
Report prepared for ToiEDA

Economic Impacts of Ōpōtiki Harbour Development

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About the Author

Sally Wyatt is an economist who brings together the disciplines of economics, public policy and law to help her clients respond to regulatory and economic change. In recent years, Sally has built up a portfolio of experience in the aquaculture industry. Her association with the industry began in 2008 when she was engaged by the Ministry of Fisheries to design and implement the valuation methodology for measuring the value of resource consents for aquaculture for a Treaty of Waitangi settlement. She was subsequently engaged as an economic advisor to the Crown following the introduction of various legislative changes affecting the marine farming sector. In 2010 Sally prepared a report outlining the Economic Impact of the Coromandel aquaculture industry on the Waikato economy and nationally, and in late 2011 she worked with Corydon consultants to prepare a social impact assessment in relation to the Ōpōtiki harbour development and proposed offshore marine farm.

The multipliers applied in this report were prepared by Geoffrey Butcher of Butcher Partners Limited. Geoffrey has 29 years of experience in economic research, and has a particular interest in economic impact analysis and cost benefit analysis. He has undertaken a number of projects aimed at assessing the economic significance of tourism, agriculture, irrigation projects, mining and manufacturing projects. Geoff also has a reputation for impartiality and integrity as an "Expert Witness" in projects being assessed under the Resource Management Act. He has appeared on numerous occasions before Commissioners, Councils, and the Environment Court with his evidence relating to Efficient Use of Resources and to Community Economic and Social Wellbeing.

About Sapere Research Group Limited

Sapere Research Group is one of the largest expert consulting firms in Australasia and a leader in provision of independent economic, forensic accounting and public policy services. Sapere provides independent expert testimony, strategic advisory services, data analytics and other advice to Australasia's private sector corporate clients, major law firms, government agencies, and regulatory bodies. Sapere has offices in Wellington, Auckland, Canberra, Sydney and Melbourne and has 45 consultants.

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Executive summary

Background

This report describes the impact of a proposed wharf and harbour development on the Ōpōtiki and Whakatāne districts and more broadly, on New Zealand. The wharf and harbour development would provide the necessary infrastructure to support development of a single farm or multiple smaller farms over 3,800 hectares (the ‘marine farm’). The marine farm’s owners, Eastern Seafarms Limited, have signalled an intention to lease the farm to an aquaculture venture that in addition to locating up to 800 mussel lines on the site would locate a specialised automated seafood processing facility in Ōpōtiki to process the mussels produced there. A hatchery dedicated to rearing mussel spat for the farm would also be located in the district.

The aquaculture industry is recognised as an industry with growth potential: the sector aspires to achieve output of \$1billion nationally by 2025 and in recent years has invested widely in legislative change and research and development. The global aquaculture industry is estimated as one of the world’s fastest growing primary industries, with recognition that catching and harvesting seafood needs to be managed to avoid the collapse of wild fish stocks. There is considerable potential for growth in aquaculture exports from New Zealand provided New Zealand producers can continue provide quality products to global markets.

The Eastern Seafarms site in the Bay of Plenty is fully consented for a range of species (one of the few in NZ) and offers some unique advantages. It is located in the productive waters of the Bay of Plenty remote from the competing uses experienced in other parts of New Zealand and remote from the effects of landuse on water quality. Early indications are that growth rates are good and that shells are clear of barnacle issues that have affected other parts of New Zealand.

Despite the potential to use the marine farm to farm other, higher value species this economic assessment assumes the farm is used to grow mussels. Further, the production scenario used in the assessment is conservative, and assumes less than full development of the site. Likewise a harbour entrance offers a range of other medium to long terms benefits such as marinas and canal housing but these are not included in this analysis.

The Ōpōtiki and Whakatāne districts seek to benefit from this growing interest in aquaculture. Many in the district recognise that seizing the opportunity to develop the district’s marine resources will translate into extra jobs and income for the local economy. This is evidenced by the level of local support in gaining both the aquaculture and harbour entrance resource consents, and in a range of community surveys. At the leadership level, there is a clear appetite to seek economic growth from aquaculture: aquaculture is identified in the regional economic development strategy as a high priority for action, along with other industries such as forestry, energy, freight logistics and Maori industry.¹ The Bay of Plenty Aquaculture Strategy has an aspiration to grow an industry with export sales of \$250 million

¹ Bay of Connections Regional Economic Development Strategy, available online at www.bayofconnections.com

by 2025.² It is also supported in the strategy of the sub regional Economic Development Agency, ToiEDA, (who part funded this report) and a key plank in the Ōpōtiki District Long Term Plan 2013-2022.

The development of this proposal also contributes to the desire of both central and local government to support māori economic development.

Core assumptions

An economic impact assessment traces spending through an economy and measures the overall effect of that spending on the local economy. Economic impact assessment recognises that one form of economic activity almost always leads to others. The impact is expressed in terms of Output, Value Added (GDP), Gross Household Incomes, and employment.

Core assumptions applied in this study include:

- Marine farm production of 16,000 greenweight tonnes (GWT) of mussels from 800 longline mussel lines located in the marine farm (employment scenarios assume up to 20,000 tonnes might be harvested).
- Despite potential for other species such as finfish, geoduck (said “gooeyduck”) scallops, oysters, and wakame (edible seaweed) to be farmed at the site, these have not been included in the assessment.
- Farm gate sales at \$800 per GWT; export sales for grade 1 product at US \$2.10/lb @ 83c exchange rate) (CIF, tax unpaid) → \$5.57 per packweight kg.
- Location of an automated seafood processing plant and a hatchery rearing mussel spat, both in or near Ōpōtiki township.
- Most major inputs for farm development, excluding rope, are sourced from Ōpōtiki manufacturers and engineers. Most capital items are New Zealand-made.
- Longline levy set at the rate included in the Whakatōhea business case projection.
- The accuracy of the Whakatōhea business case spreadsheet and assumptions has been assumed, as it has undergone peer review. Sapere Research Group has verified the price and volume assumptions as reasonable.
- Capital costs are achieved at levels shown by indicative capital cost estimates for civil works provided by Ōpōtiki District Council.

Operational impacts – year 6 and year 12

The table below shows the total impacts from the operations of the marine farm, processing, transport, marine services and charter operations at year 6 and year 12. The first row shows the direct expenditure and employment in Ōpōtiki and Whakatāne. The second row shows the induced and indirect effects in addition to the direct effects. The third shows the total impact on the national economy. The amounts below exclude construction expenditure and capital expenditure on the marine farm.

² World class aquaculture. Bay of Plenty Aquaculture Strategy, 2009. www.bayofconnections.com

The table shows that by year 12, the Ōpōtiki and Whakatāne districts will have \$33.5 million in additional value added in circulation and an additional 236.4 FTE jobs. Nationally, there will be an additional \$40.9 million in added value in circulation, and 318.2 FTE jobs.

Table 1 Summary of operational impacts

		Year 6	Year 12
Direct impacts (Whakatane and Opotiki only)	Output (\$m)	4.4	40.0
	Employment (FTEs)	13.7	198.7
	Value Added (\$m)	2.9	26.1
	Of which Household Income (\$m)	0.7	8.3
Direct and induced impacts (Whakatane and Opotiki only)	Output (\$m)	5.7	53.2
	Employment (FTEs)	20.1	236.4
	Value Added (\$m)	3.4	33.5
	Of which Household Income (\$m)	1.0	10.7
Direct and induced impacts (National)	Output (\$m)	18.6	68.6
	Employment (FTEs)	73.4	318.2
	Value Added (\$m)	9.3	40.9
	Of which Household Income (\$m)	3.5	15.1

1. Uses Whakatōhea business case assumption about council development levies

Local jobs created

By year 12, the combination of activities associated with the marine farm, processing, hatchery and associated services would be expected to generate 236 - 323 new FTE jobs³, and \$10.7 - \$14.1 million of additional gross household income for the Ōpōtiki and Whakatāne districts. Of these, around 44 FTEs will be created indirectly through flow-on activities in the regional economy. The lower estimate has been applied in the results for reasons of conservatism (the figure of 236.4 jobs can be found in the second set of results (direct and induced impacts) in the second column).

In addition, the construction activities that are likely to occur in and near Ōpōtiki will create 353.5 FTE job-years over the course of the construction in the Ōpōtiki and Whakatāne districts, as briefly summarised in the paragraph below.

National jobs created

Nationally, an additional 318 FTEs are expected to be created (including the 236 FTEs created in Ōpōtiki and Whakatāne).

Temporary impacts of construction

A lot of construction activity is expected to occur in order to construct the wharf and harbour, and to build the processing factory and hatchery. There will be modest economic impacts of construction during the early years as farms are set up and then a significant construction impact during years 7 and 8 when the processing plant is built and harbour works are completed.

³ Applying the base case projection in the Whakatohea business case central estimate would see employment at 243 FTEs. The range presented above is consistent with the Social Impact Study (Corydon, 2011).

In total, development of the marine farm, hatchery and processing plant will cost in the order of \$70 million. In addition, construction of the wharf and the harbour works is anticipated to cost in the order of \$55 million.

The economic impacts of construction are temporary and one-off. For this reason it is typical to represent them as total impact, spread across the life of the construction works. It is also typical to report ‘employment years’ rather than employment. This shows how many FTE years could be worked.

In total, the construction activity associated with the farm, processing factory, hatchery, harbour works, wharf and other civil projects is expected to add \$31.2 million of added value to the Ōpōtiki and Whakatāne districts over the life of the construction. 353.4 job years will be created for the districts, spread over 20 years but peaking in years 6-9. Nationally, the construction works add \$130.3 million of added value and over 1400 job years (this is spread over 20 years).

Table 2 Impacts of construction and capital spend over the forecast period

Summed over 20 year forecast period – peaking at years 6 - 9

	Total, over the life of the construction	Factory, farm and farm-related infrastructure spend by aquaculture entities	Harbour development	Wharf development	Total (NB the impact is spread over 20 years, peaking in years 6 - 9)
Direct and induced impacts (Whakatane and Opotiki only)	Type II Output (\$m)	71.2	52.5	7.6	131
	Employment (FTEs - job years)	95.7	225.1	32.6	354
	Value Added (\$m)	7.6	20.6	3.0	31
	Of which Household Income (\$m)	5.1	13.8	2.0	21
Direct and induced impacts (National)	Type II Output (\$m)	158.2	142.1	17.2	317
	Employment (FTEs - job years)	735.8	613.8	74.4	1,424
	Value Added (\$m)	63.7	59.4	7.2	130
	Of which Household Income (\$m)	40.3	36.8	4.5	81

Source: Sapere Research Group using data provided by Ōpōtiki District Council and taken from the Whakatōhea business case

1. Introduction

1.1 This study

This report describes the impact of a proposed wharf and harbour development on the Ōpōtiki and Whakatāne districts and more broadly, on New Zealand. The wharf and harbour development would provide the necessary infrastructure to support development of a single farm or multiple smaller farms over 3,800 hectares (the ‘marine farm’). The marine farm’s owners, Eastern Seafarms Limited, have signalled an intention to lease the farm to an aquaculture venture that in addition to locating up to 800 mussel lines on the site would locate a specialised automated seafood processing facility in Ōpōtiki to process the mussels produced there. A hatchery dedicated to rearing mussel spat for the farm would also be located in the district.

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⁴ Bay of Connections Regional Economic Development Strategy, available online at www.bayofconnections.com

by 2025.⁵ It is also supported in the strategy of the sub regional Economic Development Agency (who part funded this report) and a key plank in the Ōpōtiki District Long Term Plan 2013-2022.

The economic impact expected from all the activities associated with these ventures is expressed in terms of Output, Value Added (GDP), Gross Household Incomes, and employment.

1.2 Economic impact studies

To understand the role that large scale aquaculture production might play in the Ōpōtiki and Whakatāne economies, one needs to understand the dynamics of the local economy. An economic impact assessment traces spending through an economy and measures the overall effect of that spending on the local economy. Economic impact assessment recognises that one form of economic activity almost always leads to others.

An increase in final demand for any sector has repercussions throughout the whole economy, not just for that one sector. For example, if the demand for products and services consumed by the aquaculture industry increases significantly, the supplying sectors (when unconstrained) will respond to this demand, by increasing production. This will require an increase in the inputs to those sectors – for example there may be more demand for plastics to manufacture buoys. It may also require an increasing capacity in ancillary downstream industries such as supplies of packaging or capacity to manufacture omega-3 rich nutraceuticals, for example. Also, if the increased production leads to higher profits and income, this will be saved, reinvested into the business or spent on consumer goods.

This study uses the Input-Output method, which measures three types of impact:

- Direct impacts which relate to the injections of revenue and expenditure that can be specifically attributed to the aquaculture industry;
- Indirect impacts which arise as a consequence of changes in the level and value of sales for suppliers of goods and services to the aquaculture industry; and
- Induced impacts which arise as a consequence of increases in the level and value of expenditure on goods and services, due to increased household incomes in the study area.

The total economic impact is the sum of these three effects.

⁵ World class aquaculture. Bay of Plenty Aquaculture Strategy, 2009. www.bayofconnections.com

2. Description of the investments

2.1 Marine farm, hatchery and processing factory

The Eastern Seafarms marine farm is a site of 3,800 hectares located 8.5km of the Eastern Bay of Plenty coastline. Development forecasts estimate that by year twelve the site would support 800 installed longlines, covering 3,088 hectares of the available space and producing around 16,000 – 20,000 tonnes of mussels (assuming 615 lines are harvested in a given year). The farm may also be used for spat catching from time to time. The proposal also includes the construction and operation of an automated processing plant located in Ōpōtiki, and a hatchery dedicated to rearing mussel spat for the farm. An earlier study found that with full utilisation of the consented space, around 24,880 tonnes of mussels would be produced and 449 FTEs generated.⁶

The aquaculture project is being developed by Eastern Seafarms Ltd and Te Whakatōhea Māori Trust Board (which owns 54% of ESL).

While the primary focus for the venture is on mussels, other species could include scallops, oysters, geoducks (goosyduck), pāua and wakame (edible seaweed).

Having local servicing and processing facilities are key to the long-term viability of the farm's development. Currently the nearest landing place suitable for a mussel barge is Whakatāne – a distance which would compromise the economic feasibility of the marine farm. The Whakatāne and Ohiwa harbours both have difficult entrances and a lack of suitable land for service and processing facilities.

This project has all the necessary resource consents and trialling of production methods is currently underway.

2.2 Wharf and harbour development

The Ōpōtiki District Council is leading a large-scale infrastructure project to improve the navigability of the Ōpōtiki Harbour entrance. This project is necessary to provide a level of access suitable for servicing the marine farm. In addition to servicing the various activities offshore, an improved harbour entrance is expected to promote a variety of marine industry developments, and marine-based tourism and recreational activities.⁷

There are two aspects to the civil works. The first part is dredging and forming the harbour entrance (at an expected cost of \$49.5 million). The council is recovering part of this cost from the aquaculture venture in the form of levies, which are yet to be negotiated. For the remainder, the council is seeking investment from a combination of central government and

⁶ Corydon (2011).

⁷ Ibid, n6

perhaps, private development company(ies).

The second aspect of the civil works is forming the wharf. The wharf would consist of a steel sheet pile face with concrete deck built on solid fill (engineered soil placed behind the front wall). The cost will be approximately \$6 million and this would be funded by third party private investors. In return for the private investment, a development company would expect to receive income from fees from the entity providing berthage, slipway, dry stack (ie occupying hard stand with boat) sites. The entity providing harbour services may also earn revenue from the supply of cradles, tractor for haul out (or travel lift crane), or from services like placing boats in water when required by owners from dry stack areas.

The development has all the necessary resource consents including Regional and District Council consents and restricted coastal activity approvals from the Minister of Conservation. The consents allow sufficient flexibility to enable alternative construction options to be developed through the detailed design process. The final design will take into account the need to balance the depth requirements for a navigable channel with the width requirements for sound flood management so that there is no increase in flood risk for Ōpōtiki township.

The construction period for the harbour re-development is expected to take 1-2 years with the actual time depending on the final construction option selected and weather and sea conditions during construction. Over time, it is expected that commercial and residential land developments surrounding the harbour will follow.

2.3 Can't have one without the other

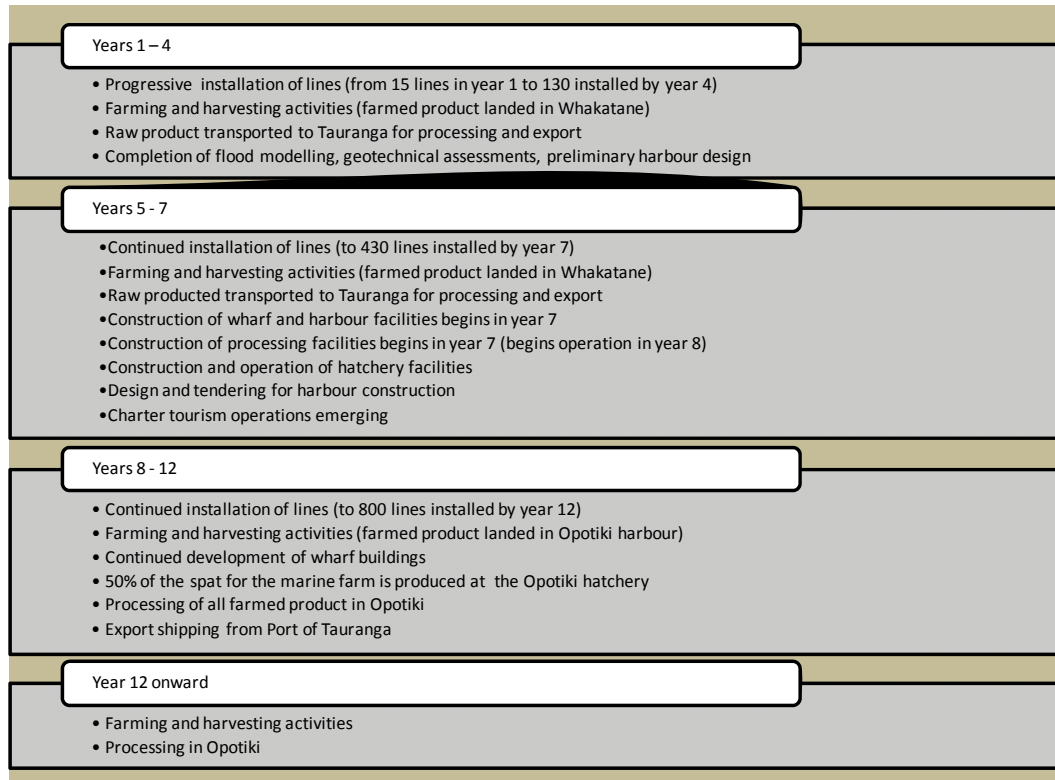
The two projects are interdependent: the Council believes the benefits of the Ōpōtiki harbour entrance improvements will only be fully realized if the marine farm servicing and processing facilities can be located in Ōpōtiki, generating downstream social and economic benefits to the community. Similarly, the infrastructure improvements are required for the efficient servicing of the marine farm.

2.4 Timeline

The diagram below illustrates the likely evolution of the two projects. Year 1 could be as early as 2014.

Figure 1 Timeline

Development of marine farm, processing facilities, wharf and harbour



Source: Sapere Research Group

2.5 The sectors that get a boost

Many industry sectors will experience additional demand as a result of the projects. Economic impacts from the aquaculture activities in the region can be expected to occur in the following areas:

- Supplying industries – industries that supply the farms with intermediate inputs, like suppliers of farm equipment or boats, will benefit. In addition, facilitating industries like transport and business services will benefit.
- Household expenditure industries – industries that households spend money on will benefit as increased incomes from marine farming are spent in the region. Such industries include housing and real estate and consumption goods like retail trade.
- Investment related industries – There will be impacts, temporary in nature, on the construction sector as farms and accompanying infrastructure like roads, wharves and shore facilities are built.

There will also be negative impacts on some industries if investment expenditure is diverted away from certain types of production and put into aquaculture.

The diagram below lists the industry groupings that will enjoy some level of additional income as a result of the marine farm and wharf and harbour development.

Figure 2 Industries that get a boost

Farming, vessels, hatchery

- Fishing
- Textiles
- Fuel Refinery
- Ship, boat and other transport equipment manufacturing
- Petroleum, metal and chemical wholesaling
- Machinery and equipment wholesaling
- Water and rail transport
- General Insurance
- Scientific research and technical services
- Other business services
- Local government administration

Processing

- Marine farming (purchase of raw mussels)
- Electricity generation and supply
- Water supply
- Sewerage, drainage and waste disposal services
- Petroleum, metal and chemical wholesaling
- Machinery and equipment wholesaling
- Insurance
- Vehicle and equipment hire
- Other business services

Other sectors

- Road transport
- Recreation and tourism
- Other property investment

Construction period

- Textiles
- Plastics manufacturing
- Structural sheet and fabricated metal product manufacturing
- Ship, boat manufacturing
- Industrial machinery manufacturing
- Furniture and other
- Non-residential building construction
- Non-building construction
- Construction trade services
- W & R Trade
- Professional consulting, engineering and design services
- Architects

3. Scope and assumptions

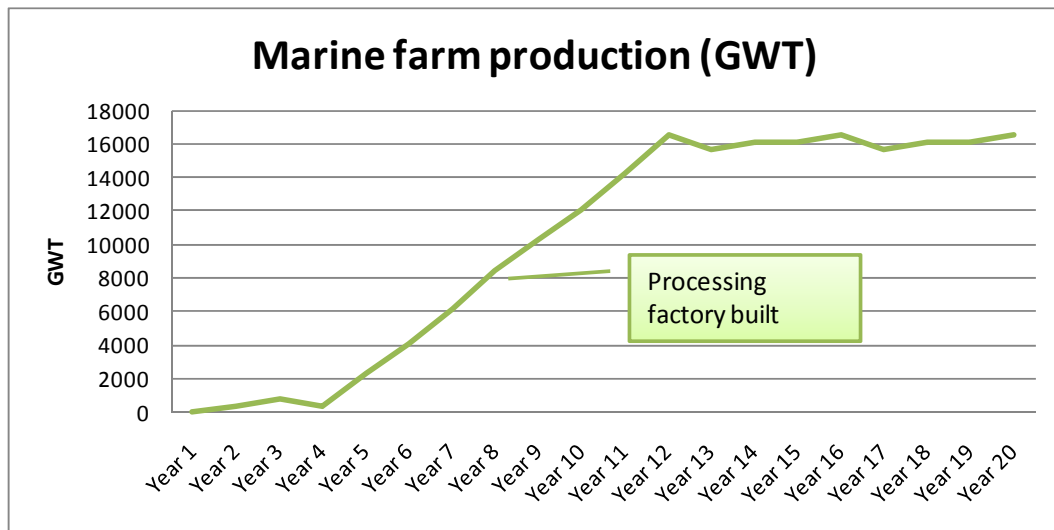
3.1 Marine farm production

Our analysis assumes that both projects have gone ahead, that the wharf and associated transport infrastructure have been completed, a hatchery for producing spat is in operation and the marine farm is operating according to the projection for year 12 of the Whakatōhea business case. We have also assumed that the marine farm produces roughly 16,000 tonnes of mussels from 800 lines, all of which is landed at the Ōpōtiki wharf and processed at the local factory. Production estimates are based on crop yields of 6.7kg per metre of growing rope. This is a relatively conservative estimate: early trials of the site indicate that much higher yields are feasible, and it is not unrealistic to expect production of more than 20,000 tonnes of mussels from those lines. If the entire consented area is used for mussel lines, production could be as high as 25,000 tonnes.

Despite potential for other species such as finfish, geoduck (said “gooneyduck”) scallops, oysters, and wakame (edible seaweed) to be farmed at the site, these have not been included in the assessment.

Figure 3 Assumed marine farm production

The economic impact figures assume production grows to around 16,000 tonnes by year 12 (employment estimates show a range of production between 16,000 -20,000 tonnes). The processing factory is expected to be operational when production hits around 8,000 tonnes.



Source: Whakatōhea business case

2. Based on an assumption of production at 6.7kg/metre of growing rope.

3.2 Prices

In this study, it is assumed that most product (88 percent of crop) is sold as halfshell 1st grade on export markets. The price assumption of NZD\$5.58 per kilo of processed product sold has been applied to this product, with a further assumption of an exchange rate at 83c USD/NZD. This price translates to USD\$2.10/lb CIF. The remaining 12 percent of crop is sold as meat, on local markets or whole frozen. Detailed price assumptions were taken from the Whakatōhea business case and were independently verified as reasonable by Sapere Research Group.

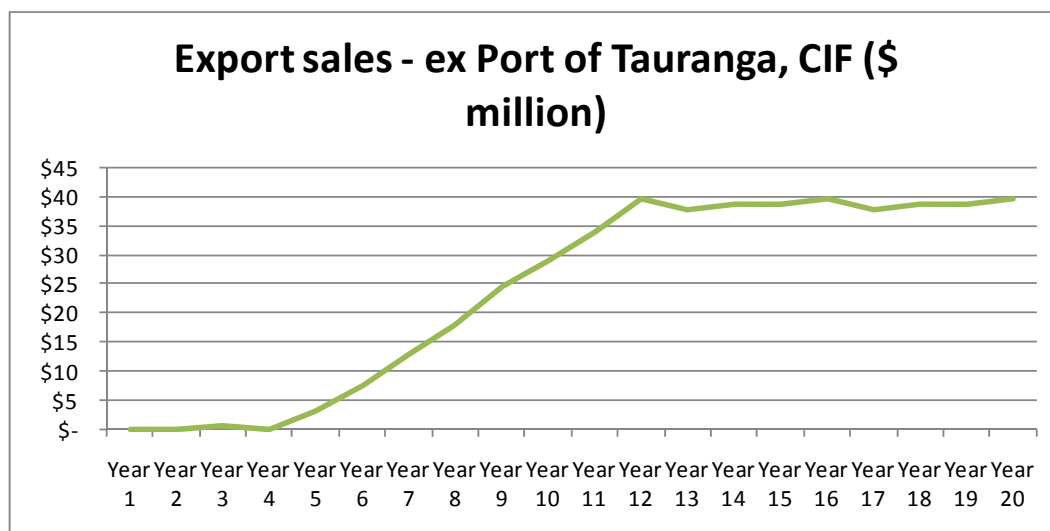
3.3 Processing

The analysis assumes that prior to the factory being built in year 8, processing occurs in Tauranga after the mussels have been trucked there following being landed at Whakatāne. Year 6 figures assume the production and export of 3.5 million kg of processed mussels from the Tauranga facility. From year 8 onward, processing occurs in Ōpōtiki. The assumption is that the plant is automated, requiring around 224 seasonal and full time staff members (detailed employment information is provided in the results chapter).

3.4 Export value

The majority of the processed product is expected to be exported: 50% to Asia and the remaining 50% to the USA. In addition to the exports shown in the chart below small volumes of fresh and processed mussels will be sold to the local market and to New Zealand based wholesalers.

Figure 4 Export value of processed mussels (CIF, \$NZ, 2012)



Source: Whakatōhea business case

To put this in context, the mission of the 2008 aquaculture strategy for the Bay of Plenty was to grow an integrated and sustainable aquaculture industry in the Bay of Plenty with export sales of \$250 million by 2025.⁸

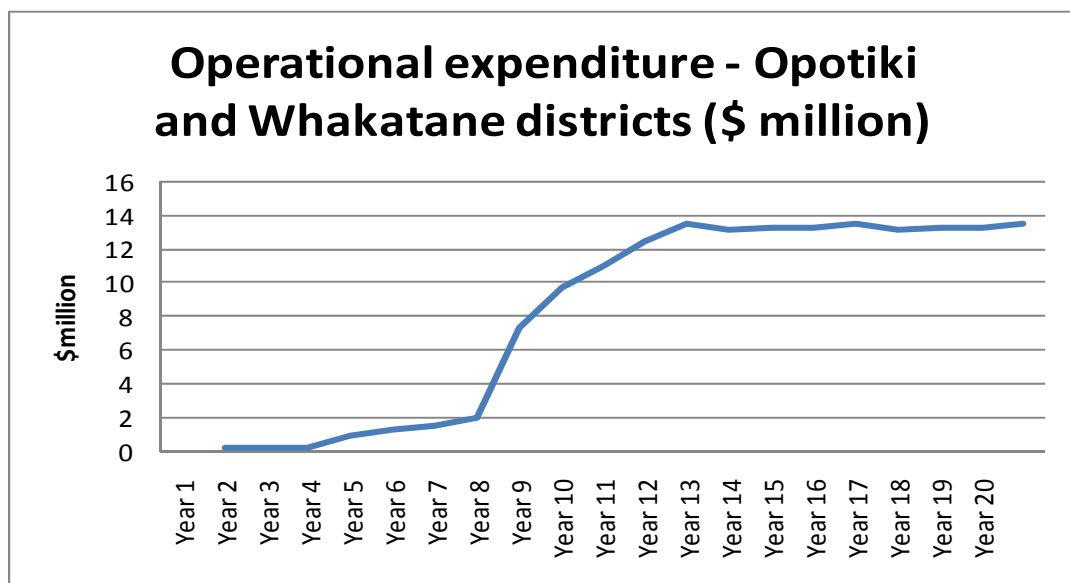
Further, the national aquaculture strategy produced by Aquaculture New Zealand in 2006 expressed an aspiration for the New Zealand aquaculture sector to have sales of \$1 billion per annum by 2025.⁹

This venture adds just under \$40 million dollars per year to these targets.

3.5 Regional expenditure

The chart below shows the total expenditure profile for the Ōpōtiki and Whakatāne districts. By year 12, around \$13.5 million dollars will be spent by the aquaculture venture on inputs sourced from the Ōpōtiki and Whakatāne districts, including labour. A further \$0.7 million will be spent on local inputs by the property services, charter fishing and/or tourism sectors.

Figure 5 Regional operational expenditure - aquaculture operation



Source: Whakatōhea business case

A summary breakdown of expenditure is provided below:

⁸ World class aquaculture. Bay of Plenty Aquaculture Strategy, 2009. www.bayofconnections.com

⁹ New Zealand Aquaculture Council (2006).

Abridged

3.6 Longline levies

The Council expects to receive income from the aquaculture venture in the form of levies, which are levied on the basis of the metres of longline in the water (the 'longline levy'). The amount of the levy is yet to be negotiated between the parties. The levy assumption applied in this study was taken from the Whakatōhea business case. Council may negotiate a higher levy. The economic impact of an increase in levies would be to decrease the direct value added from the farming venture by a corresponding amount (essentially, there will be a lower return on investment for the venture's investors). Similarly, the value added multiplier observed from farming would be smaller. The additional payment would create 'output', it would be unlikely for there to be employment created as a result of the additional payment to Council, as it would be immediately put toward Council debt. Further, the value added as a result of the 'output' is likely to be negative as the Council is not expecting to generate an economic return on its investment.

4. Methodology

4.1 Approach to multiplier generation

This study utilises the input-output method of multiplier generation. One extension of the input-output methodology is the generation of multipliers. The concept of a multiplier is that it is possible to effectively measure how a particular sector or industry is integrated with the rest of the economy.

Multipliers can be seen as a set of simple mathematical relationships between one industry and the rest of the economy, and are used to measure the effects of a change in one industry on the overall economy. The input-output model documents the linkages between industry sectors, showing purchases between sectors. Input-output tables, which are critical inputs to the multiplier calculation, are published intermittently at a national level in New Zealand by Statistics New Zealand. The most recent input-output table relates to 2006-2007, which has been used for this study. There is an assumption that similar patterns of purchase occurring in 2013 onward.

Multipliers are based on coefficients derived from the input-output transactions table. There are two types of multiplier:

- Type I multiplier, which captures direct and indirect backward linkages associated with direct expenditures. A type I multiplier measures the direct and indirect effects of an increase in expenditure from the industry; and
- Type II multiplier, which measures the direct, indirect and induced effects, taking into account consumer expenditure in the economy stimulated by the wages and salaries paid to the workers in the aquaculture sector.

Input-output analysis is based on average impacts. It maintains a set of assumptions about constant and uniform proportions of expenditure in the various sectors of the economy.

The multipliers used for this study were prepared by Geoffrey Butcher of Butcher Partners Limited using proprietary input-output software. In particular, bespoke multipliers were generated to show the degree of follow-on impact that might be expected as a result of marine farming and processing activities in the subject districts. These multipliers were generated by using detailed information in the business cases about the investors' expected spending and the expected location of the farm's and hatchery's suppliers. A distinction is made between businesses that operate within the regional boundary and those that are outside the regional boundary.

4.2 Economic assumptions

Assumptions about industry revenue are used alongside the multipliers. This study has relied on business case information provided about the marine farm project. This information was taken at face value and not reviewed or cross-checked.

4.3 Method is consistent with other studies

The methodology used in this study is consistent with the method used by Sapere in a 2010 study of the Coromandel industry, by Covec in a 2007 study of the Coromandel industry, and with the Economic Impact Assessment methodology recommended by PricewaterhouseCoopers in the project commissioned by New Zealand Trade and Enterprise, Auckland Regional Council and Environment Waikato to develop a methodology for assessing the economic effects of aquaculture at a regional and sub-regional level.

4.4 Limitations of method

The first limitation of this method is that an economic impact study is a static analysis: a snapshot in a period of time. A limitation with any static analysis is that it is based on fixed prices and set industry linkages for a fixed time period. It cannot capture dynamics such as changing product or commodity prices, which are relevant to an emerging industry such as aquaculture. Input-Output (IO) multipliers, which assume a fixed ratio between inputs and prices, tend to systematically overestimate the true multiplier and provide a rosy picture of the economic impacts of an industry or project. This is mitigated somewhat by adopting a midpoint multiplier rather than those at the top of the range. It is also less of a problem in the event that the inputs (in the case of aquaculture the primary inputs are water space and labour) would be under-utilised in the absence of the project. The aquaculture project is fairly unique in the sense that it creates a use for a water resource that was previously unused. The social impact study¹⁰ showed that the venture would utilise labour that might have been unemployed or underemployed.

The second limitation is that the figures do not capture opportunity cost. That is, these economic impact figures do not allow for the fact that alternative activities could be carried out using the same resources, ie sea, land, labour and capital. GDP, value-added, household income and employment are important impacts and can provide an indication of the value of economic activity in the region, but they do not indicate what else might have been done with the capital employed. For example, rezoning could allow the farming of finfish instead of shellfish which could impose a different range of financial, social and environmental effects. Depending upon the costs and benefits of this activity relative to the other potential activities, the districts could be better- or worse-off if existing activities were substituted for alternative land and sea uses. However, determining whether the existing activity provides a net benefit compared with other possible activities requires a comprehensive cost-benefit analysis. This is outside of the scope of this study.

A final limitation is that the district level multipliers are likely to have a large margin of error attached to them. For very small districts such as Ōpōtiki or Whakatāne, this margin of error is such that it would not be appropriate to report the district results separately. This is why the results for the Ōpōtiki and Whakatāne districts are aggregated.

¹⁰ Corydon (2011).

4.5 Alternative methodologies

Another method of preparing economic impact studies, which has not been applied in this study, is Computable General Equilibrium (CGE). One benefit of a CGE model over an input-output (IO) framework is that a CGE model explicitly recognises that expanding one part of an economy (in this case the aquaculture sector) comes with an opportunity cost. The expansion uses resources (land, labour, capital, energy) and these resources are no longer available elsewhere in the economy to produce other goods and services. So in a CGE model the reduction in output elsewhere in the Ōpōtiki or Whakatāne economies (a cost) would be offset against the direct and indirect benefits of the expansion of the aquaculture sector.

There are some significant downsides to the CGE approach, however, which is why it has not been applied in this study. Firstly, it is a national-level model, and it can only be ‘shocked’ nationally. In order to use it to estimate regional impacts we would have to make some challenging assumptions about the relationships between regions and about employment. The process would involve estimating national impacts and then trying to work back to regional impacts using a series of assumptions. IO at least is built on regional-level data, which suits a smaller region like the Bay of Plenty better. There are also issues of cost and with consistency with other impact studies.

4.6 Data sources

In order to analyse the economic impact of the aquaculture industry, a number of data sources were used, including:

- A copy of the business plan prepared for Whakatōhea Maori Trust Board describing the costs and revenues of the aquaculture venture: farm, processing facility and hatchery (Version 8, dated August 2012) (“The Whakatōhea business case”).
- A copy of the business plan, Ōpōtiki Harbour Development - Commercial Business Case (Preliminary assessment) Revised March 2012, prepared by John Galbraith of John Galbraith Limited.
- Information provided by the Ōpōtiki District Council’s Engineering Manager on the likely capital costs associated with the wharf and harbour development.
- The assessment of Social and Community Benefits prepared for the Ōpōtiki District Council by Corydon Consultants and Sapere Research Group, March, 2012.¹¹
- The evaluation of social and economic impacts of the Ōpōtiki harbour development prepared for the Ōpōtiki District Council by URS Australia, June, 2005.¹²
- An economic impact study of aquaculture in the Coromandel district, prepared by Sally Wyatt of Sapere Research Group for the Hauraki-Coromandel Development Group, August 2011.¹³

¹¹ Corydon (2012)

¹² URS (2005)

¹³ Wyatt, S. (2011)

- An Auckland Regional Council economic impact study of aquaculture from 2010, by Market Economics Limited.¹⁴
- An Environment Waikato economic impact study of aquaculture from 2007, by Covec Limited.¹⁵
- A Northland Regional Council economic impact study of aquaculture from 2010, by Enveco Limited.¹⁶
- Aquaculture New Zealand's export statistics.
- Statistics New Zealand's *Annual Enterprise Survey*.
- Statistics New Zealand's Harmonised System Classification.

4.7 Industry categorisation

The results are grouped into six parts, according to the following categorisations:

- Farm and hatchery – includes all activities on the marine farm including growing spat, harvesting, vessel operation, wharfage and landing services. Outputs from the farm are valued according to an assumption about the market value of raw mussels at the farm gate
- Processing (Ōpōtiki plant) – includes processing of mussels into products for local sale or export, at a new-built processing facility in Ōpōtiki
- Processing (Tauranga plant) – includes processing of mussels into products for local sale or export, at the NIMPL factory in Tauranga
- Transport – includes trucking unprocessed mussels from Whakatāne to Tauranga for processing and sale (year 6), or trucking processed product from Ōpōtiki to Tauranga for sale (year 12). International shipping activities are excluded.
- Harbour, wharf and property management – leases in wharf-adjacent properties (essentially, real estate services). For the purposes of the discussion in section 3.6, this category is also used to reflect the operational impact of waterspace levies).
- Charter fishing and tourism – includes marine-based enterprises based at the Ōpōtiki wharf
- Construction – this category addresses the economic impact of temporary construction activities on the harbour, wharf, wharf-adjacent land and processing facilities.

¹⁴ Market Economics (2010)

¹⁵ Covec (2007)

¹⁶ Giorgetti, A. (2010)

5. Results

5.1 Multipliers

An increase in final demand for any sector has repercussions throughout the whole economy, not just for that one sector. The effect of a change in demand in one sector is ‘multiplied’, through the effects of changes brought about in other sectors. Thus, multipliers are a ratio of the overall economic change to the (initial) direct change in the economy, given that economic activity in one sector has knock-on effects in other sectors.

As described in the Methodology section, a Type II multiplier includes induced effects, along with direct and indirect effects. For example, the table below shows that if output from mussel farming were increased by \$1,000, the overall output from the regional economy would increase by \$1,240 (the Type II multiplier is 1.24). This takes into account induced effects. This includes the original \$1,000, plus an additional \$240 through flow-on effects in other sectors associated with aquaculture and also through increased household expenditure, brought about by wages and salaries paid to employees of the aquaculture sector.

The multipliers that were applied in this study are shown in the tables that follow. As described in the Methodology chapter, the multipliers for the marine farming and processing industries were derived as bespoke metrics using business case information. They were prepared by Butcher Partners Limited, using primary data collected during this study. The reliability of the multipliers was confirmed by comparing the results to earlier work by Sapere, Covec and Market Economics (although differences exist due to changes in prices, changes in technology, sources of inputs and so on).

Table 4 Regional multiplier set (Whakatāne and Ōpōtiki districts)

At year 6

	Hatchery and farming operations	Transport operations	Charter boats and associated services	Harbour and wharf (based on real estate services multiplier)
Regional multipliers (yr 6)				
Output (Type II Total impact)	3.23	1.36	1.27	1.39
Direct emp:Output	4.75	6.81	5.65	2.69
Total Emp:Output	0.70	9.96	8.03	4.36
Direct VA : Output	0.86	0.40	0.52	0.63
Total VA:Output	0.17	0.68	0.76	0.85
Direct Gross HHI :Output	0.26	0.26	0.18	0.16
Total Gross HHI : Ouput	3.72	0.40	0.27	0.26

At year 12

	Hatchery and farming operations	Opotiki processing operations	Transport operations	Charter boats and associated services	Harbour and wharf (based on real estate services multiplier)
Regional multipliers (yr 12)					
Output (Type II Total impact)	1.24	1.20	1.36	1.27	1.39
Direct emp:Output	2.48	3.84	6.81	5.65	2.69
Total Emp:Output	3.65	4.53	9.96	8.03	4.36
Direct VA : Output	0.72	0.44	0.40	0.52	0.63
Total VA:Output	0.85	0.54	0.68	0.76	0.85
Direct Gross HHI :Output	0.13	0.16	0.26	0.18	0.16
Total Gross HHI : Ouput	0.20	0.19	0.40	0.27	0.26

1. Uses Whakatōhea business case
2. assumption about council development levies

Source: Sapere Research Group and Geoffrey Butcher

Table 5 National multiplier set

At year 6

	Hatchery and farming operations	Tauranga processing operations	Transport operations	Charter boats and associated services	Harbour and wharf (based on real estate services multiplier)
National multipliers (yr 6)					
Output (Type II Total impact)	1.87	1.43	2.65	1.27	1.99
Direct emp:Output	3.23	3.84	6.81	5.65	2.69
Total Emp:Output	7.15	5.85	14.78	8.03	7.05
Direct VA : Output	0.72	0.44	0.40	0.52	0.63
Total VA:Output	1.13	0.64	1.18	0.76	1.14
Direct Gross HHI :Output	0.17	0.16	0.26	0.18	0.16
Total Gross HHI : Ouput	0.39	0.26	0.67	0.27	0.41

At year 12

	Hatchery and farming operations	Opotiki processing operations	Tauranga processing operations	Transport operations	Charter boats and associated services	Harbour and wharf (based on real estate services multiplier)
National multipliers (yr 12)						
Output (Type II Total impact)	1.70	1.43	1.43	2.65	1.27	1.99
Direct emp:Output	2.48	3.84	3.84	6.81	5.65	2.69
Total Emp:Output	5.77	5.85	5.85	14.78	8.03	7.05
Direct VA : Output	0.78	0.44	0.44	0.40	0.52	0.63
Total VA:Output	1.10	0.64	0.64	1.18	0.76	1.14
Direct Gross HHI :Output	0.13	0.16	0.16	0.26	0.18	0.16
Total Gross HHI : Ouput	0.31	0.26	0.26	0.67	0.27	0.41

1. Uses Whakatōhea business case assumption about council development levies

Source: Sapere Research Group and Geoffrey Butcher

5.1.2 Multipliers achieved by comparable industries

Multipliers for comparable industries are shown below to provide some context for the multipliers shown above. They show that in relation to other industries, the activities associated with the aquaculture project have relatively low levels of flow-on economic impact. This needs to be taken in context, however. The context of the aquaculture project is one where the industry has potential to utilise resources that are presently un-used or under-used. This means that the opportunity costs associated with resource use for the aquaculture project are likely to be lower than for other uses. A further relevant factor is that no opportunities for further investment in the comparable industries are on the table at present.

Table 6 Regional multipliers in comparable industries

	Horticulture and fruit growing	Livestock and cropping farming	Forestry & forestry services	Fishing	Oil and gas exploration and extraction	Meat and meat product manufacturing	Dairy product manufacturing	Other food manufacturing	Accommodation
Regional multipliers - comparisons									
Output (Type II Total impact)	1.63	1.64	1.87	1.45	N/A	1.66	2.06	1.40	1.49
Direct emp:Output	7.82	5.16	1.50	3.72	N/A	2.27	0.85	3.16	9.42
Total Emp:Output	11.33	8.58	5.75	6.03	N/A	5.76	5.98	5.18	11.68
Direct VA : Output	0.41	0.33	0.30	0.31	N/A	0.29	0.13	0.30	0.48
Total VA:Output	0.72	0.64	0.72	0.52	N/A	0.57	0.63	0.48	0.73
Direct Gross HHI :Output	0.29	0.19	0.10	0.16	N/A	0.16	0.07	0.17	0.34
Total Gross HHI : Ouput	0.46	0.34	0.34	0.27	N/A	0.31	0.36	0.27	0.46

Source: Geoffrey Butcher

1. Based on Statistics New Zealand's 2006-2007 inter-industry data.

National level comparable multipliers are shown overleaf.

Table 7 National multipliers in comparable industries

National multipliers - comparisons	Horticulture and fruit growing	Livestock and cropping farming	Forestry & forestry services	Fishing	Oil and gas exploration and extraction	Meat and meat product manufacturing	Dairy product manufacturing	Other food manufacturing	Accommodation
Output (Type II Total impact)	2.66	2.71	2.75	2.56	2.26	2.96	3.16	2.42	2.56
Direct emp:Output	7.82	5.16	1.50	3.72	0.23	2.27	0.85	3.16	9.42
Total Emp:Output	16.25	13.54	9.85	10.74	5.56	11.83	11.09	9.85	16.62
Direct VA : Output	0.41	0.33	0.30	0.31	0.49	0.29	0.13	0.30	0.48
Total VA:Output	1.20	1.14	1.12	0.99	1.07	1.15	1.14	0.93	1.22
Direct Gross HHI : Output	0.29	0.19	0.10	0.16	0.07	0.16	0.07	0.17	0.34
Total Gross HHI : Output	0.73	0.61	0.57	0.53	0.39	0.63	0.64	0.53	0.73

Source: Geoffrey Butcher

2. Based on Statistics New Zealand's 2006-2007 inter-industry data.

5.2 Summary of operational impacts – year 6 and year 12

Four impacts are reported here – output, employment (FTEs), value added¹⁷ and household income. The impacts are further broken down into direct, indirect and induced impacts.

The results include an adjustment which has been made to ensure that there is no double-counting of the linkages between farming and processing.¹⁸

In addition, the results assume that the entity or entities farming the site pay the Ōpōtiki District Council a levy for development – the levy has not yet been negotiated between the parties so the amount in the business plan has been adopted. This figure is strictly confidential. A comment on the economic impact of levies is included at section 3.6.

Table 6 shows the total impacts from the operations of the marine farm, processing, transport, marine services and charter operations at year 6 and year 12. The first row shows the direct expenditure and employment in Ōpōtiki and Whakatāne. The second row shows the induced and indirect effects in addition to the direct effects. The third shows the total impact on the national economy. The amounts in figure 6 exclude construction expenditure and capital expenditure on the marine farm.

¹⁷ Value added or gross domestic product (GDP) is the value of sales minus the value of intermediate goods used in the production of that output. It is the most common measure of economic impact.

¹⁸ Specifically, the processing multipliers treat purchases of shellfish as an import – the purpose being to avoid feedback effects, and hence double-counting, of farming.

Table 8 Summary of operational impacts

		Year 6	Year 12
Direct impacts (Whakatane and Opotiki only)	Output (\$m)	4.4	40.0
	Employment (FTEs)	13.7	198.7
	Value Added (\$m)	2.9	26.1
	Of which Household Income (\$m)	0.7	8.3
Direct and induced impacts (Whakatane and Opotiki only)	Output (\$m)	5.7	53.2
	Employment (FTEs)	20.1	236.4
	Value Added (\$m)	3.4	33.5
	Of which Household Income (\$m)	1.0	10.7
Direct and induced impacts (National)	Output (\$m)	18.6	68.6
	Employment (FTEs)	73.4	318.2
	Value Added (\$m)	9.3	40.9
	Of which Household Income (\$m)	3.5	15.1

3. Uses Whakatōhea business case assumption about council development levies

The series of tables provided in Appendix 1 show how the impact is broken down into industry groupings.

5.3 Permanent local jobs created

By year 12, the combination of activities associated with the marine farm, processing, hatchery and associated services will generate 236 - 323 new FTE jobs¹⁹, and \$10.7 - \$14.1 million of additional gross household income for the Ōpōtiki and Whakatāne districts. Of these, around 44 FTEs will be created indirectly through flow-on activities in the regional economy. The lower estimate has been applied in the results for reasons of conservatism.

In addition, the construction activities that are likely to occur in and near Ōpōtiki will create 353.5 FTE job-years over the course of the construction in the Ōpōtiki and Whakatāne districts. Details of the jobs created can be found at section 5.4, which details the temporary economic impacts from construction.

¹⁹ Applying the base case projection in the Whakatohea business case central estimate would see employment at 243 FTEs. The range presented above is consistent with the Social Impact Study (Corydon, 2011).

Table 9 Employment data (FTEs)

Opotiki/Whakatane Employment	Year 12	Estimate at 16,000 gwt (FTE)	Estimate at 20,000 gwt (FTE)
<i>Direct jobs:</i>			
Bale store, processing and warehouse		124.7	196.7
Vessels		24.0	31.0
Factory cleaning		13.0	21.3
Hatchery		8.0	8.0
Commercial managers and administration		8.0	8.0
Factory engineering		7.3	7.3
On-water farm managers		2.0	2.0
Road transport		1.0	1.0
Property managers		1.8	1.8
Charter fishing or eco-tourism operators		1.5	1.5
Total direct employment		191	279
Effects on associated businesses and flow-on effects (Indirect and induced FTEs)		44	44
Total FTEs created, year 12		236	323

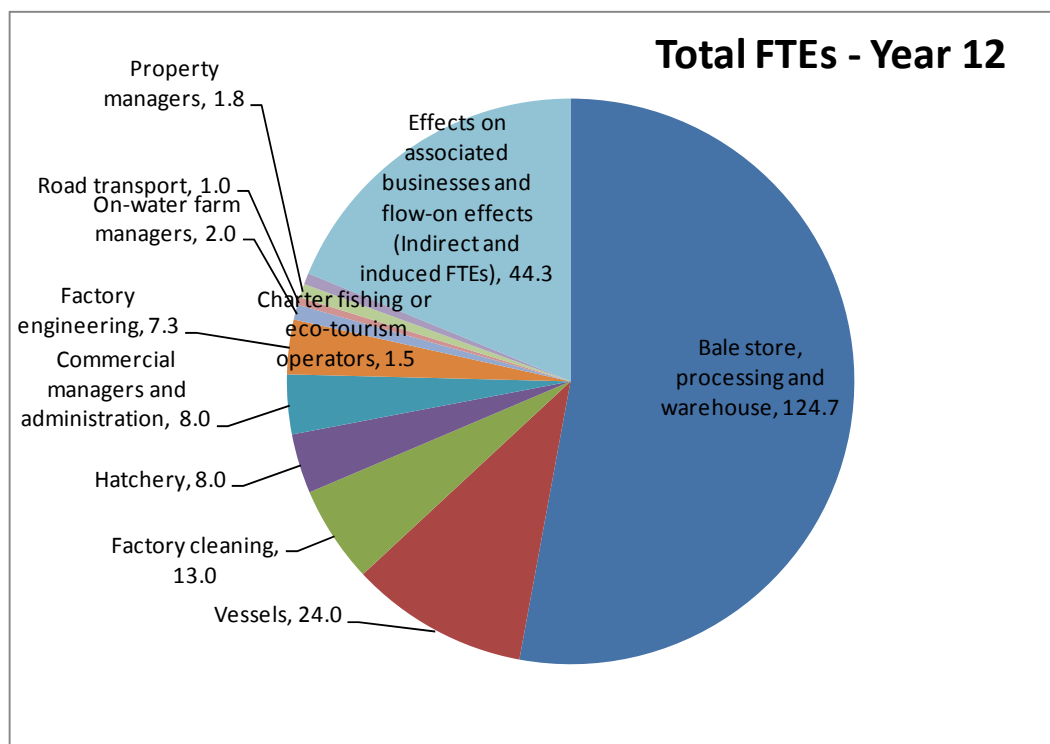
1. Employment estimates have been peer reviewed by Sapere Research Group and as part of the Whakatōhea business case development.

Source: Sapere Research Group

The type of jobs created is set out in the chart below.

Figure 6 Total FTEs created, Year 12, 16,000 tonnes

236 new jobs, \$10.7 million of additional gross household income



Source: Sapere Research Group, using data from the Whakatōhea business case, interviews conducted as part of the Social Impact Study (Corydon, 2011) and from Ōpōtiki District Council Limited.

1. Employment estimates have been peer reviewed by Sapere Research Group and as part of the development of the Whakatōhea business case.

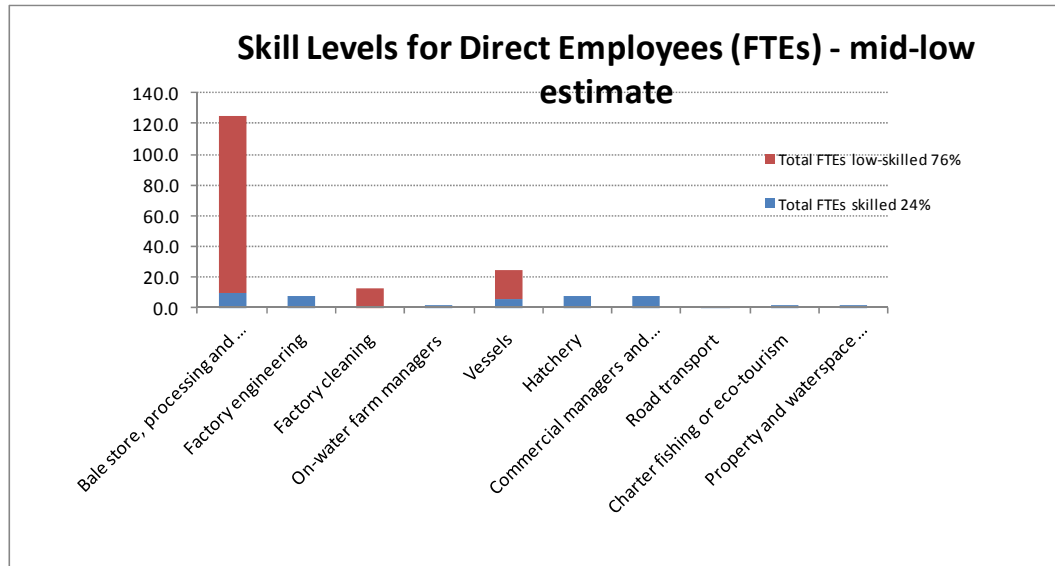
The figures above show FTEs, rather than an expected number of positions. The Social Impact study prepared in 2011 estimated that around 220 - 343 positions (depending on factory throughput²⁰) would be created to service the farm, processing factory and hatchery: a mix of full-time, part-time and seasonal. The base case business plan prepared for Whakatōhea Maori Trust Board, which was revised in 2012 following peer review, would translate to staffing needs of around 224 positions for the combined farm, factory and hatchery. In the FTE figures provided, the 220 - 343 positions translates to 187 – 274 FTEs.

There is a mix of skilled and unskilled work. According to the Social Impact Study (Corydon, 2011), around 80% of the jobs created will be relatively low-skilled (earning less than \$20 per hour wage), including for example factory processing, cleaning and deckhands. The Social Impact Study also noted that at least 50 jobs could be filled by people on the unemployment register. Higher skilled positions include team leaders, scientists and factory management

²⁰ The lower estimate assumes throughput of 16,000 tonnes per year and productivity of 100 GWT per FTE; the upper assumes throughput of 20,000 tonnes per year and lower worker productivity at 75 GWT per FTE.

As an area recording the highest ranking (10) on the Deprivation Index, any social and economic benefits that arise are likely to be more pronounced than what they would have been in more affluent communities.

Figure 7 Mix of skilled and unskilled work



Source: Corydon (2011)

1. “Skilled” is defined as earning more than \$20 per hour.

5.4 Temporary impacts from construction activities

A lot of construction activity is expected to occur in order to construct the wharf and harbour, and to build the processing factory and hatchery. There will be modest economic impacts of construction during the early years as farms are set up and then a significant construction impact during years 7 and 8 when the processing plant is built and harbour works are completed.

The construction estimates provided below show three types of construction activity, based on the description of construction contained in section 2.2:

- (i) Capital expenditure by aquaculture entities including ropes, buoys, anchors and so on, vessels, and all capital expenditure in relation to factory and hatchery;
- (ii) Works associated with the harbour entrance; and
- (iii) Works associated with the wharf.

The economic impacts of construction are temporary and one-off. For this reason it is typical to represent them as total impact, spread across the life of the construction works. It

is also typical to report ‘employment years’ rather than employment. This shows how many FTE years could be worked.

Construction activity associated with the farm, processing factory, hatchery, harbour works, wharf and other civil projects is expected to add \$31.2 million of added value to the Ōpōtiki and Whakatāne districts over the life of the construction. 353.4 job years will be created for the two districts, spread over 20 years but peaking in years 6 to 9. Nationally, the construction works add \$130.3 million of added value and over 1400 job years (this is spread over 20 years).

The table below shows three types of construction activity expenditure over the forecast period. Critically, it is important to recognise that these estimates do not recognise opportunity costs. That is, what else the money could have been spent on.

Table 10 Impacts of construction and capital spend over the forecast period

Summed over 20 year forecast period

	Total, over the life of the construction	Factory, farm and farm-related infrastructure spend by aquaculture entities	Harbour development	Wharf development	Total (NB the impact is spread over 20 years, peaking in years 6 - 9)
Direct and induced impacts (Whakatane and Opotiki only)	Type II Output (\$m)	71.2	52.5	7.6	131
	Employment (FTEs - job years)	95.7	225.1	32.6	354
	Value Added (\$m)	7.6	20.6	3.0	31
	Of which Household Income (\$m)	5.1	13.8	2.0	21
Direct and induced impacts (National)	Type II Output (\$m)	158.2	142.1	17.2	317
	Employment (FTEs - job years)	735.8	613.8	74.4	1,424
	Value Added (\$m)	63.7	59.4	7.2	130
	Of which Household Income (\$m)	40.3	36.8	4.5	81

Source: Sapere Research Group using data provided by Ōpōtiki District Council and contained in the Whakatōhea business case

5.4.1 Construction expenditure associated with marine farm, processing and hatchery buildings and associated works

The business case prepared for Whakatohea suggests that 800 longlines would be installed on the marine farm site over the first 12 years of the farming operation. This will require bouys, longlines, ropes and vessels. In addition, it will build a processing factory and a hatchery facility. This will require new building construction and site works, and the construction of tanks for the hatchery.

The table below shows a breakdown of the construction expenditure that would be anticipated if 800 lines were installed (this estimate does not include levy-funded expenditure on the wharf or harbour).

These are summary figures. The expenditure figures used in the calculation of the multiplier were more detailed, and distinguished between items supplied within the district by participants in wholesale and retail trade and items manufactured within the district.

Table 11 Breakdown of construction expenditure associated with marine farm, processing, hatchery and associated works, by location of initial spend

Total over the life of the construction

	Opotiki and Whakatane Districts (\$ million)	NZ wide, incl. Opotiki (\$ million)	Total (incl. imports)
<u>Investment on on-water infrastructure</u>			
On water capital costs (Markers, bouys, ropes etc), includes spat catching	13.0	36.8	36.8
Vessels	0.0	9.2	9.2
Total farming capital investment	13.0	46.0	46.0
<u>Hatchery</u>			
Hatchery infrastructure	0.1	0.1	0.1
Hatchery land and building	0.6	0.6	0.6
Hatchery ponds	0.5	0.5	0.5
Hatchery plant, equipment, IT, furniture	0.4	0.4	0.7
Contingencies	0.1	0.1	0.1
Total hatchery capital investment	1.6	1.7	2.0
<u>Mussel processing plant</u>			
Processing factory infrastructure	1.1	1.1	1.1
Processing land, building and design	4.4	6.8	6.8
Plant, systems, equipment, IT, furniture	1.5	13.8	13.8
Total processing capital investment	7.1	21.7	21.7
Total	21.7	69.3	69.6

Source: Whakatōhea business case, aggregated by Sapere Research Group

5.4.2 Civil works

The table below shows the breakdown of construction expenditure on the wharf and harbour. These figures show the initial spend, not the multiplied impact.

These are summary figures. The expenditure figures used in the calculation of the multiplier were more detailed, and distinguished between items supplied within the district by participants in wholesale and retail trade and items manufactured within the district.

Table 12 Wharf and harbour entrance construction expenditure, by location of initial spend

Total over the life of the construction

Construction and capital expenditure breakdown - Wharf and harbour development	Opotiki and Whakatane Districts (\$ million)	NZ wide, incl. Opotiki (\$ million)
<u>Harbour entrance construction:</u>		
Establishment / Site Management	4.6	4.6
Construct Training Walls	18.4	23.0
Rivermouth Embankment	6.7	8.4
Dredging	0.0	5.7
Access Road Upgrade	0.5	0.5
Design	0.0	2.8
Contingency (10%)	0.0	4.5
Total harbour entrance	30.2	49.5
<u>Expenditure on wharf construction:</u>		
Steel purchase	0.0	1.9
Concrete purchase	0.03	0.3
Ashphalt and contractor	0.0	0.2
Earthworks including geotextile and consolidation treatment	2.5	2.5
Pipework, cabling, lighting, fendering (e.g rubber on wharf front)	0.9	1.1
Total wharf construction	3.4	6.0

Source: Ōpōtiki District Council

6. Conclusion

In conclusion, the combination of the aquaculture venture and the wharf and harbour development is likely to add significantly to the economic life of the Ōpōtiki and Whakatāne districts. The estimates generated by this study anticipate that the Ōpōtiki and Whakatāne district economies will have \$33.5 million of additional value added in circulation, and an additional 236.4 FTE jobs. Nationally, there will be an additional \$40.9 million in added value in circulation, and 318.2 FTE jobs.

In addition, the construction activity associated with the farm, processing factory, hatchery, harbour works, wharf and other civil projects is expected to add \$31.2 million of added value to the Ōpōtiki and Whakatāne districts over the life of the construction. 353.4 job years will be created for the two districts, spread over 20 years but peaking in years 6 to 9. Nationally, the construction works add \$130.3 million of added value and over 1400 job years (this is spread over 20 years).

The methodology does not allow for estimates of opportunity cost, that is, what alternative investments might have been made if the capital was put to other uses. What is clear, however, is that this is a real and present opportunity to create jobs and wealth in the Eastern Bay of Plenty region.

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Appendix 1 Breakdown of operational impacts into industry sectors

Hatchery and farming operations			
		Year 6	Year 12
Direct impacts	Output (\$m)	3.7	13.7
	Employment (FTEs)	12.0	34.0
	Value Added (\$m)	2.6	9.9
	Of which Household Income (\$m)	0.6	1.8
Direct and induced impacts (Whakatane and Opotiki only)	Output (\$m)	5.0	17.0
	Employment (FTEs)	17.7	50.1
	Value Added (\$m)	3.2	11.6
	Of which Household Income (\$m)	1.0	2.7
Direct and induced impacts (National)	Output (\$m)	6.96	23.30
	Employment (FTEs)	26.6	79.1
	Value Added (\$m)	4.2	15.1
	Of which Household Income (\$m)	1.4	4.3
Opotiki processing operations			
		Year 6	Year 12
Direct impacts	Output (\$m)	-	39.8
	Employment (FTEs)	-	152.6
	Value Added (\$m)	-	17.5
	Of which Household Income (\$m)	-	6.2
Direct and induced impacts (Whakatane and Opotiki only)	Output (\$m)	-	47.7
	Employment (FTEs)	-	180.1
	Value Added (\$m)	-	21.5
	Of which Household Income (\$m)	-	7.4
Direct and induced impacts (National)	Output (\$m)	-	56.87
	Employment (FTEs)	-	232.8
	Value Added (\$m)	-	25.5
	Of which Household Income (\$m)	-	10.2

Tauranga processing operations			
		Year 6	Year 12
Direct impacts	Output (\$m)	-	-
	Employment (FTEs)	-	-
	Value Added (\$m)	-	-
	Of which Household Income (\$m)	-	-
Direct and induced impacts (Whakatane and Opotiki only)	Output (\$m)	-	-
	Employment (FTEs)	-	-
	Value Added (\$m)	-	-
	Of which Household Income (\$m)	-	-
Direct and induced impacts (National)	Output (\$m)	10.80	-
	Employment (FTEs)	44.2	-
	Value Added (\$m)	4.8	-
	Of which Household Income (\$m)	1.9	-
Transport operations			
		Year 6	Year 12
Direct impacts	Output (\$m)	0.03	0.15
	Employment (FTEs)	0.2	1.0
	Value Added (\$m)	0.0	0.1
	Of which Household Income (\$m)	0.0	0.0
Direct and induced impacts (Whakatane and Opotiki only)	Output (\$m)	0.04	0.40
	Employment (FTEs)	0.3	2.3
	Value Added (\$m)	0.0	0.2
	Of which Household Income (\$m)	0.0	0.1
Direct and induced impacts (National)	Output (\$m)	0.08	0.40
	Employment (FTEs)	0.4	2.3
	Value Added (\$m)	0.0	0.2
	Of which Household Income (\$m)	0.0	0.1

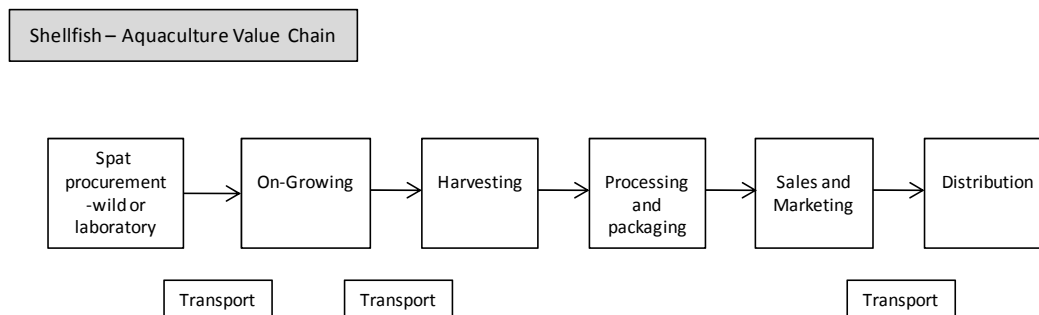
Harbour, wharf and property management			
<i>Assumes levy at higher end of Council expectation - not used as part of main results</i>			
		Year 6	Year 12
Direct impacts	Output (\$m)	0.4	1.4
	Employment (FTEs)	-	1.8
	Value Added (\$m)	< 0	< 0
	Of which Household Income (\$m)	-	0.2
Direct and induced impacts (Whakatane and Opotiki only)	Output (\$m)	0.4	1.4
	Employment (FTEs)	-	1.8
	Value Added (\$m)	< 0	< 0
	Of which Household Income (\$m)	-	0.4
Direct and induced impacts (National)	Output (\$m)	0.41	1.44
	Employment (FTEs)	-	1.8
	Value Added (\$m)	< 0	< 0
	Of which Household Income (\$m)	-	0.4
Charter boats and associated services			
		Year 6	Year 12
Direct impacts	Output (\$m)	0.3	0.3
	Employment (FTEs)	1.5	1.5
	Value Added (\$m)	0.1	0.1
	Of which Household Income (\$m)	0.0	0.0
Direct and induced impacts (Whakatane and Opotiki only)	Output (\$m)	0.3	0.3
	Employment (FTEs)	2.1	2.1
	Value Added (\$m)	0.2	0.2
	Of which Household Income (\$m)	0.1	0.1
Direct and induced impacts (National)	Output (\$m)	0.34	0.34
	Employment (FTEs)	2.1	2.1
	Value Added (\$m)	0.2	0.2
	Of which Household Income (\$m)	0.1	0.1

Appendix 2 Aquaculture industry background

Industry overview

The aquaculture industry consists of a value chain starting with suppliers of inputs for marine farms such as spat, ropes and so on, to distributors and exporters or to industries which use aquaculture products in their goods (e.g. nutraceuticals, cafes and restaurants). The aquaculture industry value chain was summarised by PricewaterhouseCoopers (2006) and was described as covering functions ‘from seabed to plate’. These functions are illustrated below.

Figure 8 Aquaculture value chain (Source: PricewaterhouseCoopers (2006))



Global aquaculture

Aquaculture is the fastest growing food production system in the world. For the past 20 years, global production from aquaculture has steadily increased. This trend is projected to continue, especially for low energy intensive farming.

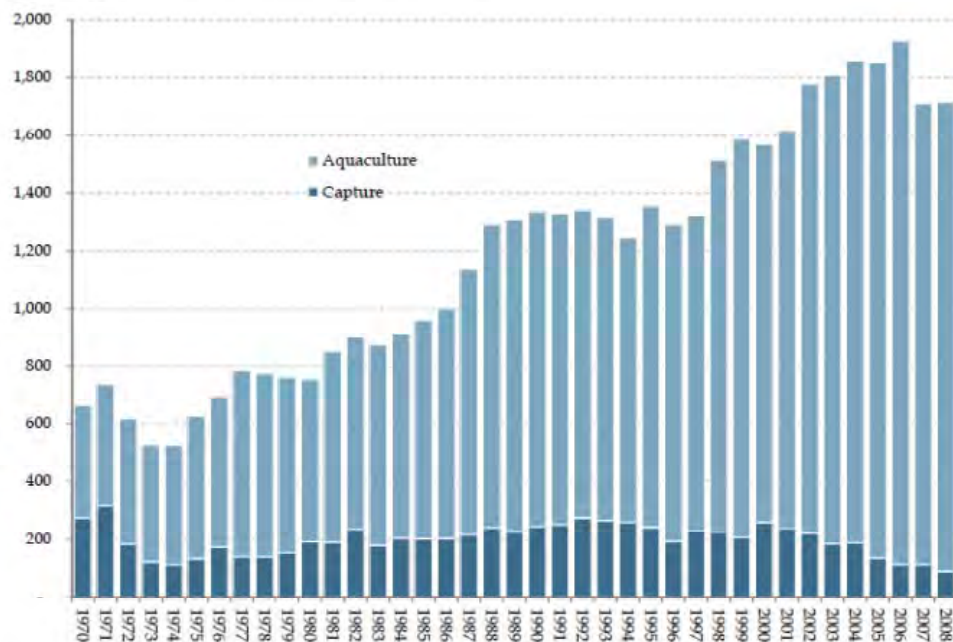
On a global scale, aquaculture is already a major contributor to meeting the needs of world food production, with the UN Food and Agriculture Organisation (FAO) stating that aquaculture now contributes half of the fish consumed by the human population worldwide²¹. This trend is likely to continue, with increasing world population, exploitation of existing global fisheries, and growing prosperity in Asian countries driving international demand.

Global mussel aquaculture production has grown at a cumulative average growth rate (CAGR) of 2% over the past decade. While New Zealand’s production of greenshell

²¹ UN Food and Agriculture Organisation “The State of the World Fisheries and Aquaculture” 2008

mussels plateaued over the past few years, the production of other species of mussels (primarily from Asia) continues to grow.²²

Global mussel volume by species: aquaculture & capture
(t, 000; 1970-2008)



Source: UN Food and Agriculture Organisation (FAO) "The State of World Fisheries and Aquaculture" 2008

New Zealand's traditional markets for mussels are the United States, Canada, Europe and Australia²³. While these traditional markets are still important, particularly Europe where higher returns for products are achieved, the areas of growth in recent years have been Australia and Asia, particularly South East Asia.

Mussel exports and export prices

Globally, only 12 percent of the total worldwide mussel production is exported to other countries. New Zealand exports the bulk of its mussels, and as a consequence, exports of New Zealand Greenshell mussels make up 27 percent of global mussel export value.²⁴ As New Zealand is the only country that produces Greenshell mussels, 100 percent of the exports of Greenshell mussels come from New Zealand.

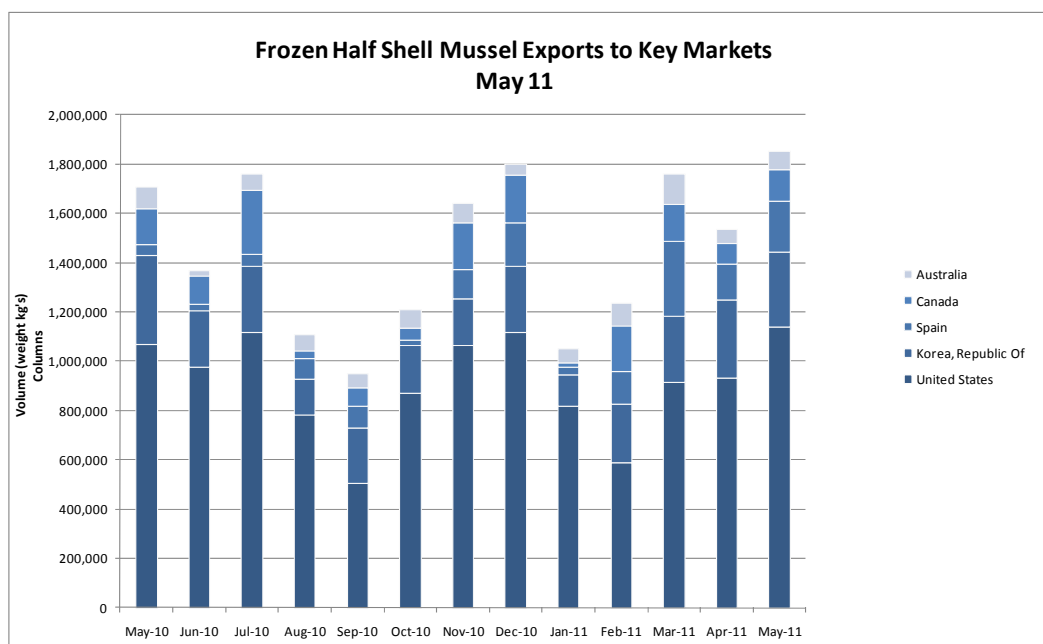
The price that 'sets the market' for New Zealand exporters tends to be the export price to the United States market, which is dominated by frozen halfshell mussels. Frozen halfshell

²² UN Food and Agriculture Organisation (FAO) FishStat, with analysis from Coriolis Limited (unpublished report)

²³ Aquaculture New Zealand export database.

²⁴ Ibid.

(HS) mussels make up 77 percent of the value of mussel exports from New Zealand (83 percent by weight)²⁵.



Source: *Aquaculture New Zealand export statistics*

Export prices for mussels are notoriously volatile, with the main driver for variation being the prevailing exchange rate. According to processors, prices in the previous season averaged out to US\$2.00 – US\$2.10/lb for 1st grade product. Not all of the effect of price variability flows through to mussel processors, however. In aquaculture, as in other export driven industries in New Zealand, the domestic market acts as a shock absorber for changes in global price and global demand. If domestic supply for export grows, domestic demand will grow through the domestic market receiving the “export reject” with availability at low prices that will stimulate domestic consumption.

New Zealand aquaculture

New Zealand’s aquaculture industry was first established in the 1960s and comprises approximately 6,250 hectares of farmed space. Predominately this is taken up by mussel farms (particularly in Marlborough Sounds, Golden Bay and Coromandel), with a significant oyster farming industry (particularly in Northland and Auckland), some areas for scallop growing and a small number of salmon farms. In 2010, aquaculture production in New Zealand was as follows:

²⁵ Aquaculture New Zealand export database, statistics for June 2010 – May 2011.

Aquaculture production in New Zealand, 2010

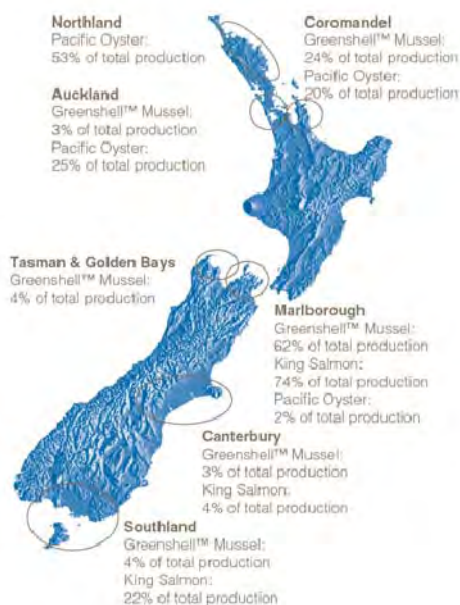
Species	NZ Greenshell mussels	NZ Pacific Oysters	NZ King Salmon	Paua
Production	92,000 GWT	2,439 GWT	12,893 GWT	Approx. 10 GWT

Source: *Aquaculture New Zealand*

Currently aquaculture makes up approximately 20% of the total fisheries production in value, and 15% of New Zealand's seafood exports by revenue. Research is underway by the industry and research institutions to explore options for farming new species, for example kingfish and hapuka, and to increase the quality and quantity of yields of existing farmed species. The aquaculture industry is recognised as a growth industry with aspirations for the New Zealand aquaculture sector to have sales of \$1 billion per annum by 2025.²⁶

Aquaculture growing areas, Aquaculture NZ, 2010

Major Aquaculture Areas in New Zealand



Source: *Aquaculture New Zealand Levy Production 2010*

²⁶ New Zealand Aquaculture Council (2006).