Report to:

Local Government New Zealand

TRANSPORT FUTURES –

ECONOMIC EVIDENCE

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Transport Futures – Economic Evidence

Tables

1 Summary

In relation to the export of New Zealand's main land-based commodities, for every 1 tonne kilometre of transport task met by state highways another 1.3 to 1.8 tonne kilometres is met by local or regional roads.

The backbone of the New Zealand economy comprises primary production from land-based industries producing bulky goods from farm, forest, orchard or vineyard. These are predominantly transported on local and regional roads to a processing, packing, or manufacturing facility. Processing these goods often reduces the bulk of the product for transport to port prior to export, with this final stage usually being completed on state highways.

This study estimates the transport task associated with the following main land-based commodities exported:

- dairy;
- meat and livestock
- horticulture – kiwifruit, apples and wine; and
- forest and wood products.

We estimate that the annual road transport task for these export commodities totals 6.6 billion tonne kilometres, as listed in Table 1.1.

Table 1.1 Road transport task for main commodity exports

Commodity	tonne kilometres (m)
Meat	406
Kiwifruit	25
Wine	20
Apples	19
Logs & timber	4,198
Dairy	1,940
TOTAL	**6,608**

We estimate that this total comprises:

- 4.4 billion tonne kilometres relating to the road transport of raw product from point of origin to the processor/packhouse/winery/sawmill.
- 2.2 billion tonne kilometres relating to the road transport of product from processor to the port prior to export.

The first stage of the export journey of these commodities (i.e. to the "processor") is predominantly made within the region (intra-regional) and is on a local or regional road. Thereafter, processor-to-port movements are generally between regions (inter-regional) and are on state highways. This is because processors are located close to farms/orchards due to the time-dependent nature of the product, and to reduce transportation costs. In turn, processors are generally in close proximity to state highways, again to reduce spoilage and transportation costs.

Therefore, we believe that intra-region movements are effectively representative of the use of local and regional roads for exports. For all of the commodities listed except dairy, we assume that the producer-to-processor tonne kilometres are on local or regional roads; and the processor-to-port tonne kilometres are on state highways.

We believe this assumption to be a close approximation to the true situation. Given the lack of readily available data, significant additional resources would be required to enable a more precise estimate. We believe such additional effort would not significantly alter the conclusions of this study.

However, the size of dairy exports on the overall road transport task is significant.[1] Consequently, in the absence of more detailed information, we provide results using two alternative assumptions. These assumptions relate to the proportion of the transport of raw milk from farm gate to processor that is undertaken on local or regional roads. In particular:

- assumption A: 65% of the dairy farm-to-processor road transport task occurs on local or regional roads, with the remaining 35% on state highways
- assumption B: 90% of the dairy farm-to-processor road transport task occurs on local or regional roads, with the remaining 10% on state highways.[2]

[1] As well as the significant difference in weight of the commodity being transported from the producer-to-processor stage, compared with the weight transported over the processor-to-port stage.

[2] We note that that an assessment provided to us of Fonterra vehicle running distances in the Waikato shows that 73% of the kilometres travelled were on local roads. This information is consistent with the range adopted by our assumptions.

The results are listed in Table 1.2 below.

Table 1.2 Road transport task for major commodity exports

Commodity	Local and regional tonne kilometres (m)	State highway tonne kilometres (m)	Total tonne kilometres (m)	Ratio (Local and regional-to-SH)
Meat	299	107	406	2.8
Kiwifruit	16	9	25	1.8
Wine	11	9	20	1.2
Apples	12	7	19	1.7
Logs & timber	2,327	1,871	4,198	1.2
Dairy – assumption A	1,121	819	1,940	1.4
TOTAL if A	**3,786**	**2,822**	**6,608**	**1.3**
Dairy – assumption B	1,552	388	1,940	4.0
TOTAL if B	**4,217**	**2,391**	**6,608**	**1.8**

In summary, we find the road transport task associated with the main land-based export commodities totals:

- between 3.8 and 4.2 tonne kilometres on local and regional roads
- between 2.4 and 2.8 tonne kilometres on state highways.

For each of these commodities, as well as in total, the transport task met by local and regional roads is greater than that met by state highways. Overall, the transport task met by local and regional roads is between 1.3 and 1.8 times greater than the task met by state highways.

Discussion

Recognising the importance of the local and regional transport networks for these exports, Local Government New Zealand established an Infrastructure and Transport Committee, which will obtain a more comprehensive and reliable evidence base as a vital first step in fulfilling the objective '*to work towards developing a meaningful partnership with government for achieving jointly-desired, long-term transport outcomes'*

Local and regional roads make up 88 percent of New Zealand's total road length (New Zealand Transport Agency), with 83,000 kilometres. Of these local and regional roads, 20 percent are urban with the remainder being rural. The majority of rural roads are unsealed.

Demand for local and regional roads, and the associated state highway network, to support the export of major goods has increased. The importance of land-based exports transported on these roads has also increased. The value of dairy, meat, logs, kiwifruit, wine and apples exported in the year to July 2011 totalled nearly $27 billion rising $12 billion since 2000.

This rapid expansion in export revenue, an increase of 80 percent, has been the main driver of growth in New Zealand's total export revenue over this period. Further, the value of exports from the dairy, meat and forestry industries have generated over 60% of this increased value of exports between 2006/07 and 2010/11.

At present, these main land-based exports account for over 60% of the value of New Zealand's exports.

With local and regional roads making up a substantial part of New Zealand's road network, and with increasing export revenue placing high demand on local and regional roads, this study assesses the importance of local and regional roads to the New Zealand economy; estimates the transport task associated with these roads and values this transport task based on key New Zealand exports.

The National Freight Demands Study (NFDS) was the first substantive piece of work in estimating the size of New Zealand's transport freight task.[3] The NFDS analysed the main freight transport flows in 2006/07. It was completed for the Ministry of Transport, the NZ Transport Agency and the Ministry of Economic Development in 2008.

The present study has refined the NFDS by where possible updating analyses to 2010/11 and cross-referencing these analyses to production data by Territorial Local Authority (TLA).[4] The land-based industries measured by the NFDS were: milk and dairy products; livestock and meat; horticulture; and logs and wood products. These four land-based sectors accounted for over 40% of the total transport task for all measured groups.

The main objective of this study is to estimate the transport task in local and regional, as well as national terms. We have therefore concentrated this study on the main export products

[3] Richard Paling Consulting et.al. *National Freight Demands Study*. Ministry of Transport, NZ Transport Agency, Ministry of Economic Development. September 2008.

[4] A Territorial Local Authority as defined under the Local Government Act 2002 is a city council or district council. There are 73 territorial authorities, comprising of 15 cities and 58 districts.

where production data is available, or can be generated down to a TLA, or district level for the main producing TLAs.

This has imposed some limitations on the study as it has eliminated analyses of the minor flows of co-products like wool, hides, and skins. We have concentrated on exports and so have not estimated the transport task for the local consumption, which accounts for about 5% of the total production of most of these products. Also, we have not included the effects of producing and transporting inputs such as fertiliser, agricultural lime, and petroleum products.

For these four main export products, and their associated value chains, we estimate that each year:

- 43 million tonnes is transported from point of origin to processor (or packhouse, winery, or sawmill).
- 19 million tonnes is transported from the processor to the port or exit prior to export.

The domestic transport task is heavily dominated by first stage of the export journey. The reason for this is that in all industries, the weight of the primary input is reduced when it is converted to export product.[5] This is particularly so for the dairy industry, where the weight of export product is only 13%, or about one-eighth, of the weight of the milk input. That is, the task of transporting produce from farm/orchard gate is most pronounced, when compared with the transport task of the final stage from processor/packer to port of exit.

We have valued the exports at farm/orchard/vineyard gate, or forest ride, as well as at free on board (FOB) export value

Table 1.3 below provides a basis for estimating the value of local and regional roads to the New Zealand economy.

Using the base production and value data from industry sources, the value of these products at the farm/orchard gate for the year to July 2011 totalled over $18.7 billion. By far the largest contribution was from milk which had a farm gate value of $11.9 billion, or over 60% of the total.

Looking then at the contribution to the economy of the packed, processed, and manufactured products exported from these industries, the annual export value is approximately $27.5 billion. The difference between the value of commodities transported

[5] With the exception of wine.

from farm to processor and those transported to port prior to export is estimated to be $8.8 billion.

Table 1.3 Economic value of local and state highway roads

Commodity	Annual farm gate value (July 2011 $m)	Annual export value (July 2011 $m fob)	Value add from farm gate (July 2011 $m)
Dairy	11,894	16,326	4,431
Meat	3,740	5,539	1,799
Logs & timber	2,200	3,300	1,100
Kiwifruit	390	950	560
Wine	300	1,100	800
Apples	235	322	87
Sub-TOTAL	**18,759**	**27,537**	**8,778**

The direct impact of the local and regional roads is to provide access from the production areas to processing and thus allow the producers to generate $18.8 billion of farm gate value within their production regions. However, the real impact is that without this access to the land-based producers, none of the export activity would be possible.

Local roads therefore facilitate the value chains of these key exports, which we estimate contribute $27.5 billion of export value. In 2010/11, we estimate this to be over 62% of the total value New Zealand's merchandise exports. As the New Zealand economy and the future prosperity of New Zealand is critically dependent on exports, these land-based products are the key base for the economy.

The importance of these exports to New Zealand is of even greater prominence in the light of the global financial and economic uncertainty currently being experienced.

The road transport task associated with these exports is met by a combination of local and regional roads and by state highways; with the ratio being between 1.3 to 1.8 tonne kilometres on local and regional roads for each 1 tonne kilometre on state highways.

Given this evidence, the importance of local and regional roads in relation to the nation's export effort is clear.

2 Introduction

New Zealand's economy is largely based upon primary production from the land-based industries of dairying, livestock and meat, forestry and wood products, and horticulture. The value chains for these exports generally include transport of bulky goods from farm, forest, orchard or vineyard to a processing, packing, or manufacturing facility. These primary products are predominantly transported on the local or regional road networks.

Recognising the importance of local and regional transport networks, Local Government New Zealand has established an Infrastructure and Transport Committee which will obtain a more comprehensive and reliable evidence base as a vital first step in fulfilling the objective "*to work towards developing a meaningful partnership with government for achieving jointly-desired, long-term transport outcomes"*.

Local and regional roads make up 88 percent of New Zealand's total road length (New Zealand Transport Agency), with 83,000 kilometres. Of these local and regional roads, 20 percent are urban, while the remainder are rural, with the majority of these unsealed.

Demand for local and regional roads, and state highways to export major goods has increased. The importance of the export of land-based exports transported on the roads has also increased. The value of export of dairy, meat, logs, kiwifruit, wine and apples totalled nearly $27 billion in the year to July 2011, rising $12 billion since the year 2000. This rapid expansion in export revenue by 80 percent has been the main driver of growth in New Zealand's total export revenue over this period.

At present, these main land-based exports and their first-stage processed products account for over 60% of the value of New Zealand's exports. The importance of these exports to New Zealand has been of even greater prominence in the last few years of world financial and economic uncertainty. The value of exports from the dairy and meat industries plus logs and sawn timber have generated over 60% of the increased value of exports between 2006/07 and 2010/11.

Given their importance to the economy, and the dependence upon transport, it is surprising that little work has been done on the impact of the local and regional transport network and the State Highway (SH) network on the effective and efficient operation of the value chains of these land-based products.

The first substantive piece of work in the area was the National Freight Demands Study (NFDS), completed for Ministry of Transport, NZ Transport Agency and Ministry of Economic

Development in 2008. [6] This study estimated the total transport task, measured in Tonne Kilometres transported for selected main commodity groups. The land-based industries measured by the NFDS were: milk and dairy products; livestock and meat; horticulture; and logs and wood products. According to the NFDS, these four land-based sectors accounted for over 40% of the total transport task for all measured groups.

The NFDS also estimated mode share for these land-based sectors and found that road transport had the dominant share for all four. The present research aims to progress the work of the NFDS further and to understand the current road networks, and to measure the importance and value of local and regional road networks.

2.1 Scope of study

The scope of the project is to focus on economic evidence, and specifically to create a repeatable process at local, regional, and national levels for more accurately identifying the potential economic benefits of investment in transport infrastructure. This is a very broad scope. Given the paucity of prior work and data in the area, the present research has focussed the scope on obtaining sound information on the main product flows from local, regional and national levels, and developing a process to estimate the transport task, and the economic value of that transport.

2.2 The export value chains

There are four main value chains and product flows modelled:

- dairy;
- meat and livestock;
- horticulture – kiwifruit, apples and wine; and
- forest and wood products.

The production of these land-based products are by their nature spread around the country. The successful production for export of the processed and manufactured products depends heavily on the ability to transport them efficiently and effectively on local and regional roads to their processing or packing plant and hence to port.

The processing and/or manufacturing facilities reduce the bulk and weight of the goods for export. These goods are then transported to port mostly on the SH network, and/or by rail.

[6] Richard Paling Consulting et.al. *National Freight Demands Study*. Ministry of Transport, NZ Transport Agency, *Ministry of Economic Development. September 2008.*

In general, we have modelled the main land-based products that were analysed for the 2006/07 season by the NFDS, and have refined these analyses, brought them up-to-date to 2010/11 production season where possible, and also cross-referred these analyses to data for production by TLA where that is available, or can be derived from other sources. In some quite fundamental areas, the published data from different sources is inconsistent, and so where possible we have triangulated among sources to obtain estimates of the correct order-of-magnitude.

Given the magnitude of the task of obtaining sound information, the research has adopted the 80:20 rule of obtaining sound information for the larger flows where that is possible, on the basis that the lesser flows are likely to reflect the principal findings from the large product flows. For each export product there is also a flow from processing plant to domestic wholesale or retail outlets for sale locally. Our information from industry sources and Statistics NZ indicates that this flow, for most products is about 5% of the total. This flow, mostly on the SH network, is not directly related to export and so is not counted.

There is limited information available on the distance of haulage of livestock, milk and other raw product to processing plants on a regional basis, and these were estimated from such information as can be obtained. More detailed accuracy of these distances would require on-the-ground research which is beyond the scope of this project

There are also limitations in terms of the export products analysed, and the handling of productive inputs like fertiliser and petroleum products. The NFDS did not include the co-products in the livestock industry such as wool, hides and skins. The patterns of these would reflect the patterns for meat, and from our information the volumes are an order-of-magnitude smaller than the main products of meat and milk.

Livestock in the NFDS analyses did not include pigs or chickens, though little of that product is exported. There was in the NFDS some internal haulage of livestock from district-to-district as store stock for finishing. That has been included, absorbed into the overall volume of transport to slaughter.

Finally the estimation of the value to the economy is the value at farm gate and export. We have not estimated the multiplier effects of the production and processing activities on GDP and employment. Similarly, although inputs such as fertiliser, agricultural lime and petroleum products are necessary to produce the land-based exports there was less information on the regional transport of these inputs in the NFDS, and so the emphasis in this present research is on the local and regional transport of the export products.

2.3 Structure of report

The rest of the report is set out as follows. Section 3 to 6 analyses each of these main export sectors to determine the production of primary produce, transport flows and the values of produce moving from land-based production to export. The following is calculated for each main export:

1. the impact of the regional road network
    a. estimate the tonnage of produce transported from the gate of the farm, orchard or vineyard, or the forest ride to the initial collection or processing point.
    b. estimate the average distance which this produce is carried on the local and regional road network.
    c. multiply the tonnage produced by the distance hauled to show the extent of the transport task, measured in tonne kilometres[7]. This is a sound measure of the impact this transport will have on the local and regional road network.
    d. estimate the value to the economy, measured at farm gate, orchard gate, forest ride.
2. the impact of the SH network
    a. estimate the tonnage of export products transported from the processing / manufacturing plants to port.
    b. estimate the average distance which these products are carried to port;
    c. multiply the tonnage produced by the distance hauled to show the extent of the transport task, measured in tonne kilometres.
    d. estimate the mode share as between the SH network and rail, these mode shares having been determined by the NFDS.
    e. estimate the value to the economy, measured at FOB [8]the port.
3. compares the transport task and the product values for product handled on the local and regional, and the SH road networks.
4. displays the intra-regional movements at a TLA level for the largest-producing TLAs, where the basic data is available.

Section 7 then provides the main conclusions that can be drawn from the transport task associated with the four export value chains on the local and regional and the SH network.

[7] Tonne kilometres is a unit of measure of goods transport which represents the transport of one tonne by road over one kilometre (OECD, 2002).

[8] Free on Board is the value of goods at New Zealand ports before export.

3 Dairy product value chain

3.1 Impact of milk and dairy products on local and regional road network

Approximately 96 percent of liquid milk is transported via roads and 4 percent via rail.[9] This is because milk is highly perishable and must be moved quickly to the nearest processing plant. There are economies of scale in milk processing, and so the number of processing plants has reduced, and milk is hauled considerable distances. The majority of milk is processed in the region that it is produced in, with the major producing areas being Waikato/Bay of Plenty, Southland, Canterbury and Taranaki/Manawatu-Wanganui/Wellington[10]. The main exception to this pattern is the milk from Hawke's Bay and Gisborne which is hauled by road to Oringi in southern Hawke's Bay. There it is loaded on a train and hauled to the Fonterra factory at Whareroa, Hawera in Taranaki. The part of this transport on the roads is included in our analysis.

3.1.1 Regional milk production and milk transport task

The extent of the milk production and the transport to the plants in the regions has been estimated using the production information by region, sourced from Dairy NZ for the 2009/10 season, and the total milk purchased nationally in 2010/11 by Fonterra (with allowance for non-Fonterra purchases). These estimates show that there was over 17.7 million tonnes of milk produced across the country in the 2010/11 season. The volumes in the major production regions are Waikato/Bay of Plenty with 5.9 million tonnes, Taranaki/ Manawatu/ Wellington with 3.4 million tonnes, Canterbury with 3 million tonnes, and Otago/Southland also a with a total of 3 million tonnes.

The transport task on the nation's local and regional road network was estimated at 1,724 million tonne kilometres. As to be expected the greatest load was on the Waikato/Bay of Plenty, the Taranaki/ Manawatu/ Wellington, and the Otago/Southland regions.

[9] NFDS 2008 Table E3, page iv.

[10] Regions have been categorised based on the data gathered by the NFDS. They have been put into the following groups: Northland/Auckland, Waikato/Bay of Plenty, Hawke's Bay/Gisborne. Taranaki/Manawatu-Wanganui/Wellington, Tasman/Marlborough/West Coast, Canterbury, and Otago/Southland.

Table 3.1 Milk production and transport task 2010/11

Region	Tonnes ('000)	Tonne kilometres (million)
Northland/ Auckland	1,281	82
Waikato/Bay of Plenty	5,944	589
Gisborne/Hawkes Bay	193	18
Taranaki/ Manawatu/ Wellington	3,396	404
Top of South	846	66
Canterbury	3,071	306
Otago	921	91
Southland	2,110	168
Total	**17,761**	**1,724**

Sources: NFDS 2008; Dairy NZ; Fonterra; Statistics NZ; BERL

Looking at the overall picture, 17.76 million tonnes of milk generated an estimated transport task of just over 1,700 million tonne kilometres. This implies that the average distance the milk was hauled is estimated at a little less than 100 kilometres (the figure reflected in these numbers is an average haul of 97 kilometres).

3.1.2 Milk value to the economy at farm gate

We estimated that the farm gate value of milk produced is equal to the milk solids produced, times the Fonterra payout in 2010/11 of $7.90 per kilogram of milk solid. We have estimated the 2010/11 figures using the data on milk solids produced by region in 2009/10 from Dairy NZ data increased pro rata to the total milk solids purchased by Fonterra in 2010/11 (with allowance for non-Fonterra purchases).

This estimate indicates that the farm gate value to the economy of milk in the 2010/11 season was about $11.9 billion.

In Table 3.2 we show the farm gate value by regions as well as the tonnage and transport task.

Table 3.2 Milk production transport and farm gate value 2010/11

Region	Tonnes ('000)	Tonne kilometres (million)	Farm Gate value ($million)
Northland/ Auckland	1,281	82	$858
Waikato/Bay of Plenty	5,944	589	$3,981
Gisborne/Hawkes Bay	193	18	$129
Taranaki/ Manawatu/ Wellington	3,396	404	$2,274
Top of South	846	66	$566
Canterbury	3,071	306	$2,056
Otago	921	91	$616
Southland	2,110	168	$1,413
Total	**17,761**	**1,724**	**$11,894**

Sources: NFDS 2008; Dairy NZ; Fonterra; Statistics NZ; BERL

The role of the local and regional road network in facilitating the generation of $11.9 billion direct input to the regional and national economies is very significant. As noted, the scope of these estimates does not include the indirect and induced multiplier effects of this revenue through the regional and national economy.[11]

3.2 Impact of dairy products on the State Highway network

We follow a similar process to that for milk above, for estimating the transport of dairy products from processing plant to port (including the small volumes exported through Auckland and Christchurch airports). This work requires considerable triangulation between the regions of milk production, the export 'tonnage yield' from that milk when processed, and the figures for tonnages of product exported. This process was completed (with judgement) by the NFDS for the 2006/07 season, and we have repeated it for the 2009/10 season, and 2010/11 to arrive at consistent figures.

3.2.1 Regional dairy product transport task to export

Our estimates show that the 17.7 million tonnes of milk generated about 2.3 million tonnes of dairy products for export. There is production of approximately 100,000 tonnes of product

[11] Producers increase the output of a product due to increased demand. This is known as the direct effect. The direct effect has flow-on effects throughout an economy known as multiplier effects. The flow-on effects are either indirect or induced. Indirect effects arise as the increased demand on producers means that they will demand more inputs from their suppliers, who in turn, will demand more inputs from their suppliers. This is known as the indirect effect. The induced effect is the expenditure by households due to increased employment from the increased demand on producers and suppliers.

for local sale, but our interest is in export impact, so we have not estimated the transport task to local retail. The export volume implies that the tonnage of milk carried from farm gate to processor is about 7.6 times the tonnage of dairy products carried from processor to port. The dairy product for export and its transport task are presented in Table 3.3 below.

Table 3.3 Dairy product for export and transport task 2010/11

Region	Tonnes	Tonne kilometres
	('000)	*(million)*
Northland/ Auckland	138	18
Waikato/Bay of Plenty	783	98
Gisborne/Hawkes Bay	0	0
Taranaki/ Manawatu/ Wellington	345	36
Top of South	37	9
Canterbury	403	62
Otago	0	0
Southland	617	142
Total	**2,324**	**366**

Sources: NFDS 2008; Dairy NZ; Fonterra; Statistics NZ; BERL

We have allocated the estimated production for export among the ports, as consistent with the export tonnages, and consequently estimated the land transport distances that the dairy products were hauled. These distances are used to estimate the transport task in terms of tonne kilometres on the land transport system. The estimate is that transporting dairy products from processing plant and factory to port required a transport task of 366 million tonne kilometres.

This transport task to port is the estimate of the total land transport task. This includes both road transport and rail transport. Without a major survey of industry players it is not realistic to attempt to separate the transport task into modes at the regional level. At the national level the NFDS estimated that the breakdown was road 59% mode share, and rail 41% mode share.

Using the NFDS mode shares, the implication is that in 2010/11 the transport task for hauling dairy products from factory to port was 59% of 366 million tonne kilometres, or 216 million tonne kilometres.

3.2.2 Dairy product value to the economy at export

We have estimated the production at regional level from first principles, and then related them to total export tonnages as recorded in Statistics NZ export statistics. We have then cross referred these data to the product yield coefficients implied in the NFDS data for 2006/07 season. These two approaches resulted in relatively close estimates.

There is one fundamental problem we have with the valuation of dairy products at export. The farm gate value estimated from the payout to farmers is $11.9 million. The total FOB value of dairy products exported, as recorded in the Statistics NZ export data, is in the range $12.3 billion to about $13 billion, depending upon the products included. This implies that the total transport, processing, and manufacturing costs between farm gate and export is only about $1.4 billion to $2.1 billion.

We should note that the FOB value recorded is a transfer value of product moving within the Fonterra value chain. It is not a market-determined transaction value. It appears therefore that the declared FOB value may be an under-estimate of the market value of the product at FOB.

Given that Fonterra's total revenue in that year is shown as nearly $19.9 billion, it seems unlikely that the $7 billion difference between the FOB figures and the revenue figures are all absorbed by post-FOB costs. In this work and in previous work that was reviewed by MAF, without comment on the impact of pasture on the New Zealand economy, we have therefore taken the figure given by Fonterra as the 'Cost of Goods Sold' in their accounts to reflect a likely level of value of dairy products at export. This figure in the 2010/11 year was $16.3 billion which allows a further $3.6 billion of revenue to cover post-FOB costs like overseas freight, and Fonterra's profit. This figure is converted to a value per tonne of product exported.

Table 3.4 Dairy product for export transport and FOB value 2010/11

Region	Tonnes	Tonne kilometres	Export value
	('000)	*(million)*	*($ million)*
Northland/ Auckland	138	18	$969
Waikato/Bay of Plenty	783	98	$5,501
Gisborne/Hawkes Bay	0	0	$0
Taranaki/ Manawatu/ Wellington	345	36	$2,427
Top of South	37	9	$261
Canterbury	403	62	$2,831
Otago	0	0	$0
Southland	617	142	$4,336
Total	**2,324**	**366**	**$16,326**
Value added to Farm Gate			**$4,431**

Sources: NFDS 2008; Dairy NZ; Fonterra; Statistics NZ; BERL

The estimated export values are included in Table 3.4 along with the tonnage and the transport task. We also show the difference between the farm gate value and the export value as the 'Value added to farm gate'.

3.3 Comparison of impact of dairy on local and regional road network and SH network

The above displays the importance of local and regional roads to New Zealand, in terms of the dairy value chain when moving from producer to processor. This is shown by a larger quantum of transport (as measured in tonne kilometres) required within regions, on the local and regional road network, rather than transport using the main roads and SH network through and between regions to the ports. The transport task for milk to factory was 1,724 million tonne kilometres, or about 8 times the transport task of 216 million tonne kilometres for dairy products from factory to port.

The farm gate value of milk is about $11.9 billion per year which is nearly three times the value added from farm gate to FOB export, estimated to be about $4.4 billion per year.

3.4 Districts with greatest dairy transport on local and regional roads

The significance of intra-regional movements can be highlighted by looking at the intra-regional movements at a TLA level. Table 3.5 displays the distribution of dairy products transported on local and regional roads at the TLA level.

Table 3.5 District milk production transport and farm gate value 2010/11

District	Tonnes	Tonne kilometres	Farm Gate value
	('000)	*(million)*	*($million)*
Southland	1,535.0	122.8	$1,028.0
South Taranaki	1,155.3	92.4	$773.7
Ashburton	1,079.1	64.7	$722.7
Matamata-Piako	1,075.9	75.3	$720.5
Waikato	769.8	46.2	$515.5
Waipa	727.0	50.9	$486.8
Selwyn	587.3	76.4	$393.3
South Waikato	535.6	69.6	$358.7
Rotorua	490.4	39.2	$328.4
Otorohanga	460.4	36.8	$308.3
Timaru	416.8	25.0	$279.1
Clutha	412.1	28.8	$276.0
New Plymouth	403.4	44.4	$270.1
Hauraki	389.4	31.2	$260.8
Tararua	373.1	26.1	$249.9
Kawerau/Whakatane	354.7	17.7	$237.5
Manawatu	345.0	13.8	$231.0
Taupo	340.8	27.3	$228.2
Kaipara	329.0	19.7	$220.3
Waitaki	328.5	46.0	$220.0
Gore	324.3	16.2	$217.2
Waimate	316.2	19.0	$211.8
Whangarei	305.5	12.2	$204.6
Hurunui	249.3	44.9	$167.0
Sub-Total	**13,304.0**	**1,046.7**	**$8,909.3**
Share of New Zealand	**75%**	**61%**	**75%**

The 24 TLAs account for 75 percent of all intra-regional movements in New Zealand, 61 percent of New Zealand's total transport task, and 75 percent of New Zealand's farm gate value of dairy exports. This pattern is to be expected because the largest milk producing regions can be expected to have high production densities around their processing plants. Thus the transport task per tonne of milk processed is expected to be less than the average for the whole country.

The Southland, South Taranaki, Ashburton districts and the Matamata-Piako District in the Waikato produce the most dairy products, with each producing over 1 million tonnes annually. The Southland District has the largest estimated transport task of 122.8 million

tonne kilometres, followed by the South Taranaki District with 92.4 million tonne kilometres, and the Selwyn District with 76.4 million tonne kilometres.

As for farm gate values, milk products in the Southland District contributes more than $1 billion to the local economy the highest contribution, followed by the South Taranaki District with $773.7 million. Again, note that this is the direct effect on farm revenue at the farm gate, and does not include the indirect and induced multiplier effects on the regional and national economy.

4 Meat product value chain

4.1 Impact of livestock production on local and regional road network

The NFDS 2008 found that all livestock transport is now by road. This is undoubtedly because larger, more efficient stock transporters are now available, and the cost of trans-shipping to rail wagons exceeds the savings in unit cost of transport.

The mode of transportation for livestock has also changed due to the quality of meat demanded internationally. Previously, the main export product was frozen meat and stock movements were by rail. However now, the higher quality chilled meat receives a premium price in the market, prompting meat processing companies to demand livestock being transported by road as it is a quicker and less-stressful means of transport.

4.1.1 Regional livestock production and transport task

There appears to be significant movements of livestock from production regions of origin to slaughter regions. The data in the NDFS does not appear consistent. We have based our analysis on Beef and Lamb New Zealand production data, and Statistics New Zealand data for animals slaughtered. We estimate that there were 3.3 million tonnes of livestock transported to slaughter in 2010/11. The transport within regions is estimated at 299 million tonne kilometres, with the approximate distribution among regions as shown in Table 4.1.

Table 4.1 Livestock production and transport task 2010/11

Region	Tonnes ('000)	Tonne kilometres (million)
Northland	265	21
Auckland	99	8
Waikato	456	32
Bay of Plenty	73	7
Gisborne	182	9
Hawke's Bay	365	35
Taranaki	64	7
Manawatu	410	39
Wellington	109	13
Top of South and West Coast	100	10
Canterbury	720	76
Otago	228	23
Southland	237	19
Total	**3,310**	**299**

Sources: National Freight Demand Study 2008; Beef & Lamb; Statistics NZ; BE

There is considerable transport of livestock between regions for slaughter at different meat plants. The NFDS made some estimates and we have cross-checked production within each region with the shipping of meat product. We estimate that the total transport task for livestock in 2010/11 was 375 million tonne kilometres. The additional 76 million tonne kilometres transport task between regions would most likely be on the SH network and so is not counted in this section. Some of this task will be transporting store stock to another district or region for finishing prior to slaughter.

4.1.2 Livestock value at farm gate

We estimate the farm gate value of livestock using parameters generated in an earlier study by BERL on the value of pasture in the New Zealand economy. This study obtained relationships between FOB export values and farm gate values. From this analysis we estimate that in 2010/11, the farm gate value of livestock sent to export was $3.74 billion

Table 4.2 Livestock production transport and farm gate value 2010/11

Region	Tonnes ('000)	Tonne kilometres (million)	Farm Gate value ($million)
Northland	265	21	$300
Auckland	99	8	$112
Waikato	456	32	$515
Bay of Plenty	73	7	$82
Gisborne	182	9	$206
Hawke's Bay	365	35	$412
Taranaki	64	7	$72
Manawatu	410	39	$464
Wellington	109	13	$124
Top of South and West Coast	100	10	$113
Canterbury	720	76	$814
Otago	228	23	$258
Southland	237	19	$268
Total	**3,310**	**299**	**$3,740**

Sources: National Freight Demand Study 2008; Beef & Lamb; Statistics NZ; BERL

The role of the local and regional road network in facilitating the generation of $3.7 billion in farm gate value into the regional and national economies is clearly very significant.

4.2 Impact of meat products on the State Highway network

We again utilise the approach taken in the NFDS to estimate the flows of meat products from processing plants to port. We derived these patterns consistent with meat product exports in 2010/11.

We estimate that in 2010/11 the 3.3 million tonnes of livestock generated approximately 786,000 tonnes of meat products for export from New Zealand. As with milk products, there will also be some additional meat products sold locally. This implies that the tonnage of livestock carried from farm gate to processor is over 4 times the tonnage of meat products carried from processor to port. Table 4.3 shows the meat product for export and its associated transport task.

Table 4.3 Meat product for export and transport task 2010/11

Region	Tonnes	Tonne kilometres
	('000)	*(million)*
Northland	64	9
Auckland	24	3
Waikato	97	10
Bay of Plenty	18	2
Gisborne	35	7
Hawke's Bay	71	14
Taranaki	79	27
Manawatu	62	14
Wellington	26	9
Top of South and West Coast	26	5
Canterbury	150	60
Otago	62	14
Southland	71	14
Total	**786**	**187**

Sources: National Freight Demand Study 2008; Beef & Lamb; Statistics NZ; I

We have estimated the flow of product from processing region to port consistent with the export pattern. This provides an average distance that the meat product was carried to port, and thus the total land transport task measured in tonne kilometres. Our estimate is that the transport from meat plant to port required a transport task of 187 million tonne kilometres.

The meat transport task to port is the estimate of the total task performed by all transport modes. That is, it includes both road and rail transport. Without a major survey of industry players it is not realistic to attempt to separate the transport task into modes at the regional level. At the national level, the NFDS estimated that 57 percent of meat is transported by road while 43 percent is transported by rail.

Using the NFDS mode shares, the implication is that in 2010/11 the transport task for hauling meat products from processing plant to port was 57 percent of 187 million tonne kilometres, or 107 million tonne kilometres.

4.2.1 Meat product value to the economy at export

The export value of meat products is well-documented in the Statistics NZ export statistics, and we have used these to arrive at estimates for the FOB value of export at national and regional levels. The scope of the study did not include developing new modelling to estimate the volumes and values of co-products including wool, hides, and skins.

The estimate shows that the export value of meat products at FOB was over $5.5 billion in the year to June 2011. This exceeded the value at farm gate by an estimated $1.8 billion.

Table 4.4 Meat product for export transport and FOB value 2010/11

Region	Tonnes	Tonne kilometres	Export value
	('000)	*(million)*	*($ million)*
Northland	64	9	$453
Auckland	24	3	$169
Waikato	97	10	$685
Bay of Plenty	18	2	$124
Gisborne	35	7	$249
Hawke's Bay	71	14	$498
Taranaki	79	27	$560
Manawatu	62	14	$436
Wellington	26	9	$187
Top of South and West Coast	26	5	$187
Canterbury	150	60	$1,058
Otago	62	14	$436
Southland	71	14	$498
Total	**786**	**187**	**$5,539**
Value added to Farm Gate			**$1,799**

Sources: National Freight Demand Study 2008; Beef & Lamb; Statistics NZ; BERL

4.3 Comparison of impact of livestock and meat on local and regional road network and SH network

These analyses of the transport of livestock and meat products along the value chain show the relative importance of the local and regional road network to this industry and the economy.

The quantum of transport of livestock on the regional network within regions was estimated at 299 million tonne kilometres, say 300 million tonne kilometres. The land transport task for hauling meat products from processing plant to ports is estimated at 187 million tonne kilometres. Of this task, it is estimated that 57 percent, or 107 million tonne kilometres are carried by the SH network. This implies that the transport task for livestock on the local and regional road network is about 2.8 times the transport task for meat products on the SH network.

The farm gate value of livestock is about $3.7 billion per year which is nearly twice the value added from farm gate to FOB export, estimated to be about $1.8 billion per year.

4.4 Districts with greatest livestock transport on local and regional roads

As intra-regional livestock movements represents over 60 percent of total livestock movements Table 4.5 displays the quantum of livestock movements on local and regional roads at a district level.

Table 4.5 District livestock production transport and farm gate value 2010/11

District	Tonnes	Tonne kilometres	Farm Gate value
	('000)	*(million)*	*($million)*
Southland	308.6	24.7	$453.1
Gisborne	224.1	17.9	$220.7
Clutha	182.2	18.4	$266.7
Central Hawkes Bay	175.0	14.0	$177.7
Hastings	166.9	13.4	$167.2
Hurunui	142.5	14.5	$167.3
Central Otago	133.8	13.5	$195.0
Rangitikei	103.9	11.4	$166.8
Ruapehu	100.0	11.0	$156.1
Ashburton	93.7	9.6	$108.6
Tararua	92.0	10.1	$148.9
Wairoa	88.1	7.1	$86.9
Waitomo	80.6	6.4	$99.6
Waitaki	77.2	7.8	$106.9
Far North	73.1	5.9	$76.8
Dunedin City	66.9	6.8	$95.6
Selwyn	62.7	6.4	$74.6
Manawatu	61.5	6.8	$93.9
Timaru	57.5	5.9	$66.0
Masterton	57.1	6.3	$93.6
Waikato	56.2	4.5	$62.8
Mackenzie	55.8	5.7	$65.4
Kaipara	55.8	4.5	$59.0
Gore	55.4	4.4	$86.4
Marlborough	48.4	4.9	$57.9
Whangarei	45.0	3.6	$46.9
Waimakariri	43.4	4.4	$49.8
Waimate	42.0	4.3	$49.0
Franklin	40.9	3.3	$45.9
Tasman	40.2	4.1	$44.5
Sub-total	**2,830.6**	**261.4**	**3,589.4**
Share of New Zealand	**88%**	**90%**	**84%**

The Southland, Gisborne, and Clutha districts transport the most tonnes of meat on local roads of 308,600 tonnes, 224,100 tonnes and 182,200 tonnes respectively. The Southland District has by far the largest transport task of 24.7 million tonne kilometres, followed by the

Clutha District with 18.4 million tonne kilometres, and Gisborne with 17.9 million tonne kilometres. As for farm gate values, the Southland District contributes the highest farm gate value of $453.1 million to the local and national economies, followed by the Clutha District with $266.7 million.

5 Forest and wood product value chain

5.1 Impact of log production on local and regional road network

We have estimated the regional log harvests in 2009/10 from the MAF data on log removals. Table 5.1 shows the log harvest and associated transport task.

Table 5.1 Log harvest and transport task 2009/10

Region	Tonnes	Tonne kilometres
	('000)	*(million)*
Northland	2,111	264
Auckland	606	48
Waikato	3,169	349
Bay of Plenty	5,470	684
Gisborne/East Coast	1,328	199
Hawkes Bay	1,847	166
Taranaki	70	6
Manawatu - Wanganui	1,351	162
Wellington /Wairarapa	470	49
Marlborough/Nelson	673	61
Nelson/Tasman	1,155	104
West Coast	562	87
North Canterbury	924	134
Otago	960	106
Southland	457	57
Total	**21,154**	**2,476**

Sources: NFDS 2008, MAF, Statistics NZ

The NFDS found that 94 percent of logs and chips were transported by road and 6 percent by rail. This implies that 94 percent of the 2.48 billion tonne kilometres transport task for the log harvest would be on local and regional roads. This is a total of 2.33 billion tonne kilometres on the local and regional road network.

The value of the log harvest to mill are shown in Table 5.2 below.

Table 5.2 Log harvest transport and mill value 2009/10

Region	Tonnes	Tonne kilometres	Value delivered mill
	('000)	*(million)*	*$million*
Northland	2,111	264	$220
Auckland	606	48	$63
Waikato	3,169	349	$330
Bay of Plenty	5,470	684	$569
Gisborne/East Coast	1,328	199	$138
Hawkes Bay	1,847	166	$192
Taranaki	70	6	$7
Manawatu - Wanganui	1,351	162	$140
Wellington /Wairarapa	470	49	$49
Marlborough/Nelson	673	61	$70
Nelson/Tasman	1,155	104	$120
West Coast	562	87	$58
North Canterbury	924	134	$96
Otago	960	106	$100
Southland	457	57	$48
Total	**21,154**	**2,476**	**$2,200**

Sources: NFDS 2008, MAF, Statistics NZ

The forest ride value of these 21 million tonnes of logs is $2.2 billion. The main regions for log production are the Central North Island (CNI), including Bay of Plenty and Waikato regions. The other main regions include the East Coast and Hawke's Bay. Log production in these and other areas fluctuate over time as not all regions have age-balanced plantation forests. Also different owners may delay or bring-forward log harvest according to world market conditions, cash flow requirements of existing or new owners, and other factors.

Another complicating factor with log transport which is not present for the other primary products analysed, is that in the large CNI forests there are dedicated private logging roads which carry much of the transport task. This particular aspect of the log transport task does not appear to have been factored into the NFDS analysis of log transport modes.

The general regional pattern can be expected to hold in the longer term, but particular regions or districts can suffer very heavy increases in logging traffic for relatively short periods when particular forests are clear-felled.

National or regional data for the log value at forest ride is not collected and published in New Zealand. However, MAF does publish indicative price ranges for logs of different grades, as

delivered to the mill. We have interpreted these price ranges with judgement to estimate the value of logs by regions, delivered to the mills (or for export).

5.2 Impact of forest and wood products on the State Highway network

There are considerable volumes of wood products consumed locally in New Zealand. In the case of these wood products, the NFDS obtained information and created a process to allocate the log production among uses, and between local consumption and export. The NFDS did not do this with other export products. We had to follow the same process and updated the data to obtain estimates of the different wood products from each region, through the different ports for the 2009/10 June year. These tonnage figures, and the transport task they generated are shown in Table 5.3.

Table 5.3 Wood product for export and transport task 2009/10

Region	Tonnes	Tonne kilometres
	('000)	*(million)*
Northland	1,857	260
Auckland	340	37
Waikato	2,622	446
Bay of Plenty	2,533	380
Gisborne/East Coast	1,263	114
Hawkes Bay	1,465	132
Taranaki	56	5
Manawatu - Wanganui	904	99
Wellington /Wairarapa	248	30
Marlborough/Nelson	607	67
Nelson/Tasman	962	87
West Coast	396	63
North Canterbury	508	66
Otago	824	99
Southland	373	45
Total	**14,957**	**1,929**

Sources: NFDS 2008, MAF, Statistics NZ

The NFDS found that 97 percent of manufactured wood products were hauled by road and 3% by rail. This implies that 97 percent of the 1.93 billion tonne kilometres transport task for wood product from mill and factory to port would be on road, mainly the SH network. This is 1.87 billion tonne kilometres on the SH network.

We have developed a process to estimate the approximate export value of product generated by logs from each region. We were able to obtain the export of main product types by ports, and allocate approximate values per tonne FOB to these products. This process was used to estimate the FOB value of wood product exported from each region as shown in Table 5.4.

Table 5.4 Wood product for export and FOB value 2009/10

Region	Tonnes	Tonne kilometres	Export value
	('000)	*(million)*	*($million)*
Northland	1,857	260	$306
Auckland	340	37	$155
Waikato	2,622	446	$608
Bay of Plenty	2,533	380	$588
Gisborne/East Coast	1,263	114	$177
Hawkes Bay	1,465	132	$308
Taranaki	56	5	$9
Manawatu - Wanganui	904	99	$274
Wellington /Wairarapa	248	30	$75
Marlborough/Nelson	607	67	$79
Nelson/Tasman	962	87	$207
West Coast	396	63	$119
North Canterbury	508	66	$153
Otago	824	99	$160
Southland	373	45	$81
Total	**14,957**	**1,929**	**$3,300**

Sources: NFDS 2008, MAF, Statistics NZ

The FOB export value of the 15 million tonnes of forest product exports is approximately $3.3 billion. Therefore, the value added by the processing industry is approximately $1.1 billion.

5.3 Comparison of impact of logs and wood on local and regional road network and SH network

These analyses of the transport of logs and wood products along the value chain show the relative importance of the local and regional road network to this industry and the economy.

The quantum of logs transported on the local and regional road network within regions was estimated at 2.5 billion tonne kilometres. The SH network transport task for hauling wood products from mill and factory to port is estimated at 1.87 billion tonne kilometres.

This implies that the transport task for logs on the local and regional network is about 1.2 times the transport task for wood products on the SH network. This number is much lower than for dairy or meat products. A lower transport task for logs on the local and regional road network than the SH network is to be expected because the wood products are much more bulky, and there is much less weight loss in processing to create the export product.

5.4 Districts with greatest log transport on local and regional roads

As we noted at the beginning of this section on logs and wood products, the transport task for logs in the major production regions with large processing plants and age-balanced forests will be reasonably steady over time. However, log production in these and other areas fluctuate over time as not all regions have age-balanced plantation forests. Also, different owners may delay or bring-forward log harvest according to world market conditions, cash flow requirements of existing or new owners, and other factors.

The other complicating factor for the main CNI production regions is that much of the log transport task is carried by dedicated private logging roads through the forests.

To obtain meaningful estimates of the present and near-future log transport task by district, and especially as they affect the District Council requirement for road maintenance would require a detailed forest-by-forest survey to determine present harvesting intentions of the forest owners. The logging transport task nationally is large and such a detailed survey may be justified. However that level of detail is beyond the scope of the present study.

The general regional pattern can be expected to hold in the longer term, but particular regions or districts can suffer very heavy increases in logging traffic for relatively short periods when particular forests are clear-felled. Where this clear-felling is in relatively isolated forests, there is very high pressure on local and regional roads for only a short period in each 25-30 year rotation. Equally, as isolated forests, they do not provide the steady requirement for log harvesting businesses, log transport and logging teams, so most of that capacity tends to come from outside the district. Consequently, while generating significant national economic benefits, there may be little economic benefit for the district and its ratepayers.

6 Horticulture product value chain

The horticultural industry is New Zealand's third largest export sector, with exports of $3.3 billion for the year ending June 2010, representing 8.3 percent of New Zealand's total merchandise exports (Horticulture New Zealand, 2010). [12]

The NFDS 2008 found that 93 percent of horticultural products are moved via road, and 7 percent via rail. [13] This estimate was based on apples, kiwifruit, grapes, summerfruit, berryfruit, citrus fruit, vegetables and cereal. The NFDS does not differentiate the movement of imported and exported horticultural products. Therefore, we have analysed the transport task for the top three horticultural export crops, in terms of export earnings for the year ending March 2010. These products are wine ($1.1 billion), kiwifruit ($950 million), and apples ($322 million). These are individually an order-of-magnitude lower than the other three value chains of dairy, meat and wood, but together comprise an export value of nearly $2.4 billion, which is of significant value to the economy.

The pattern of transport of these horticulture products is different from the agricultural and forest products, because with the latter the processing is done in a relatively small number of large plants which are generally centrally-located. The horticultural products are usually packed or processed in smaller packhouses and wineries located at, or close to the producing orchards and vineyards. Therefore much of the transport task from packhouse to port, where the port is in the same region as the production, is largely on local and regional roads. There is considerable transport of final horticultural product between regions, going to port, and this is mainly on the SH network.

While the distances that horticultural crops are carried are generally less than the livestock products, the horticultural crops are generally subject to bruising damage. The condition of the local and regional roads can therefore have a significant impact on the value of the export products.

6.1 Impact of wine value chain

Grapes are transported by trucks to wineries for processing, as wineries and vineyards are not generally co-located, particularly for medium and large scale producers (Barker, 2011). Although we know that 50 percent of grapes grown in New Zealand are by independent grape growers selling to wineries, the location and distance of these grape growers from

[12] Statistics New Zealand Overseas Merchandise Trade data, i.e. exports.

[13] NFDS 2008 Table E3, page iv.

wineries is unknown. Further investigation is needed to refine estimates of grape movements in New Zealand.

The following analysis is also a simplistic view of the industry, where grapes are sent to be crushed at a winery and where the winery then sends the wine to port for export. There are other steps in wine making such as pressing, fermentation, storage, blending and bottling, that also occur in different locations throughout New Zealand (Barker, 2011).

Using data from the New Zealand Winegrowers Annual report (2011) and the Agricultural Production Census, Table 6.1 indicates the likely movements of grapes to wineries in New Zealand.

Table 6.1 Transport of grapes to wineries in tonnes

Region	**Grapes produced** *Tonnes ('000)*	**Grapes processed** *Tonnes ('000)*
Northland	1	0
Auckland	3	1
Waikato/Bay of Plenty	1	-
Gisborne	15	10
Hawke's Bay	34	25
Wairarapa/Wellington	6	3
Marlborough	126	171
Nelson	6	6
Canterbury/Waipara	12	7
Otago	11	5
Total	**213**	**227**

Sources: NZ Wine growers; Statistics NZ; and Various [14]

The majority of grapes grown in the main wine producing areas of Marlborough and the Hawke's Bay are also crushed within their region, using local and regional roads.

According to our estimates, the Marlborough region produces 126 thousand tonnes of grapes and sources 45 thousand tonnes from elsewhere to crush. All the other regions in New Zealand, appear to produce more grapes than they crush, which tells us that each region sends some of their grape production to Marlborough to get crushed. How this is done is not clear, without further investigation which is beyond the scope of this study.

[14]The regions used for wine are based on the regions from New Zealand's Winegrowers Annual report (2011).

6.1.1 Regional grape production and transport task

To understand the movement of grapes from grape-growers to wineries, the New Zealand Winegrowers Annual report (2011) and the Agricultural Production Census were used. The movements of grapes from vineyard to winery are presented in Table 6.2 below.

Table 6.2 Transport of grapes to winery, 2010/11

Region	Tonnes *('000)*	Tonne kilometres *('000)*
Northland	-	2
Auckland	1	31
Waikato/Bay of Plenty	-	1
Gisborne	10	304
Hawke's Bay	**25**	**249**
Hastings District	*23*	*226*
Napier City	*2*	*18*
Central Hawke's Bay District	*1*	*5*
Wairarapa/Wellington	3	76
Marlborough	171	5,143
Nelson	6	165
Canterbury/Waipara	7	199
Otago	5	149
Total	**247**	**6,318**

Sources: NZ Wine growers; Statistics NZ; and Various

There was over 247,000 tonnes of grapes produced across the country in the 2010/11 season. The major production regions are Marlborough (171,000 tonnes), and Hawke's Bay (25,000 tonnes).

The transport task on the nation's local and regional road network was estimated at 6 million tonne kilometres. Marlborough had the largest transport task with 5 million tonne kilometres followed by Gisborne with 304 thousand tonne kilometres.

Looking at the overall picture, 247,000 tonnes of grapes generated an estimated transport task of just over 6 million tonne kilometres. This implies that grapes were hauled an average distance of 25 kilometres.

At a TLA level, the Marlborough District is the largest producer and has the largest transport task on local and regional roads in New Zealand. In the Hawke's Bay, there is considerable production in the Hastings District (22,600 tonnes) which also has the greatest tonne kilometres for the region of 226,200.

6.1.2 Wine grape value to the economy at farm gate

The average grape price in New Zealand in 2011 was $1,172 per tonne (New Zealand Winegrowers, 2011). Multiplying the average grape price by the tonnes crushed by each region provides the farm gate value by regions from the transport of wine on local roads.

Table 6.3 Wine grape production transport and farm gate value 2010/11

Region	Tonnes ('000)	Tonne kilometres ('000)	Farm gate value ($million)
Northland	-	2	-
Auckland	1	31	$ 1
Waikato/Bay of Plenty	-	1	-
Gisborne	10	304	$ 12
Hawke's Bay	**25**	**249**	**$ 29**
Hastings District	*23*	*226*	*$ 27*
Napier City	*2*	*18*	*$ 2*
Central Hawke's Bay District	*1*	*5*	*$ 1*
Wairarapa/Wellington	3	76	$ 3
Marlborough	171	5,143	$ 201
Nelson	6	165	$ 6
Canterbury/Waipara	7	199	$ 8
Otago	5	149	$ 6
Total	**247**	**6,318**	**$ 295**

Sources: NZ Wine growers; Statistics NZ; and Various

The local and regional road network facilitates the generation of $295 million direct farm gate revenue into the regional and national economy. As with all other value chains, the indirect and induced effects will be multiplied around the economy, but they are not included here.

6.1.3 Impact of wine on the State Highway network

We follow a similar process as the movement of grapes from vineyards to wineries. Exports via ports were obtained from Statistics New Zealand, and aligned with the quantity produced from each region. There is a limitation in the Port data, as the port data records the product when it goes to export. However, upon further discussion with industry representatives, there are likely to be several movements of wine before it is exported. The main movements being to bottling companies in Auckland, as most of the larger wineries send their wine to Auckland. Wine from Marlborough is transported either by (Schwass, 2011):

- trucking wine to Blenheim to be railed to Picton to be railed from Wellington to Auckland; or

- trucking wine to Nelson to be coastal shipped to Auckland.

Therefore, the majority of inter-regional movements are via ship and rail. However, there is a large proportion of wine being trucked from the Hawke's Bay to be exported through Auckland. Where transportation to export is predominantly rail or ship, this has been excluded from our analysis. Once in Auckland, the bottling plants are in Onehunga, and East Tamaki (Schwass, 2011).

The transport of wine from the Hawke's Bay to Auckland has 4.6 million tonne kilometres, the highest tonne kilometres for wine in New Zealand.

6.1.4 Regional wine transport task to export

According to our estimates, the 247,000 tonnes of grapes being carted on local and regional roads is approximately equal to the 227,000 tonnes of wine being carted on the roads for export. Table 6.4 below shows movement of wine from winery to port in tonnes and tonne kilometres.

The reason that there is not a reduction in tonnage when the grapes are processed into wine in the same way that there is reduction in weight of the other primary products is that the packaging of wine includes the heavy glass bottles.

We have allocated the estimated production for export among the ports as consistent with the export tonnages, and consequently estimated the land transport distances that wine were hauled. These distances are used to estimate the transport task in terms of tonne kilometres on the land transport system. Transporting wine from the winery to port required a transport task of 14 million tonne kilometres.

Table 6.4 Wine for export and transport task 2010/11

Region	Tonnes ('000)	Tonne kilometres ('000)
Northland to Auckland	-	19
Gisborne to Bay of Plenty	10	2,529
Hawke's Bay to Auckland	11	4,655
Marlborough to Auckland	84	1,495
Marlborough to Bay of Plenty	57	251
Nelson to Auckland	1	-
Nelson to Canterbury	5	21
Otago to Canterbury	1	2
Wairarapa/Wellington to Auckland	2	-
Inter-region total	*170*	*8,971*
Auckland	1	21
Waikato/Bay of Plenty	-	2
Gisborne	-	-
Hawke's Bay	**14**	**305**
Hastings District	*12*	*274*
Napier City	*1*	*11*
Central Hawke's Bay District	-	*20*
Wairarapa/Wellington	1	60
Marlborough/Nelson	**30**	**3,401**
Tasman District	1	36
Marlborough District	30	3,365
Canterbury/Waipara	7	469
Otago	4	864
Intra-region total	*57*	*5,121*
Total	**227**	**14,092**

Sources: Wine growers NZ; Statistics NZ; and Various

We have divided the table above into inter and intra regional flows. It can be assumed that intra regional flows can be attributed predominantly to the local road network, whereas the inter regional flows are assumed to use the SH network.

The above shows that most wine is not exported out of the region it is produced in, as 170 tonnes (or 75 percent) of wine is transported between regions to ports. Although wineries are close to port, there appears to be considerable transportation of wine around New Zealand before it goes to export. Intra-regional movements for the wine industry are less significant. This could be because wineries in the main areas of Marlborough and the Hawke's Bay are located close to ports.

The greatest inter-region movement came from transporting wine from the Hawke's Bay to Auckland, 4.6 million tonne kilometres

6.1.5 Wine value to the economy at export

We have estimated the movement of wine from winery to port at the regional and TLA level and then related them to the total export tonnages as recorded by Statistics New Zealand. The export values were obtained from BERL's regional database and are displayed in Table 6.5 below.

Table 6.5 Export of wine and export value 2010/11

Region	**Tonnes** *('000)*	**Tonne kilometres** *('000)*	**Export value** *($million)*
Northland to Auckland	-	19	$ 0
Gisborne to Bay of Plenty	10	2,529	$ 48
Hawke's Bay to Auckland	11	4,655	$ 53
Marlborough to Auckland	84	1,495	$ 402
Marlborough to Bay of Plenty	57	251	$ 270
Nelson to Auckland	1	-	$ 3
Nelson to Canterbury	5	21	$ 23
Otago to Canterbury	1	2	$ 3
Wairarapa/Wellington to Auckland	2	-	$ 9
Inter-region total	*170*	*8,971*	*$ 812*
Auckland	1	21	$ 5
Waikato/Bay of Plenty	-	2	-
Gisborne	-	-	-
Hawke's Bay	**14**	**305**	**$ 100**
Hastings District	*12*	*274*	*$ 59*
Napier City	*1*	*11*	*$ 0*
Central Hawke's Bay District	*-*	*20*	*$ 3*
Wairarapa/Wellington	1	60	$ 4
Marlborough/Nelson	**30**	**3,401**	**$ 145**
Tasman District	1	36	$ 5
Marlborough District	30	3,365	$ 141
Canterbury/Waipara	7	469	$ 32
Otago	4	864	$ 20
Intra-region total	*57*	*5,121*	*$ 306*
Total	**227**	**14,092**	**$ 1,118**

Sources: Wine growers NZ; Statistics NZ; and Various

The majority of grapes are grown and processed in the Marlborough, Hawke's Bay and Gisborne regions. Despite these regions being the major areas for wine production, wine is mainly exported through the ports of Tauranga (44 percent) and Auckland (33 percent), with the main wine producing areas of Marlborough and the Hawke's Bay only exporting 14 percent and 16 percent respectively.

When comparing intra-regional with inter-regional movements of wine for the whole production process, the quantum of inter-regional movements of 9 million tonne kilometres is larger than the intra-region movements of 5 million tonne kilometres. Our estimates show that inter-regional movements are more important in the production of wine, than intra-regional movements. The intra-regional movements will involve a component of travel on local and regional roads, and not be all on the SH network.

6.1.6 Comparison of impact of wine on local and regional road network and SH network

What this section displays is the role that local and regional roads play in terms of the export of goods moving from vineyard to winery to port. The importance is shown by the quantum of transport (measured in tonne kilometres) on local and regional roads compared with the SH network. The transport task for vineyards to winery on the regional road network comprised 6.3 million tonne kilometres, with another 5.1 million tonne kilometres for the winery to the port stage. In comparison, the transport task on the SH network totalled 8.9 million tonne kilometres, being the inter-region winery to port leg.

6.2 Impact of apples production and value chain

Generally, apple orchards are located close to packhouses at an average distance of approximately 15 kilometres.[15] Most packhouses are within 20 kilometres of the Port and apples are predominantly moved by truck as they are within short distances of the packhouses and ports. Apples can be exported fresh, or processed. For this analysis, concentration is given on the export of fresh apples as processed apples only account for two percent of production.

6.2.1 Regional apple production and apple transport task

The extent of the apple production and the transport to the packhouses or coolstores in the regions has been estimated using the production information by region, sourced from

[15] We were advised by a representative from Mr Apple that most growers and packhouses are within 10 kms of each other in the Hawke's Bay.

Statistics New Zealand Agricultural Production Census 2007, and Statistics New Zealand port data. Table 6.6 shows the transport task at a regional level in New Zealand.

Table 6.6 Apple orchard to packhouse production and transport task 2010/11

Region	Tonnes *('000)*	Tonne kilometres *('000)*
Northland	1	10
Auckland	6	58
Waikato	7	73
Bay of Plenty	-	3
Gisborne	6	61
Hawke's Bay	**167**	**1,673**
Hastings District	*132*	*1,320*
Napier City	*16*	*158*
Central Hawke's Bay District	*20*	*195*
Taranaki	-	-
Manawatu	1	11
Wellington	4	41
Tasman/Marlborough	**79**	**791**
Tasman District	*78*	*783*
Marlborough District	*1*	*8*
West Coast		
Canterbury	8	80
Otago	15	152
Southland (Timaru)		
Total	**295**	**2,952**

Sources: Statistics NZ and Various

These estimates show that there was over 295 thousand tonnes of apples produced across the country in the 2010/11 season. Apples are predominantly grown in the Heretaunga plains in the Hawke's Bay region (167 thousand tonnes), and in the Waimea plains in the Tasman/Marlborough region (79 thousand tonnes).

The transport task on the nation's local and regional road network was estimated at 3 million tonne kilometres. As to be expected, the greatest load was on the Hawke's Bay and Tasman/Marlborough regions. Looking at the overall picture 295 thousand tonnes of apples generated an estimated transport task of just under 3 million tonne kilometres. This implies that on average apples travel approximately 10 kilometres from grower to packhouse/coolstore.

It has been assumed that apples are packed within the region they are produced. Table 6.6 above shows that the Hawke's Bay produces over 50 percent of New Zealand's apples, with

nearly 80 percent of these coming from the Hastings District. For the Tasman/Marlborough region, 99 percent of apples are grown in the Tasman District producing 78 thousand tonnes. Both the Hastings and Tasman Districts have a high transport task of 1,320 tonne kilometres and 783 tonne kilometres respectively.

6.2.2 Apple value to the economy at farm gate

We obtained the farm gate value of apple from MAF's Hawke's Bay Pipfruit Orchard Model, 2011, which estimated a farm gate value of $0.79 cents. This estimate indicates that the farm gate value to the economy of apples in the 2010/11 season was $235 million.

Table 6.7 shows the farm gate value by regions as well as the tonnage and transport task.

Table 6.7 Transport of apples and farm gate value 2010/11

Region	Tonnes *('000)*	Tonne kilometres *('000)*	Farm gate value *($million)*
Northland	1	10	$ 1
Auckland	6	58	$ 5
Waikato	7	73	$ 6
Bay of Plenty	-	3	-
Gisborne	6	61	$ 5
Hawke's Bay	**167**	**1,673**	**$ 133**
Hastings District	*132*	*1,320*	*$ 105*
Napier City	*16*	*158*	*$ 13*
Central Hawke's Bay District	*20*	*195*	*$ 16*
Taranaki	-	-	-
Manawatu	1	11	$ 1
Wellington	4	41	$ 3
Tasman/Marlborough	**79**	**791**	**63**
Tasman District	*78*	*783*	*$ 62*
Marlborough District	*1*	*8*	*$ 1*
West Coast			
Canterbury	8	80	$ 6
Otago	15	152	$ 12
Southland (Timaru)			
Total	**295**	**2,952**	**$ 235**

Sources: Statistics NZ and Various

The local and regional road network facilitates the generation of $235 million to the regional and national economies.

6.2.3 Impact of apples on State Highway network

We follow a similar process to that for apples above, for estimating the transport of the packed apples from packhouse to port.

6.2.4 Regional apple transport task to export

Table 6.8 shows the export transport task for apples.

Table 6.8 Apples for export and transport task 2010/11

Region	Tonnes ('000)	Tonne kilometres ('000)
Northland to Auckland	1	370
Waikato to Bay of Plenty	7	1,048
Gisborne to Bay of Plenty	6	1,667
Hawke's Bay to Bay of Plenty	5	1,583
Taranaki to Bay of Plenty	-	10
Manawatu to Bay of Plenty	1	441
Wellington to Bay of Plenty	2	1,199
Tasman/Marlborough to Auck	32	1,076
Canterbury to Auckland	5	-
Canterbury to Bay of Plenty	3	-
Otago to Auckland	1	-
Inter-region total	*64*	*7,392*
Auckland	6	204
Bay of Plenty	-	34
Hawke's Bay	**162**	**4,491**
Hastings District	128	2,903
Napier City	15	186
Central Hawke's Bay District	19	1,401
Wellington	2	142
Tasman/Marlborough	-	**1,800**
Tasman District	*47*	*1,777*
Marlborough District	*1*	*8*
Canterbury	-	11
Otago	14	2,924
Intra-region total	*183*	*9,464*
Total	**247**	**16,856**

Sources: Statistics NZ and Various

We have divided the table above into inter and intra regional flows. It can be assumed that intra regional flows can be attributed predominantly to the local road network, whereas the inter regional flows are assumed to use the SH network.

We have allocated the estimated production for export among the ports as consistent with the export tonnages, and consequently estimated the land transport distances that apples were hauled. These distances are used to estimate the transport task in terms of tonne kilometres on the land transport system. The estimate is that transporting apples from packhouse to port required a transport task of nearly 17 million tonne kilometres.

Apples are generally grown and exported in the same region, with the majority of apples being exported through the growing regions of the Hawke's Bay and Tasman/Marlborough. However, there are a significant amount of apples being exported through Port Tauranga in the Bay of Plenty. Port Tauranga gets 6,000 tonnes from Gisborne, 5,000 tonnes from the Hawke's Bay, and 7,000 tonnes from the Waikato.

The Hawke's Bay has a significantly large transport task of 4.5 million tonne kilometres which is over a quarter of the total transport task for apples in New Zealand.

6.2.5 Apple value to the economy at export

The estimated export value of apples was estimated using the BERL database, and proportioned out according to the exports from the ports in each region. Therefore if the region does not have a port, there is no export value. These estimated export values are included in Table 6.9 along with the tonnage and the transport task.

Table 6.9 Apples for export transport and FOB value 2010/11

Region	Tonnes ('000)	Tonne kilometres ('000)	Export value ($million)
Northland to Auckland	1	370	$ 1
Waikato to Bay of Plenty	7	1,048	$ 9
Gisborne to Bay of Plenty	6	1,667	$ 7
Hawke's Bay to Bay of Plenty	5	1,583	$ 6
Taranaki to Bay of Plenty	-	10	-
Manawatu to Bay of Plenty	1	441	$ 1
Wellington to Bay of Plenty	2	1,199	$ 3
Tasman/Marlborough to Auck	32	1,076	$ 39
Canterbury to Auckland	5	-	$ 6
Canterbury to Bay of Plenty	3	-	$ 3
Otago to Auckland	1	-	$ 1
Inter-region total	*64*	*7,392*	*$ 78*
Auckland	6	204	$ 7
Bay of Plenty	-	34	-
Hawke's Bay	**162**	**4,491**	**$ 163**
Hastings District	128	2,903	$ 156
Napier City	15	186	$ 0
Central Hawke's Bay District	19	1,401	$ 7
Wellington	2	142	$ 2
Tasman/Marlborough	-	**1,800**	**$ 57**
Tasman District	*47*	*1,777*	*$ 57*
Marlborough District	*1*	*8*	-
Canterbury	-	11	-
Otago	14	2,924	$ 18
Intra-region total	*183*	*9,464*	*$ 245*
Total	**247**	**16,856**	**$ 322**

Sources: Statistics NZ and Various

In total, the export value of apples at FOB is valued at $322 million. This is only $87 million more than the value at orchard gate.

6.2.6 Comparison of impact of apples on local and regional road network and SH network

What these two sections display is the importance of local and regional roads to New Zealand, in terms of the apple value chain when moving from packhouse to port. This is shown by larger quantum of transport (as measured in tonne kilometres) required within regions, on the local and regional road network from the rurally located packhouses and the port, rather than transport using the main roads and SH network through and between

regions to the ports. The transport task for apples to packhouse on the regional road network was just under 3 million tonne kilometres, with another 9.4 million tonne kilometres on local and regional roads for the packhouse to port leg of the journey.

The farm gate value of apples is about $235 million while the export value of apples is estimated to be about $322 million per year. Therefore, the farm gate value of apples is three-quarters of the export value.

Most apples are packed and exported through the Hawke's Bay and Tasman/Marlborough regions. The major apple movements between regions in New Zealand is from Gisborne to Bay of Plenty (1.7 million tonne kilometres) and the Hawke's Bay to the Bay of Plenty (1.6 million tonne kilometres). The total for inter-region movements is 7.4 million tonne kilometres, while intra-region movements of apples total 9.5 million tonne kilometres. This means that local roads are used more intensely in exporting apples than the main state highways that join each region. The value of the goods transported on local roads is also greater, with a total of $245 million while inter-regional movements are valued at $78 million.

If inter-regional movements from packhouse to port are assumed to be local roads, this brings the contribution of local roads to $480 million and SH network to $78 million, and the transport task for local roads to 12.4 tonne kilometres and SH network to 7.4 tonne kilometres.

6.3 Impact of kiwifruit production and value chain

Close to 80 percent of kiwifruit growers are in the Bay of Plenty, with the majority of growers being located in Te Puke.

Generally, orchards are located close to packhouses because transportation of kiwifruit over long distances damages the product.

6.3.1 Regional kiwifruit production and transport task

The extent of the kiwifruit production and the transport to packhouses has been estimated by region using the production information sourced from the Agricultural Production Census 2007 and Statistics New Zealand data. Table 6.10 shows the transport task from orchard to packhouse for kiwifruit.

Table 6.10 Kiwifruit orchard to packhouse and transport task 2010/11

Region	Tonnes *('000)*	Tonne kilometres *('000)*
Northland	18	265
Auckland	9	129
Waikato	21	315
Bay of Plenty	**282**	**2,814**
Western Bay of Plenty District	226	2,258
Tauranga District	11	110
Rotorua District	1	6
Whakatane District	20	197
Kawerau District	-	-
Opotiki District	24	244
Gisborne	8	119
Hawke's Bay	6	92
Taranaki	-	-
Manawatu	4	58
Wellington	-	-
Tasman/Marlborough	17	256
West Coast		
Canterbury		
Otago		
Southland		
Total	**364**	**4,047**

Sources: Statistics NZ and Various

[16]

There was over 364 thousand tonnes of kiwifruit produced across the country in the 2010/11 season. The major production region is the Bay of Plenty with 282 thousand tonnes.

The transport task on the nation's local and regional road network was estimated at 4 million tonne kilometres. Overall, 364 thousand tonnes of kiwifruit generated an estimated transport task of just over 4 million tonne kilometres. This implies that on average kiwifruit are hauled 11 kilometres from orchard to packhouse.

The Bay of Plenty produces the largest amount of kiwifruit, with 282 thousand tonnes each year, most of which is from Te Puke in the Western Bay of Plenty District. The Bay of Plenty has the largest transport task of 2.8 million tonne kilometres.

[16] Note that where there is a dash, this means that the numbers are too small to display. Where there is no dash, this means that there is no kiwifruit grown in that region.

Similar to apples, it has been assumed that kiwifruit is packed within the region they are produced.

6.3.2 Kiwifruit value to the economy at farm gate

We obtained the farm gate value of kiwifruit from MAF's Bay of Plenty Kiwifruit 2011 Model which estimated the orchard gate return for the year ending 2010/11 at $4.24 per tray or $1,178 per tonne. [17]

This estimate indicates that the farm gate value to the economy of kiwifruit in the 2010/11 season was about $428 million.

Table 6.11 shows the farm gate value by regions as well as the tonnage and transport task.

Table 6.11 Kiwifruit transport and farm gate value 2010/11

Region	**Tonnes** *('000)*	**Tonne kilometres** *('000)*	**Farmgate value** *($million)*
Northland	18	265	$ 21
Auckland	9	129	$ 10
Waikato	21	315	$ 25
Bay of Plenty	**282**	**2,814**	**$ 331**
Western Bay of Plenty District	226	2,258	$ 266
Tauranga District	11	110	$ 13
Rotorua District	1	6	$ 1
Whakatane District	20	197	$ 23
Kawerau District	-	-	$ -
Opotiki District	24	244	$ 29
Gisborne	8	119	$ 9
Hawke's Bay	6	92	$ 7
Taranaki	-	-	$ -
Manawatu	4	58	$ 5
Wellington	-	-	$ -
Tasman/Marlborough	17	256	$ 20
West Coast			
Canterbury			
Otago			
Southland			
Total	**364**	**4,047**	**$ 428**

Sources: Statistics NZ and Various

[17] A tray contains approximately 3.6 kilograms of kiwifruit.

The local and regional road network facilitates the generation of $428 million to the regional and national economies.

The Western Bay of Plenty District also has the highest farm gate value of $266 million, 62 percent of the total farm gate value in New Zealand.

6.3.3 Impact of kiwifruit on the State Highway network

We follow a similar process to that for apples, for estimating the transport of kiwifruit from packhouse to port/coolstore.

6.3.4 Regional kiwifruit transport task to export

Table 6.12 shows the movement of kiwifruit from packhouse to port in tonnes and the transport task in tonne kilometres.

Table 6.12 Kiwifruit for export and transport task 2010/11

Region	**Tonnes** *('000)*	**Tonne kilometres** *('000)*
Northland to Auckland	10	2,375
Marlborough to Auckland	3	-
Waikato to Bay of Plenty	21	2,684
Gisborne to Bay of Plenty	2	526
Hawke's Bay to Bay of Plenty	6	1,770
Manawatu to Bay of Plenty	4	1,449
Marlborough to Bay of Plenty	5	-
Inter-region total	*51*	*8,804*
Northland	8	238
Auckland	9	258
Bay of Plenty	**282**	**10,673**
Western Bay of Plenty District	226	5,170
Tauranga District	11	468
Rotorua District	1	60
Whakatane District	20	1,756
Kawerau District	-	-
Opotiki District	24	3,219
Gisborne	6	174
Tasman/Marlborough	9	255
Intra-region total	*313*	*11,598*
Total	**364**	**20,402**

Sources Statistics NZ and Various

We have allocated the estimated production for export among the ports as consistent with the export tonnages, and consequently estimated the land transport distances that kiwifruit were hauled. These distances are used to estimate the transport task in terms of tonne kilometres on the land transport system. The estimate is that transporting kiwifruit from packhouse to port required a transport task of over 20 million tonne kilometres.

We have divided the table above into inter and intra regional flows. It can be assumed that intra-region flows can be attributed predominantly to the local road network, whereas the inter-region flows are assumed to use the SH network. Therefore the transport task from packhouse to port on local and regional roads is 11.6 million tonne kilometres, and on the inter-regional roads, 8.8 million tonne kilometres.

6.3.5 Kiwifruit value to the economy at export

The estimated export value of kiwifruit was estimated using the BERL database, and proportioned out according to the exports from the ports in each region. Therefore if the region does not have a port, there is no export value. These estimated export values are included in the table along with the tonnage and the transport task. Table 6.13 shows the transport task and export value of kiwifruit going from packhouse to port.

Table 6.13 Kiwifruit for export transport and FOB value 2010/11

Region	Tonnes ('000)	Tonne kilometres ('000)	Export value ($million)
Northland to Auckland	10	2,375	$ 25
Marlborough to Auckland	3	-	$ 9
Waikato to Bay of Plenty	21	2,684	$ 55
Gisborne to Bay of Plenty	2	526	$ 5
Hawke's Bay to Bay of Plenty	6	1,770	$ 16
Manawatu to Bay of Plenty	4	1,449	$ 10
Marlborough to Bay of Plenty	5	-	$ 14
Inter-region total	*51*	*8,804*	*$ 134*
Northland	8	238	$ 21
Auckland	9	258	$ 22
Bay of Plenty	**282**	**10,673**	**$ 735**
Western Bay of Plenty District	226	5,170	$ 589
Tauranga District	11	468	$ 29
Rotorua District	1	60	$ 2
Whakatane District	20	1,756	$ 51
Kawerau District	-	-	-
Opotiki District	24	3,219	$ 64
Gisborne	6	174	$ 15
Tasman/Marlborough	9	255	$ 22
Intra-region total	*313*	*11,598*	*$ 815*
Total	**364**	**20,402**	**$ 949**

Sources Statistics NZ and Various

Total export value of kiwifruit for the year ending July 2011 were $949 million. Intra-region movements accounts for 86 percent of this value.

6.3.6 Comparison of impact of kiwifruit on local and regional road network and SH network

What this section displays is the importance of local roads to New Zealand, in terms of the kiwifruit value chain when moving from packhouse to port. This is shown by larger quantum of transport (as measured in tonne kilometres) required within regions, on the regional road network, rather than transport using the main roads and SH network through and between regions to the ports. The transport task for kiwifruit to packhouse on the local and regional road network was 4 million tonne kilometres and for the intra-regional transport of packed product was 11.6 million tonne kilometres, and the inter-regional transport to port was 8.8 million tonne kilometres.

The farm gate value of kiwifruit is about $428 million while the export value of kiwifruit is estimated to be about $949 million per year. Therefore, the farm gate value of kiwifruit is 45% of the export value.

7 Export commodities road transport task

This section provides an overview of New Zealand's road transport task by bringing together the transport task of the dairy, meat, forest and wood, and horticultural product value chains.

7.1 Summary of results

For New Zealand's major exports of dairy, meat, forest and wood, and horticulture, we estimate that overall 43 million tonnes is transported from farm to processor or packhouse or winery each year while only 19 million tonnes is transported from processor to port.

The transport task of New Zealand's major exports on the local and regional and SH networks are presented in Table 7.1.

Table 7.1 Road transport task for major commodity exports

Commodity	Local and regional tonne kilometres (m)	State highway tonne kilometres (m)	Total tonne kilometres (m)	Ratio (Local and regional-to-SH)
Meat	299	107	406	2.8
Kiwifruit	16	9	25	1.8
Wine	11	9	20	1.2
Apples	12	7	19	1.7
Logs & timber	2,327	1,871	4,198	1.2
Dairy – assumption A	1,121	819	1,940	1.4
TOTAL if A	**3,786**	**2,822**	**6,608**	**1.3**
Dairy – assumption B	1,552	388	1,940	4.0
TOTAL if B	**4,217**	**2,391**	**6,608**	**1.8**

Measured in tonne kilometres, there is a total of 6.6 billion tonne kilometres of road transport task in getting our key export commodities from source producer to port of export. Depending on the assumption as to the split between local roads and state highways for dairy export commodities, this 6.6 billion tonne kilometres is divided as:

- between 3.8 and 4.2 billion tonne kilometres on local roads and regional roads
- between 2.4 and 2.8 billion tonne kilometres on state highways.

The transport task is heavily dominated by the intra-region flows of products. The reason for this is that in all industries except wine, the weight of the primary input is reduced when it is converted to export product. This is particularly so for the dairy industry, where the weight of export product is only about 13%, or one-eighth of the weight of the milk input. That is, the task of transporting produce from farm/orchard gate is most pronounced, when compared with the task of the final stage from processor/packer to port of exit.

As established earlier, the movement of these commodities (i.e. to the 'processor') is predominantly made within the region (intra-regional) and is on a local or regional road. Thereafter, processor-to-port movements are generally between regions (inter-regional) and are on state highways. This is because processors are located close to farms/orchards due to the time-dependent nature of the product, and to reduce transportation costs. In turn, processors are generally in close proximity to state highways, again to reduce spoilage and transportation costs.

How the transport task on local and regional roads and state highways is calculated for each industry is outlined separately below.

7.2 Dairy

The dairy transport task from farm to processor is estimated to be 1,724 million tonne kilometres as presented in Table 3.1. However, a proportion of this transport task is undertaken on local or regional roads and state highways. Detailed information on the proportion of milk haulage from farms to processors on local and regional roads and state highways is unknown. Consequently, in the absence of more detailed information, we provide results using two alternative assumptions:

- assumption A: 65% of the dairy farm-to-processor road transport task occurs on local or regional roads, with the remaining 35% on state highways
- assumption B: 90% of the dairy farm-to-processor road transport task occurs on local or regional roads, with the remaining 10% on state highways.[18]

Under assumption A, the road transport task on local and regional roads is 1,121 million tonne kilometres (65 percent of the 1,724 million tonne kilometres) and 603 million tonne kilometres on state highways (35 percent of the 1,724 million tonne kilometres).

[18] We note that that an assessment provided to us of Fonterra vehicle running distances in the Waikato shows that 73% of the kilometres travelled were on local roads. This information is consistent with the range adopted by our assumptions.

Under assumption B, the road transport task on local and regional roads is 1,552 million tonne kilometres and 172 million tonne kilometres on state highways.

The dairy transport task from processor to port is estimated to be 366 million tonne kilometres as presented in Table 3.3. Similar to the transport task from farm to processor, transporting from processor to port is shared between rail and road. According to the NFDS, 59 percent of the transport task from processor to port is by road meaning the road transport task is 216 tonne kilometres from processor to port.

As discussed before, the transport task from farm to processor uses not only local and regional roads, but also state highways. Therefore, the total transport task on state highways is the addition of the transport task from farm to processor and then from processor to port.

Therefore, under assumption A, the road transport task from farm to processor on state highways is 603 million tonne kilometres. Adding the road transport task of 216 million tonne kilometres from processor to port gives a total road transport task on state highways of 819 million tonne kilometres.

Under assumption B, the road transport task from farm to processor on state highways is 172 million tonne kilometres. Adding the road transport task of 216 million tonne kilometres from processor to port gives a total road transport task on state highways of 388 million tonne kilometres.

7.3 Meat

The transport task of 299 million tonne kilometres on local and regional roads comes from Table 4.1 on the movement of livestock to processing plants from.

The meat transport task from processor to port is estimated at 187 million tonne kilometres as presented in Table 4.3. However, this includes both road and rail transport. The NFDS estimated that 57 percent of meat products from processor to port is by road. Therefore, the total freight task for meat products on state highways is estimated to be 107 million tonne kilometres.

7.4 Logs and timber

Table 5.1 shows that the transport task for log harvests is 2,476 million tonne kilometres. The NFDS found that 94 percent of logs and chips were transported by road and 6 percent by rail. Therefore the transport task on the local and regional road network is 2.33 billion tonne kilometres.

Table 5.3 wood product for export transport task 1,929 million tonne kilometres. NFDS found that 97 percent of manufactured wood products were hauled by road and 3 percent by rail. Therefore this implies that the road transport task on state highways from wood manufacturer to port is 1.87 billion tonne kilometres.

7.5 Kiwifruit

For horticulture, the inter-regional transport task is considered to be all on state highways, and the intra-regional transport task is on all local and regional roads.

For kiwifruit, transport from orchard to packhouse is all on local roads. The transport task for local and regional roads is estimated at 4,047 thousand tonne kilometres from Table 6.11. Local roads are also used when transporting kiwifruit to port. The transport task of kiwifruit on local and regional roads from packhouse to port is 11,598 thousand tonne kilometres as presented in Table 6.12 (the 'intra-region total'). Consequently, the total road transport task on local and regional roads from kiwifruit is 16 thousand tonne kilometres.

The road transport task on state highways is in Table 6.12 (the 'inter-region' total) at 8,804 thousand tonne kilometres.

7.6 Wine

Transport of grapes from vineyard to winery is all on local roads. The transport task for local and regional roads is estimated at 6,318 thousand tonne kilometres from Table 6.3. Local roads are also used when transporting wine to port. The transport task of wine on local and regional roads from winery to port is 5,121 thousand tonne kilometres as listed in Table 6.4 (the 'intra-region total'). Consequently, the total road transport task on local and regional roads from wine is 11.4 thousand tonne kilometres.

The road transport task on state highways is in Table 6.4 (the 'inter-region total') at 8,971 thousand tonne kilometres.

7.7 Apples

Transport of apples from orchard to packhouse is all on local roads. The transport task for local and regional roads is estimated at 2,952 thousand tonne kilometres from Table 6.6. Local roads are also used when transporting apples to port. The transport task of apples on local and regional roads from packhouse to port is 9,464 thousand tonne kilometres as listed in Table 6.8 (the 'intra-region total'). Consequently, the total road transport task on local and regional roads from apples is 12.4 thousand tonne kilometres.

The road transport task on state highways is in Table 6.8 (the ‘inter-region total’) at 7,392 thousand tonne kilometres.

8 Conclusion

The effectiveness of local and regional roads is of fundamental importance to the effective operation of the New Zealand economy. The logic is that:

- The local and regional road networks are the primary capillaries in the multi-modal New Zealand transport network, making up 88 percent of New Zealand's total road length (New Zealand Transport Agency) , 83,000 kilometres. The basic fundamental of network economics is that the efficiency of the overall network is dependent upon the efficiency of the weakest link.

- The effectiveness and efficiency of local and regional roads is thus fundamental to the efficiency of the value chains for New Zealand's land-based produce.

- The land-based produce is fundamental to New Zealand's economy, because it is the raw material for at least 60% of New Zealand's exports.

- The local and regional road networks are even more important than the regional SH network. The tonnage of primary produce carried on local and regional roads from land-based farms, orchards/vineyards and forests to their initial collection points is up to eight times as heavy as the processed and manufactured products carried to port on the SH network.

8.1 The value of the transport task

The economic value of the key export commodities that local and regional and state highways transport is presented in Table 8.1.

The farm gate value of export products coming from farms, forests etc to processors is $18.8 billion. The export value of products going from processor to port is $27.5 billion. The difference between commodities transported from farm to processor and those transported from port to export is estimated to be $8.8 billion.

The direct impact of the local and regional roads is to provide access from the production areas to processing and thus allow the producers to generate $18.8 billion of farm gate value within their production regions. However the real impact is that without this access to the land-based producers, none of the export activity would be possible.

The local and regional roads therefore facilitate the value chains of these key exports which we estimate contribute $27.5 billion worth of FOB export value. In 2010/11 we estimate this to be over 62% of the total value New Zealand's merchandise exports. As the New Zealand

economy is largely based on exports, the land-based products are the key base for the economy.

Table 8.1 Economic value of local and regional roads and state highways

Commodity	Annual farm gate value (July 2011 $m)	Annual export value (July 2011 $m fob)	Value add from farm gate (July 2011 $m)
Dairy	11,894	16,326	4,431
Meat	3,740	5,539	1,799
Logs & timber	2,200	3,300	1,100
Kiwifruit	390	950	560
Wine	300	1,100	800
Apples	235	322	87
TOTAL	**18,759**	**27,537**	**8,778**

The importance of these exports to New Zealand is of even greater prominence in the light of the global financial and economic uncertainty currently being experienced.

The value of exports from the dairy and meat industries plus logs and sawn timber have generated over 60% of the increased value of exports between 2006/07 and 2010/11.

The road transport task associated with these exports is met by a combination of local and regional roads and by state highways; with the ratio being between 1.3 to 1.8 tonne kilometres on local and regional roads for each 1 tonne kilometre on state highways.

Given this evidence, the importance of local and regional roads in relation to the nation's export effort is clear.

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