Australasian Agribusiness Perspectives
2021, Volume 24, Paper 11
ISSN: 2209-6612

Environmental Issues in the Tasmanian Salmon Supply Chain, and Commercial Response

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Abstract

Issues concerning the environmental impacts associated with the Tasmanian farmed salmon industry have been brought into sharp focus recently. In this paper, we examine the broader adoption of an existing technology for the industry to minimize future poor environmental outcomes. Its introduction is described from a broad supply chain perspective and from the point of view of commercial firms.

Keywords: Tasmania, farmed salmon, environmental externalities, farming practices

Introduction

The farmed salmon industry is the largest primary industry in Tasmania, with increasing gross revenue that reached $830 million in 2018-19 (Briscoe, 2020). It is also the nation's largest seafood product by volume, reaching 58,000 tonnes in 2018-19 and predicted to grow to some 70,000 tonnes by 2021-22 (ABARES, 2020).

Salmon farming in Tasmania is mainly undertaken by three large, vertically integrated companies that grow fish from eggs to harvest and value add to a final product. The companies are Tassal Group Limited, Huon Aquaculture, and Petuna. All three companies started in Tasmania and remain based there (Credit Suisse, 2015; Tassal, 2020).

Salmon supply chains are focused on production and delivery costs, and time in association with shelf life. Costs of regulatory compliance, and of accreditation for product attributes such as sustainability, add to supply chain costs but also serve aspects of consumer demand so as to add value.

The salmon farms are located primarily in estuarine locations such as Macquarie Harbour on Tasmania's west coast, using the technology known as "inshore" aquaculture. The salmon pens are in sheltered areas to occasion access, and flow of inputs and product. Currents are weak in such locations and this can lead

to the build-up of waste, and reduced oxygen levels. These impacts are less likely in an "offshore" setting, where currents are stronger and better disperse waste (Environment Tasmania, n.d.).

A build-up of waste and an associated reduced oxygen level in Macquarie Harbour in 2015 led to an outbreak of disease and many fish died. Some pens were required to be destocked and quotas for the amount of fish allowed in the harbour were reduced (Environment Tasmania, n.d.). Related consumer concerns are reflected in a survey published by Minshull & Brown (2017), reporting that 14 per cent of respondents had concerns over the environmental impact of Tasmanian salmon farming and that these had stopped them from buying Tasmanian salmon. Issues concerning these environmental impacts have been brought into sharp focus recently with the publication of Richard Flanagan's book *Toxic: The Rotting Underbelly of the Tasmanian Salmon Industry* (Flanagan, 2021) and associated news reports (for example, Langenberg, 2021).

In this paper, we examine an alternative production system for the Tasmanian salmon industry to minimize future poor environmental outcomes. Its introduction is described from a broad supply chain perspective but with particular attention paid to incentives and options available to commercial salmon farmers.

The Role of Government in the Tasmanian Salmon Industry

The Tasmanian Government plays a significant role in the salmon aquaculture industry in Tasmania. It dictates the locations where salmon farming can and cannot occur. It requires that all marine farming operations must be licensed and with this license comes environmental compliance requirements. The license is a barrier to entry to the Tasmanian salmon industry and losing it for an incumbent operator would lead to a shutdown of production and the supply chain (DPIPWE, 2019).

Restricting farm locations, and limiting production and requiring environmental compliance, all help to reduce the negative externalities associated with this supply chain. The government intervention described appears justified as it would be expected that without it, the level of salmon farming would increase beyond what society demands when true costs are reflected. The presence of multiple salmon farmers competing for the same resources would also likely exacerbate the environmental problems, such as in the "tragedy of the commons".

The Australian government influences the salmon supply chain through quarantine restrictions. Currently whole salmon with heads on cannot be imported into Australia (EverBlu Capital, 2018). Food safety standards are also imposed (Food Standards Australia New Zealand, 2015) and Tasmanian businesses receive a subsidy from the Australian Government on shipping freight between Tasmania and mainland Australia. The large firms in the salmon supply chain are recipients of such subsidies.

Aspects of the Salmon Production and Supply Chain

The Tasmanian salmon farm operators are large vertically integrated enterprises with processing and packaging facilities, and the largest are listed on the Australian Securities Exchange. Details of their supply

chains can be found in their annual reports. They produce a wide range of salmon products and sell them domestically into both wholesale and retail markets. Some of the large companies serve export markets.

The companies offer a range of products. Fresh packaged salmon is sold at retailers, in varying weights, with various flavour enhancements, and with the skin on or off. Observations on one brand's 260g package from a large supermarket as a guide, on 8 June 2021 this salmon was listed at a price of $38.46 per kg with the skin on and $42.31 per kg with the skin off. These prices are the same regardless of any additional flavour enhancements such as a sauce. In comparison, that supermarket's home brand Tasmanian Atlantic salmon fillets, skin on, could be purchased for $25.50 per kg.

The prices outlined above indicate that removing the skin is a value adding activity – essentially packaging and branding. Conversely, adding a flavour enhancement does not appear to add any additional value. A simple explanation for the increased value might be the increased convenience to the customer. That is, not having to remove the skin themselves, being able to quickly choose the product from the refrigerator in the supermarket, and knowing easily where the fish has come from and how long it will last (shelf life).

Another common retail product is smoked salmon in both hot and cold smoked varieties. Again at a supermarket, a 250g package of cold smoked salmon, which is the closest comparison in weight to the freshly packaged salmon, sells for $53.33 per kg. This is a significant increase over the price per kg of fresh packaged salmon and shows that customers are willing to pay a greater amount as they derive more value. The price of smoked salmon varies depending on the weight of the package purchased but a like for like comparison of hot and cold smoked fish shows that in a 150g package cold smoked salmon sells for $53.33 per kg while hot smoked salmon sells for $60.00 per kg. The retailer for which this data was observed sells home brand for $46.67 per kg, rather less than for the producer's branded product. Hot smoking therefore creates the greatest value addition of the two options and increases the value customers derive from consumption.

A product called 'smoked salmon pieces for cooking' was also observed at retail. At one supermarket this salmon is sold in 200g packages for $37.50 per kg, a significant drop in price from the other smoked products. This reduced price indicates that the smoking process alone does not generate the higher value, but it is also to do with the 'pieces' of fish used and how they are presented. Further, firms produce and sell canned salmon. The retail price for a 95g tin of salmon regardless of flavour was observed to be $21.05 per kg. The reduced price per kg indicates that customers derive less value from canned salmon than the fresh alternatives. There are various domestic and imported salmon products and brands available. For example, and one supermarket's home brand sells for $13.68 per kg. This suggests competitive pressure on the price of canned salmon.

Pricing on whole fish sold at retail is more difficult to assess. A currently advertised price online for a fresh whole Tasmanian Atlantic salmon is $24.99 per kg. This is the lowest price per kg of the non-canned salmon products considered. This is not surprising given there have been no value-added actions taken except for gutting. When comparing this price per kg to that of the fresh fillets we can see filleting the fish creates significant additional value for the final customer.

The Productivity Commission (1996) stated that frozen Atlantic salmon sells for some 30 per cent less than fresh salmon. It also reported that the Australian domestic price for fresh Atlantic salmon was greater than the price received when fish were exported to Japan but that this margin is declining. It would be expected that customers prefer fresh fish to frozen, and that Australian fish sold in Australia would receive a price premium given the fact that with less distance to travel they would be fresher when sold. Anecdotal evidence support this, with one large firm confirming the domestic price advantage.

According to SBS (2017), "bigger fish mean bigger profits". This is because bigger fish attract a price premium, especially in export markets. The price premium on bigger fish indicates more value is being derived by the end customer, however costs of additional fish growth, and adjustments for quality, are not addressed in the report.

The fish in/fish out ratio, which illustrates how many kilograms of fish feed are used to produce a kilogram of salmon, is a measure of technical efficiency as well as being an indicator of the impact salmon production has on global fish stocks. It can be compared among species to determine the most sustainable production method. It is therefore a useful tool in demonstrating value, although has limitations such as indifference to species of fish used in feed, and how they were caught. Other indicators of sustainability include fish mortality level, greenhouse gas emissions per Head-on-and gutted (Hog) tonne, and water and energy usage. These are reported by the Tasmanian firms, for example (Tassal, 2016).

Impacts of Regulation on Supply Chain Performance

The regulatory regime directly impacts salmon supply chain costs. Site location has a big impact on transport costs and times. Licensing is costly, as is compliance such as monitoring and waste disposal. A move to a site further from shore would add to some of these costs, and shorten shelf life at the retail stage of the supply chain. The move would also increase greenhouse gas emissions. Compliance with increased environmental regulation could also have some positive impact on performance measures such as fish mortality.

The quarantine regime gives domestic producers an advantage as they have a salmon product (whole fish) which only they can produce. Additionally, removing the heads limits shelf life which also gives the domestic product an advantage over its imported alternative. Reduced competition from these quarantine restrictions helps boost performance in terms of domestic market share and profit margin.

Compliance with food safety standards add to costs along the supply chain, but also adds value as it gives consumers confidence in the products. Transport subsidies make Tasmanian business' more competitive against their mainland rivals (Aurecon, 2013). The subsidy reduces transport cost, while enhancing collaboration in the supply chain.

Salmon Supply Chain Actors and Governance Relationships

The large producing firms' focus is on salmon production and processing: feed, transport services, on selling and retailing tend to be in the hands of partners. Additional freight service providers are involved in moving the products around Australia as well as internationally. Supermarkets are active as on-

sellers/retailers who stock a large range of firms' branded salmon products. There are also independent food processors and manufacturers present in the supply chain. In 2018 an ABC news report (Whitson, 2018) detailed an agreement between two large Tasmanian salmon producers to share some of its supply chain operations.

For the salmon producers, the Aquaculture Stewardship Council offers third party environmental accreditation, and certification, for sustainable production. In turn, the producers' engagement with suppliers is contingent on approval. This ensures that suppliers, such as those supplying feed inputs, meet ethical, quality and food safety requirements. Sustainable suppliers therefore assist with producing a sustainable product. Tassal was the first salmon company to receive full Aquaculture Stewardship Council (ASC) certification, in 2016. This accreditation also promotes customer confidence and indicates performance along the entire chain. Burgess (2017) lays out difficulties encountered in maintaining the accreditation. Woolworths, one of the large retailers selling salmon products, state on their website (Woolworthsgroup.com.au) that they aim to have all farmed seafood third party certified. It seems likely that this commitment will means that such certification would also be required from producers (Ford, 2016).

The importance of freshness means that reducing transport time is a key driver of value for the salmon producers. Aurecon (2013) emphasizes this point in explaining how the supply chain for Tasmanian salmon has been designed to have no idle time. Deliveries are timed to meet transport cut off times, entailing TT-line waiting if a delivery is running late. This collaboration suggests flexibility in the governance model, possibly associated with the limited available transport options. Kumar (2015), for example, reported Tassal's transport costs to Asia, on a per kg basis, as a performance measure. This was done to illustrate the advantages Australia has over Norway, the other key supplier of Atlantic salmon. Although the lower transport costs would mean greater profit for Tassal than a competing Norwegian company, speed of delivery and not cost of transport is the key driver of value in salmon products.

The salmon producers' supply chains are driven by both cost and quality. Specifically, the interlocking competitive connections to feeds, processing and the powerful retail sector, provides a barrier to change. It favors non-collaborative behavior by supply chain actors who maximize individual profits rather than maximizing and sharing in overall supply chain surplus. This "chain failure" can be overcome by isolation and allocation of costs and benefits from a change in technology to actors within the value adding process, so as to maximize supply chain surplus.

An Alternate Technology to Increase Supply Chain Surplus

There are two alternatives to 'inshore' aquaculture - 'offshore' aquaculture, where pens are moved further out to sea, or 'onshore' aquaculture, where pens are placed on land (Minshull & Browne, 2017). Of the two, a move to offshore aquaculture seems the most feasible given it is the most similar to the current operations of the existing salmon producers. Tasmanian operator Huon Aquaculture has already begun farming offshore in a higher energy zone - following examples from Norway - demonstrating the feasibility of this method (Rabobank, n.d.). Onshore operations offer opportunities in waste collection and disposal, but the concept has not been examined for Tasmania.

A major impact of moving away from 'inshore' aquaculture is a lower environmental impact. However, in an environment of rising demand for salmon, firms will need more space, for more pens. More space is going to become increasingly harder to find if the Tasmanian Government becomes stricter about how many fish can be kept at one location. Stricter environmental conditions will also make all inshore locations more expensive to farm. The production of larger fish, which require more space in pens, may also be more easily accommodated in offshore locations. These factors support a move offshore for pragmatic reasons. As noted earlier, Huon Aquaculture already farms in Storm Bay, and the three main companies have recently been given initial State government approval to farm a combined total of 30,000 tonnes of salmon in Storm Bay (Morton, 2021). While a formal analysis of the range of costs and benefits is not possible in this paper, the revealed preference of the firms indicate that benefits outweigh the costs.

Progress towards full implementation requires collaboration with the large retailers, and with suppliers of inputs associated with sustainability such as feed and transport. Risks of chain failure are significant in that individual supply chain actors may choose not to recognize the value being added by a supplier's move offshore, and maintain their existing cost and payment relationships. Avoiding chain failure may be assisted by the strength of existing partnerships and shared experience in working in the Tasmanian commercial and policy environments, particularly in logistics.

Of the actors in the supply chain, the salmon producers will bear the greatest burden in implementing this change. This includes ensuring that farming practices can, technically, be performed further out to sea, and making necessary changes. Huon Aquaculture has already demonstrated that new pens are required for a move further offshore (Huon Aquaculture, n.d.). New boats may also be required to handle the greater distance between port and pens, and the stronger seas. Logistics adjustments to account for changed physical conditions will be needed by service provides along parts of the supply chain. The companies' land-based activities can likely remain unchanged during the transition, but choices are required about whether to move existing fish further out to sea, or to transition more slowly with only new fish being placed in offshore pens.

The foregoing shows that salmon producers' branding, which is associated with sustainability, adds value and is reliant on trust and reputation. Earlier environmental problems have presented challenges to this reputation and its enablers such ASC accreditation. Expanding output, while maintaining a strong reputation for sustainable production that adds value, does not seem possible without the move offshore. However, moving offshore presents the opportunity of enhancing this reputation and therefore adding even more value. The move offshore will also mean maintaining ASC accreditation, which facilitates products' remaining on the shelves of the large retailers.

Ensuring success will require alignment from the other actors in the supply chain. This particularly applies to the promotion of sustainability as value addition. Retail roles then include promoting the change to consumers and implementing a suitable pricing strategy, alongside promotion and other steps taken by producers and other supply chain actors.

Conclusion

This paper sketches an alternative production system for Tasmanian salmon supply chains entailing a move to 'offshore' salmon farms. Information about the large salmon producers is used to depict the likely benefits and costs of the alternative and their implications for the supply chain. Elements of current operations in production, the supply chain and market are employed to gauge the motivation for the change.

A move offshore for producers will increase supply chain surplus in the long term. The burden of the change in technology will mostly fall on producers as they experience all the costs. No significant changes in governance will be involved. However, the higher costs will be offset by the fact that producers will be able to expand operations to meet growing demand while also growing larger, more profitable fish with farming practices that are more sustainable. These factors will enable higher prices for salmon and potentially reduce costs per kg through increased scale.

The regulatory and policy environment, coupled with an increasing segment of consumers favoring sustainable production methods and known provenance, provide numerous incentives for change. Producers can also address a range of production changes, such as larger fish size, and do so more easily following the implementation of the new offshore system. Maintenance of supply chain relations under existing governance arrangements is likely to require change in terms of sustainability indicators, which may generate competition amongst the Tasmanian producers in selling to powerful retailers. Further cementing supply chain relationships in pursuit of the expected delivery of customer value will be essential in avoiding chain failure outcomes.

References

Aurecon (2013), 'Supply Chains in Tasmania', stategrowth.tas.com.au. Retrieved 11 May 2019 from http://www.stategrowth.tas.gov.au/__data/assets/word_doc/0005/88556/Tasmanian_Supply_Chains.docx.

Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) (2020), 'Australian fisheries and aquaculture outlook 2021'. Retrieved 23 May 2021 from https://www.agriculture.gov.au/abares/research-topics/fisheries/fisheries-economics/fisheries-forecasts

Briscoe, T. (2020), 'The rise and rise of Tasmania's Atlantic salmon industry, from zero to a billion dollars in three decades', ABC Rural, posted 1 December 2020. Available at: https://www.abc.net.au/news/rural/2020-12-01/tasmanian-atlantic-salmon-industry-growth-over-30-years/12923592

Burgess, G. (2017), 'Tassal given three months to clean up Macquarie Harbour salmon-farming leases', ABC News, posted 20 May 2017. Retrieved 25 June 2021 from https://www.abc.net.au/news/2017-05-19/tassal-given-three-months-to-clean-up-macquarie-harbour-leases/8542900

Credit Suisse (2015), 'Tassal Group', credit-suisse.com. Retrieved 11 May 2019 from https://plus.credit-suisse.com/rpc4/ravDocView?docid=mxoUQH

Department of Primary Industries, Parks, Water and Environment (DPIPWE) (2019), 'Sustainable industry growth plan for the salmon industry', Retrieved 11 May 2019 from https://dpipwe.tas.gov.au

EverBlu Capital (2018), 'Seafood Industry Report', everblucapital.com. Retrieved 11 May 2019 from http://www.everblucapital.com/wpcontent/uploads/2018/02/Seafood_Industry_Report_.pdf

Environment Tasmania (n.d.), 'Cleaning up Tasmanian Salmon'. Retrieved 11 May 2019 from https://d3n8a8pro7vhmx.cloudfront.net/marine/pages/776/attachments/original/1479256732/Cleaning_up_Tasmanian_Salmon._FINAL.pdf?1479256732

Flanagan, R. (2021), Toxic: The Rotting Underbelly of the Tasmanian Salmon Industry, Penguin Random House, Sydney and Melbourne.

Food Standards Australia New Zealand (2015), 'Food safety standards (Australia Only)', foodstandards.gov.au. Retrieved 11 May 2019 from http://www.foodstandards.gov.au/industry/safetystandards/Pages/default.aspx

Ford, Sean (2016), 'Woolies plan secures Tassal plant's future', The Advocate. Retrieved 22 May 2019 from https://www.theadvocate.com.au/story/3949894/woolies-plan-secures-tassal-plantsfuture/

Huon Aquaculture (n.d.), 'Huon's Fortress Pens', huonaqua.com.au. Retrieved 11 May 2019 from https://www.huonaqua.com.au/our-approach/future-fish-farming/huons-fortresspens/

Kumar, Kalyan (2015), 'Australia to increase salmon exports to China', ibtimes.com.au, International Business Times. Retrieved 11 May 2019 from https://www.ibtimes.com.au/australia-increase-salmon-exports-china-1476756

Langenberg, A. (2021), 'Author Richard Flanagan unleashes tirade against salmon farming industry', ABC News 22 April. Retrieved 23 May 2021 from https://www.abc.net.au/news/2021-04-22/richard-flanagan-allegations-salmon-farm-expansion/100085142

Minshull, L. & Browne, B. (2017), 'Salmon Stakes Risks for the Tasmanian Salmon Industry', tai.org.au, The Australian Institute. Retrieved 11 May 2019 from http://www.tai.org.au/sites/default/files/P429%20Salmon%20stakes%20FINAL_0.pd f

Morton, A. (2021), 'Tasmania's salmon industry expansion has no sound scientific basis, expert who quit review panel says', The Guardian, April 28. Retrieved 25 June 2021 from https://www.theguardian.com/australia-news/2021/apr/28/tasmania-salmon-industry-expansion-has-no-sound-scientific-basis-expert-who-quit-review-panel-says

Productivity Commission (1996), 'Australian Atlantic Salmon: Effects of Import Competition', pc.gov.au. Retrieved 11 May 2019 from https://www.pc.gov.au/research/supporting/salmon/salmon.pdf

Rabobank (n.d.), 'Huon Aquaculture', rabobank.com.au. Retrieved 11 May 2019 from https://www.rabobank.com.au/about-rabobank/our-clients/huon-aquaculture/

SBS News (2017), 'Bigger fish means bigger profit for Tassal', sbs.com.au. updated 23 August, Retrieved 11 May 2019 from https://www.sbs.com.au/news/bigger-fish-means-bigger-profit-for-tassal

Tassal Group Limited (2016), 'Sustainability Report 2016', tassal.com.au. Retrieved 11 May 2019 from http://www.tassal.com.au/wp-content/uploads/2013/12/Tassal-SustainabilityReport-2016.pdf

Tassal Group Limited (2020), 'Annual Report 2020', https://tassalgroup.com.au/investors/reports/annual-reports/

Woolworth Group Limited (2021), Woolworths.com.au. Retrieved 8 June 2021 from https://www.woolworths.com.au/shop/search/products?searchTerm=tassal

Whitson, Rhiana (2018), 'Tassal, Petuna joint venture in Macquarie Harbour not a PR exercise, companies say', ABC News. Retrieved 11 May 2019 from https://www.abc.net.au/news/2018-05-17/tassal-petuna-joint-venture