East Coast sheep and beef farms in 2007/08 is 26% down on the pre-drought forecast for the year.
- Forecast total farm operating expenditure for 2007/08 is down approximately \$35m or 7% on the 2006/07 figure (with the drought) and also down \$61m or 11% on the pre-drought figure for that year.

## 2008-2009 Year

Total Net Cash Income is forecast to increase by \$70m or 10% during the 2008/09 production year, in comparison to the result for the previous year (including the drought impact). However, the 2008/09 income forecast is still \$242m or 25% down on the 2008/09 pre-drought forecast. Total farm operating expenditure in 2008/09 is up \$66m or 14% on the 2007/08 level (with the drought impact), but down \$23m or 4% on 2008/09 (excluding the drought impact).

## Total Impact 2007-2009

The overall income and expenditure impacts associated with the drought during the 2006/07-2008/09 period are therefore:

- A *Net Cash Income* fall of \$99 million or 12%. (This compares to a forecast pre-drought gain of \$143 million or 17%). The total impact of the drought by the end of the 2008/09 year is therefore a Net Cash Income level for the whole East Coast sheep/beef sector which is approximately \$242 million below the forecast level for that year without the drought.
- A total *Farm Working Expenditure* increase of \$11 million (compared to a forecast pre-drought gain of \$34 million or 6%)

## Expenditure Changes

Detailed **Table 3** indicates the profile of total on-farm working expenses (excluding labour and overhead expenses) for the East Coast sheep-beef farming sector for the 2005/06 base year and the following two years, incorporating the impact of the drought.

Table 3: East Coast Sheep/Beef Sector Drought Impact Period Farm Working Expenditure Levels 2005/06-2007/08

Expenditure Item	Expenditure Levels (\$M)		
	2005/06	2006/07	2007/08
Animal Health	33.8	31.5	29.5
Power	7.2	7.7	8.1
Feed	10.1	18.2	16.7
Fertiliser	68.1	57.3	53.1
Freight	9.6	10.7	10.3
Re-grassing	9.2	9.4	9.2
Shearing	46.9	43.5	42.1
Weed/Pest Control	12.6	10.0	10.4
Fuel	11.2	12.3	12.8
Other Vehicle Costs	22.7	20.8	19.7
Repairs/Maintenance	50.6	39.0	29.7
<b>TOTAL</b>	<b>282.0</b>	<b>260.4</b>	<b>241.6</b>

Total farm working expenditure falls steadily over 2005/06 to 2007/08, overall by 14%. In the 2006/07 drought year, increased spending occurred with power, feed (up 80%), freight, re-grassing and fuel. Noticeable expenditure reductions were recorded for fertiliser and repairs/maintenance. Other items recording reduced levels of expenditure over the year were animal health, shearing, weed and pest control and vehicle running costs (excluding fuel). Over the current 2007/08 year, increased spending is forecast for power, weed/pest control and fuel, whilst farm spending on animal health, feed, fertiliser, shearing and repairs/maintenance (-24%) drops back. Increased spending is forecast for 2008/09 as farmers catch up on deferred maintenance and restore most inputs to near maintenance levels.

## 4.0 Economic Impact Analysis Methodology

This section describes the methodology that was used to generate the drought economic impact results presented in Section 5 of the report.

### Analysis Principles

The key underlying principles guiding the methodology used were as follows:

- (i) Use of a 'bottom up' approach with the economic impact results reflecting the range of broad farm types and actual 'on farm' impacts of the drought in the East Coast region, as well as MAF model farm financial results.
- (ii) An economic impact assessment approach using both 'without drought' and 'with drought' scenarios and drawing comparisons between the two, where appropriate.
- (iii) Incorporating a time dimension in the economic impact analysis, in order to reflect the diversity of 'on farm' impacts of the drought, over time.
- (iv) An analysis incorporating both the revenue and expenditure effects of the drought (in the economic impact assessment).
- (v) A primary focus on the East Coast region impacts of the drought.
- (vi) Analysis of the economic impacts of the drought in terms of the sheep and beef farming sector itself, the flow-on multiplier impacts to the regional industries servicing the sector and also those utilising its outputs, and the total impacts for the East Coast regional economy.

## Modelling Steps

The main steps in the economic impact modelling process were as follows:

- (i) Analysis of MAF, Statistics New Zealand and University of Waikato Economics Department data, in order to generate a 2005/06 base year Gross Output figure for the East Coast sheep/beef farming sector. The figure was then apportioned amongst the three main farming type categories in the region, on the basis of their share in that year of total Net Cash Income earned by the sector. The total Net Cash Income figures for the region were calculated using MAF farm monitoring/model farm ('average farm') results for each farm type and the total number of farms in the region within each farming category.
- (ii) The MAF farm monitoring/model farm results for the Net Cash Income indicator for Years 2006/07, 2007/08 and 2008/09 were used to determine the changes over these years in the Gross Output of the East Coast sheep/beef farming sector, for the 'without drought' and 'with drought' scenarios. **Table 4** below provides details of the Net Cash Income situation for the sector, for the period 2005/06 to 2008/09, based on figures in Table 2. It is noted that in the use of the Net Cash income indicator to determine the annual changes in Gross Output which in turn 'drive' the economic impacts of the drought, assumes that the drought is the primary determinant of the MAF forecasts for Net Cash Income over the period.

Table 4: East Coast Region Sheep/Beef Farming Sector – Total Annual Net Cash Income Levels 2005/06-2008/09

June Year	Net Cash Income (\$M)	
	Without Drought	With Drought
2005/06 (Base Year)	831.9	831.9
2006/07 (Drought Year)	867.8	986.2
% Change 06/07	+4.3	+18.5
2007/08 (Post Drought Year 1)	899.1	663.1
% Change 07/08	+3.6	-32.8
2008/09 (Post Drought Year 2)	975.0	733.3
% Change	+8.4	+10.6

If the drought had not occurred, MAF's farm monitoring work forecasted total Net Cash Income to increase over the period by some \$143 million or 17%.

However, the 'forced' sale of livestock during the drought period resulted in an 'unbudgeted' increase in sector income in 2006/07 of \$154 million or almost 19% at the regional level. This income level was also 14% above the 'without-drought' forecast for the 2006/07 year. The significantly reduced livestock production base in the current 2007/08 year results in a \$323 million or 33% fall in total Net Cash Income for the year. In 2008/09, total Net Cash Income is forecast to recover back to in excess of \$730 million or some \$70 million (11%) above the 2007/08 outcome. However, the income level for the sheep/beef sector in 2008/09 is still some \$242 million or 25% below the pre-drought forecast for the year.

It is noted that the MAF farm monitoring revenue figures used for the analysis are based on an exchange rate of \$1.00NZ = \$0.70US.

- (iii) Tables 2 and 3 of the report present results for the total Farm spending changes during the drought and subsequent years. The impact of the changes are also incorporated in the economic impact analysis in Section 5 of the report.
- (iv) As noted at the outset of this section, the combined impacts of the various 'on the ground' effects of the drought on annual total Net Cash Income levels over the assessment period (2005/06-2008/09), are used to determine the movements over the interval in Gross Output from the East Coast sheep/beef farming sector. The changes in Gross Output are, in turn, used through the modelling process to establish the direct and multiplied impacts of the drought. The annual levels of total farm working expenses are taken into account in establishing the final Value-Added impacts of the drought for the sector. The change in stocks of on-farm feed due to the drought are taken into account within the actual economic impact modelling process itself.
- (v) The economic impact modelling work was undertaken by Dr Warren Hughes, Visiting Professor and economic impact specialist at the University of Waikato. Dr Hughes used an updated (Year 2006) 112-industry linear economic impact model of the East Coast economy, for the purposes of the analysis. This model provides annual nominal values for the total multiplied impact of the drought on East Coast region Gross Output, Value-Added/GDP and Net Household Income. Employment impacts are not specifically included in the economic impact analysis because it is difficult to separate out the impacts of "under-employment" particularly on farm. Employment is not expected to have increased in 2006/07 (in terms of numbers employed) despite the increase in Gross Output. Employment may drop in 2007/08 and the following year in affected sectors but may result in under-employment rather than increased unemployment.
- (vi) Gross Output refers to the total value of production impact within a given region of a revenue or expenditure change generated by a particular occurrence or event, including the value of goods and services imported into the area to support the change. When imports are excluded from the 'equation' (as payments for them flow outside the area and do not add to economic activity locally), the result is the concept of Value-Added or regional/local GDP which measures the true impact of a particular revenue or expenditure change in an economy. Net Household Income refers to the total additional household income generated in the economy by an income or expenditure change, after allowing for taxation and savings.

## 5.0 East Coast Region Economic Impacts

This section presents the economic impact results of the major 2007 drought impacting the East Coast North Island sheep/beef farming sector, from the following perspectives:

- The impact on the sheep/beef farming sector itself
- The multiplied impact on linked 'backward' (supplier) and 'forward' (user) industries
- Impact on the overall East Coast economy

For each of the above factors, the comparative economic impact results for both the 'without drought' and 'with drought' scenarios are provided.

### Sheep/Beef Farming Sector

Table 5 indicates the direct economic impact of the drought on the sheep/beef farming sector specifically, over the 2006/07 to 2008/09 years. The Value-Added impacts take into account the revenue, income-equalisation and expenditure effects of the drought. The calculation of these effects is provided in **Appendix 1**

Table 5: East Coast Drought Direct Gross Output and Value-Added Economic Impacts for the Sheep/Beef Farming Sector 2005/06-2008/09

Year	Gross Output \$M	Value-Added/GDP \$M
Base Year 2005/06	1,685.0	797.1
<b>Drought Year 2006/07</b>		
- MAF Pre-Drought Forecast	1,757.7	831.5
- With Drought	1,996.7	917.8
<b>2007/08 Year</b>		
- MAF Pre-Drought Forecast	1,821.1	861.5
- With Drought	1,342.5	721.7
<b>2008/09 Year</b>		
- MAF Pre-Drought Forecast	1,972.4	933.2
- With Drought	1,484.6	636.3

In the drought year, Gross Output of the East Coast sheep/beef farming sector increases by \$312 million or 18%, compared to the 'without drought' forecast of a \$73 million or 4% increase. In 2007/08, Gross Output falls by \$654 million or 33%, compared with the pre-drought forecast of a \$63 million or 4% increase. In 2008/09, Gross Output is forecast to increase by \$142 million or 11%. The overall Gross Output impact during the three-year period is a \$200 million or 12% decline on the 2005/06 figure. This compares with a pre-drought forecast of a \$287 million or 17% gain.

The true direct contribution of the sheep/beef farming sector to the East Coast economy, as measured by Value-Added/GDP, was approximately \$797 million in 2005/06. Without the drought impact, this figure was forecast to increase steadily up to some \$933 million by 2008/09, a gain of \$136 million or 17%. However, with the drought, the overall impact for the three years is a Value-Added loss of \$161 million. In the drought year, Value-Added increased by \$121 million or 15%; however, it then falls by \$196 million or 21% during 2007/08. In 2008/09, total Value-Added for the sector is forecast to fall further by some \$85 million or 12%. At the end of 2008/09, East Coast region sheep/beef sector Value-Added is some \$297 million below the forecast figure excluding the impact of the drought.

As the drought is considered to have no direct employment impact within the sector, the base year total employment level of 6,964 and total direct Net Household Income of \$357 million remain unchanged over the 2006/07-2008/09 period.

## Industry Linkage Impacts

This section indicates the impact of the 2007 drought on 'backward'/supplier industries in the East Coast region linked to changes in the sheep/beef farming sector and on 'forward' linked industries utilising the output of the sector.

Analysis by the University of Waikato indicates that the largest backward linked industries for the sector in the region are sheep and beef farming itself (farms supplying stock and other items to the sector), wholesale and retail trade (eg firms providing farm supplies to the sector), agricultural services, financial services, households supplying employment tot the sector, property services, dairy farming, mixed cropping and electricity, and road freight. These industries account for approximately 60% of the total value of backward industry linkages to sheep/beef farming.

The leading forward-linked industries are meat processing (accounting for 51% of the total value of output generated by all 'forward' industries in the region linked to sheep/beef farming), sheep and beef farming itself, wholesaling, textile manufacturing, retailing, agricultural services, beverage production and fruit/vegetable processing. These industries account for almost 90% of the value of all forward industry linkages to the East Coast sheep/beef sector.

Table 6 details the value of backwards and forward linked industries for the East Coast sheep/beef sector, incorporating the drought impact. Only the Gross Output impacts are presented.

Table 6: East Coast Region 2007 Drought Gross Output Impact for Industries Linked to Sheep and Beef Farming

Year	Gross Output (\$M)
<b>2005/06 Base Year</b>	
- Backward Linkages	2,137.6
- Forward Linkages	1,393.4
- <b>Total Linkages</b>	<b>3,531.0</b>
<b>2006/07 Drought Year</b>	
- Backward Linkages	2,534.1
- Forward Linkages	1,651.8
- <b>Total Linkages</b>	<b>4,185.9</b>
<b>2007/08 Post Drought Year</b>	
- Backward Linkages	1,714.2
- Forward Linkages	1,117.4
- <b>Total Linkages</b>	<b>2,831.6</b>
<b>2008/09 Post Drought Year</b>	
- Backward Linkages	1,884.4
- Forward Linkages	1,228.3
- <b>Total Linkages</b>	<b>3,112.7</b>

The value of the industry linkage effects moves in concert with the changes in direct Gross Output induced by the drought. The total value of the backward industry linkages is significantly higher than the forward linkages and account for around 60% of the total linkage impacts. The results in the table for the Gross Output linkages indicate a \$655 million or 19% gain over 2006/07, a 32% decline in 2007/08 and a 10% gain in 2008/09.

## Regional Economy Impacts

This section indicates the overall impact of the drought on the East Coast regional economy, taking into account both the direct and multiplier impacts. Table 7 shows the relevant results for the 'without drought' and 'with drought' scenarios.

Table 7: East Coast Region Economic Effects of the Drought Impacting the Sheep and Beef Farming Sector 2005/06-2008/09

Economic Impact Variable	Period						
	2005/06	2006/07		2007/08		2008/09	
	Base Year	Without Drought	With Drought	Without Drought	With Drought	Without Drought	With Drought
<b>Gross Output (\$M)</b>							
- Direct Impact	1,685.0	1,757.7	1,996.7	1,821.1	1,342.5	1,972.4	1,484.6
- Industry Linkages	3,530.9	3,683.4	4,185.9	3,816.2	2,813.2	4,133.1	3,111.0
- <b>Total Impact</b>	<b>5,215.9</b>	<b>5,441.1</b>	<b>6,182.6</b>	<b>5,637.3</b>	<b>4,155.7</b>	<b>6,105.5</b>	<b>4,595.6</b>
<b>Value-Added/GDP (\$M)</b>							
- Direct Impact	797.1	831.5	917.8	861.5	721.7	933.2	636.3
- Industry Linkages	1,398.1	1,458.4	1,609.7	1,511.0	1,258.3	1,636.8	1,232.5
- <b>Total Impact</b>	<b>2,195.2</b>	<b>2,289.9</b>	<b>2,527.5</b>	<b>2,372.5</b>	<b>1,980.0</b>	<b>2,570.0</b>	<b>1,868.8</b>
<b>Net Household Income (\$M)</b>							
- Direct Impact	357.0	357.0	357.0	357.0	357.0	357.0	357.0
- Industry Linkages	452.4	491.5	536.3	525.9	362.8	530.2	398.8
- <b>Total Impact</b>	<b>809.4</b>	<b>848.5</b>	<b>893.3</b>	<b>882.9</b>	<b>719.8</b>	<b>887.2</b>	<b>755.8</b>

The points to note from the table are as follows:

- **Gross Output** – Without the drought impact, total regional Gross Output increases in nominal terms from approximately \$5,216 million in 2005/06 to \$6,106 million in 2008/09, a gain of \$890 million or 17%. The impact of the drought is an overall Gross Output loss of \$620 million or -12%.
- **Value-Added / GDP** – Without the drought impact, total East Coast Value-Added/GDP increases from approximately \$2,195 million in 2005/06 to \$2,570 million in 2008/09, a gain of \$375 million or 17%. Taking into account the drought impact, the overall result is a Value-Added loss of \$326 million or 15%. At the end of 2008/09, regional Value-Added following the drought is \$701 million below the level it would have been if the event had not occurred.
- **Net Household Income** – Without the drought impact, total Net Household Income in the East Coast region increases by some \$78 million or almost 10% over the three-year. With the drought impact, the overall result is a \$54 million (7%) decline in Net Household Income generated in the region.

## Multipliers

Using the information provided in Table 7 above, Table 8 below indicates the size of the various economic impact multipliers in relation to the economic effects of the drought.

Table 8: East Coast Drought Impact Multiplier Values 2005/06-2008/09

Economic Impact	Multiplier Value
Gross Output	3.1
Value-Added/GDP	2.8 <sup>1</sup>
Net Household Income	2.2 <sup>1</sup>

**Note:** 1. Average multiplier value for the three year period 2006/07-2008/09

The relatively high values of the above multipliers reflect the importance of sheep and beef farming in the East Coast economy and the consequent strong industry linkages to the sector in the region.

## Overall Regional Economy Impact

Table 9 indicates the overall economic impact losses for the 2005/06-2008/09 period, as a proportion of the total East Coast economy in the 2005/06 base year. Total Gross Output for the regional economy falls by 2.3% during the above period, as a result of the drought; total Value-Added/GDP falls by 3.2%; and total Net Household Income falls by 1.8% overall.

Table 9: Total East Coast Economy Impact of the Drought for the 2005/06-2008/09 Period

Economic Impact Variable	Overall Decline 2005/06-2008/09	East Coast Economy Year 2006	Economic Impact % of Total Regional Economy in 2006
Gross Output (\$M)	620.3	26,828.5	2.3
Value-Added/GDP (\$M)	326.2	10,033.3	3.2
Net Household Income (\$M)	53.6	2,937.5	1.8

## Local Authority District Impacts

Table 10 indicates the sub-regional breakdown of the Value-Added economic impacts of the drought over the 2006/07 to 2008/09 period, based on the estimated local authority district shares of total East Coast livestock numbers recorded by Statistics New Zealand's Year 2002 Agricultural Census. The base Value-Added figures used for the analysis are in the Total Impact (line 6) of Table 7.

Table 10: East Coast Local Authority Regional Shares of Drought Value-Added Economic Impact 2005/06-2008/09

Sub Region	% Share of East Coast Livestock Numbers 2002	Value-Added (\$M) June Years				Overall Value-Added Change 2005/06- 2008/09 (\$M)
		2006	2007	2008	2009	
Gisborne	20.0	439	506	396	374	-65
Wairoa	7.0	154	177	138	131	-23
Napier/Hastings	18.0	395	455	357	336	-59
Central HB	37.0	812	935	733	692	-120
Wairarapa/Tararua	18.0	395	455	356	336	-59
<b>Total</b>	<b>100.0</b>	<b>2195</b>	<b>2528</b>	<b>1980</b>	<b>1869</b>	<b>-326</b>

The combined Hastings/Central Hawke's Bay districts, where were impacted most by the drought, account for 55% of the total Value-Added loss over the period, followed by Gisborne district 20%, the combined Wairarapa/Tararua local authority districts 18% and Wairoa district 7%.

## 6.0 National Economic Impacts

Table 11 over page indicates the economic impacts of the drought at the East Coast and national levels, over the 2005/06-2008/09 period. The East Coast figures are based on the information provided in Table 7, whilst the remaining national figures are based on national economic impact modelling results generated by the University of Waikato for the purposes of this report.

Table 11: East Coast and New Zealand Economic Impacts of the 2007 Drought affecting the Sheep and Beef Farming Sector

Year/Area	Gross Output (\$M)	Value-Added/GDP (\$M)	Net Household Income (\$M)
<b>2005/06</b>			
- East Coast Region	5,215.9	2,195.2	809.4
- Rest of New Zealand	1,594.0	1,850.9	790.4
- Total New Zealand	6,809.9	4,046.1	1,599.8
<b>2006/07</b>			
- East Coast Region	6,182.6	2,527.5	893.3
- Rest of New Zealand	1,889.3	2,156.1	937.1
- Total New Zealand	8,071.9	4,683.6	1,830.4
<b>2007/08</b>			
- East Coast Region	4,155.7	1,980.0	719.8
- Rest of New Zealand	1,270.0	1,679.5	633.9
- Total New Zealand	5,425.7	3,659.5	1,353.7
<b>2008/09</b>			
- East Coast Region	4,595.6	1,869.0	755.8
- Rest of New Zealand	1,424.6	1,588.7	712.9
- Total New Zealand	6,020.2	3,457.7	1,468.7

Over the full period, the total national economic impacts of the drought are:

- A **Gross Output** fall of \$790 million or 12%. Gross Output increases by \$1,262 million in 2006/07, falls by \$2,640 million in 2007/08 but then increases by \$594 million during the 2008/09 year.
- A **Value-Added/GDP decline** of \$588 million. Value-Added increases by \$638 million in 2006/07, falls by \$1,024 million over 2007/08 and by a further \$202 million in 2008/09.
- **Net Household Income** falls by \$131 million. This variable increases by \$231 million in 2006/07, falls by \$477 million in 2007/08 and increases by \$115 million in 2008/09.

## 7.0 Conclusion

This report provides an analysis of the economic impacts for the East Coast sheep/beef farming sector and region, of the major drought which struck the area during the first half of 2007.

The results of the analysis indicate a significant gain in the regional economic contribution of the sector during the drought period itself when farmers were forced to sell significant amounts of stock due to rapidly deteriorating pasture and stock conditions. However, due to the major resulting fall in the production base of livestock for the current 2007/08 year, significant decline in lambing and calving rates, and the requirement for farmers to rebuild their herds, this year is expected to see a sharp drop in the economic scale of the sector itself in the region and its wider economic impacts. In 2008/09, a recovery in the overall economic contribution of the sector in the East Coast and its industry linkage impacts to the region, is expected.

During the full 2005/06-2008/09 period, the overall impact of the drought in the East Coast region is a \$161 million reduction in the economic scale/Value-Added of the sheep/beef farming sector itself and a \$326 million reduction in the overall size of the regional economy when industry linkage/multiplier effects are taken into account. These results compare with a forecast \$375 million increase in the overall Value-Added/GDP size of the East Coast economy if the drought had not occurred.

Comparing the drought and non-drought outcomes for the period, the overall result of the event is a \$701 million Value-Added/GDP loss over the three-year period.

## APPENDIX 1

### East Coast Drought Economic Impact Value-Added / GDP Calculation

Table 5 of the main report includes figures showing the impact of the 2007 drought on the sheep and beef farming sector, over the period 2005/06 to 2008/09.

This short paper explains the derivation of the Value-Added figures in the table.

The Value-Added figures take into account three factors:

- The total revenue change impacts of the drought, as indicated by the changes in farm Net Cash Income
- Total on-farm expenditure changes including and following the drought year (these are indicated in Table 2 in the main report).
- The impact of farm 'income equalisation' whereby a proportion of additional income received in the 2006/07 year from the selling of significant amounts of additional livestock is placed in a farm equalisation account and used in the following year for the purchase of replacement livestock. For the purposes of this report, the direct value of the farm equalisation fund at the regional level has been calculated at \$43.6 million, with a total Value-Added impact of \$47.5 million including multiplier effects.

Table (a) below indicates the calculation of the Value-Added/GDP figures for the 'without drought' and 'with drought' situations.

Table (a): East Coast Region Sheep/Beef Sector Final Value-Added/GDP Impacts 2005/06-2008/09

Year	'Without Drought' Value-Added/GDP Impacts (\$M)	'With Drought' GDP Impact (\$M)		
		(1) <sup>1</sup>	(2) <sup>2</sup>	(3) <sup>3</sup>
2005/06	797.1	797.1	797.1	797.1
2006/07	831.5	945.0	965.3	917.8
2007/08	861.5	639.3	674.2	721.7
2008/09	933.2	702.7	636.5	636.3
<i>Change 2005/06-2008/09</i>	<i>+137.1</i>	<i>-94.4</i>	<i>-160.6</i>	<i>-160.8</i>

**Notes:**

1. The figures in this column take into account only the Gross Output/Revenue changes generated by the drought.
2. The figures in this column also incorporate the impact of the annual changes in total sector expenditure indicated in Table 2 of the main report (reduced expenditure increases Value-Added and vice versa).
3. The figures in this column reflect the figures in Column 2 adjusted for the impact of income equalisation. The total Value-Added impact of the income equalisation fund is subtracted from the 2006/07 result in Column 2 and added to the 2007/08 figure in Column 3.