Costs and opportunities for Scottish products with higher value status: Salmon Producers

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Abbreviations

ASC	Aquaculture Stewardship Council	MCS	Marine Conservation Society
COO	country of origin	PFN	Protected Food Name
Defra	Department for Environment Food & Rural Affairs	PGI	Protected Geographical Indication
EEA	European Economic Area	UK	United Kingdom
EU	European Union	WTP	Willingness to pay
GI	Geographical Indication		

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1. Introduction

A key benefit claimed for food and drink products with higher value status, such as protected food names (PFNs), is that they can protect from imitation products that are produced in a specific area according to specific traditional processes. A number of studies suggest that there is, or has been, value in Scottish food and drink products with higher value status. However, it is unclear where and to what extent PFNs generate economic value. Moreover, the regulatory environment is now more complex as a result of the United Kingdom (UK) leaving the European Union (EU).

The aim of the research project of which this study forms part is to review the costs and opportunities for Scottish products with higher value status. This study is a qualitative review of these issues, as they relate to salmon products, based on semi-structured interviews with key informants, which will inform subsequent quantitative analysis.

The term 'high value status' was left open in this research so as not to miss new developments, but refers to food and drink products that tend to be regarded as selling for a premium relative to generic alternatives. Such 'premiumisation' will tend to be based on branding but will often, in addition, incorporate a claim, whether certified or not, concerning provenance and/or quality.

Some 'higher value' designations provide legal protection for producers as well as an indication of quality and/or provenance. The regulatory environment for food and drink products with higher value status is complex, with the level of protection and support varying between countries. Some countries, for example, tend to be hostile to the use of protected geographical indications (PGI). In the UK, the regulatory and economic environments for higher-value food and drink products have become more complex in recent years with heterogenous effects on products.

2. Context for the Study

This study of Scottish Farmed Salmon PGI builds on our systematic review *Costs and opportunities for Scottish products with higher value status* (Slater *et al.* 2023) and subsequent systematic review focusing on Scottish Farmed Salmon PGI[1], *Costs and opportunities for Scottish products with higher value status: Systematic literature review – salmon update* (Slater *et al.* 2024), which identified few peer-reviewed studies of Scottish salmon products. The themes emerging from this involved consumer trust in certification, costs and regulation barriers for businesses, and collection and use of data by all stakeholders when devising policy.

Scottish salmon has a long-standing good reputation. However, this is at risk from the deep distrust that has developed between stakeholders (Scot Gov 2022, 4). It is also under increasing competitive pressure from other countries which are expanding production and where regulations and costs are lower (Slater *et al.* 2024, 9-10).

The UK salmon farming sector is the third largest in the world (Seafood Source 2023), though UK salmon production is small compared to other producers (Pandey *et. al.* 2023). Scottish salmon was the UK's largest food export by value in 2022 (Fish Focus 2023), with a farm gate value of over £1 billion (Gov UK 2023a), contributing £94.1 million in tax to the Scottish and UK Governments in 2018 (Scot Gov 2003b). According to the industry association – Salmon Scotland - salmon farming employs more than 2,500 people (Salmon Scotland 2023) and supports 10,000 jobs and over 3,600 Scottish companies through the supply chain (Salmon Scotland 2024). Seafood processing also contributes to the Scottish economy (£406 million GVA) (Scot Gov 2023a). There is a premium for Scottish salmon, how much this benefits some producers is unclear: loss of salmon production might have significant negative impacts in some remote rural areas however, the aquaculture sector is consolidated many and few other functions (corporate headquarters, feed production etc.) are present in areas where salmon farms are located.

Several welfare and sustainability labels are used to certify the quality of salmon with GlobalG.A.P. the most common label used on Scottish farmed salmon (Marine

[1] As of 24 April 2024, the UK PGI is Scottish Salmon PGI (https://www.gov.uk/protected-food-drink-names/scottish-farmed-salmon#full-publication-update-history, accessed 18-Oct-2024).

Conservation Society (MCS) (no date)). Farmed salmon has protection via the Scottish Farmed Salmon PGI and benefits from using Label Rouge - a French high quality assurance scheme (INAO 2024).

Few studies have examined consumer preferences for salmon labelling schemes and willingness to pay (WTP) (Thogersen 2023; Slater *et al.* 2023). The only study on sustainable fish, Mulazzani *et al.* (reviewed in Slater *et al.* 2023), found Italian consumers were WTP a premium of over 25%. In the USA, McKinsey and NielsenIQ (2023) found that wide range of consumers, across socio-economic characteristics, buy products with sustainability labels including seafood. Consumer WTP for Scottish salmon will be analysed elsewhere in this research project (Objectives 8.3 and 8.4).

3. Methods

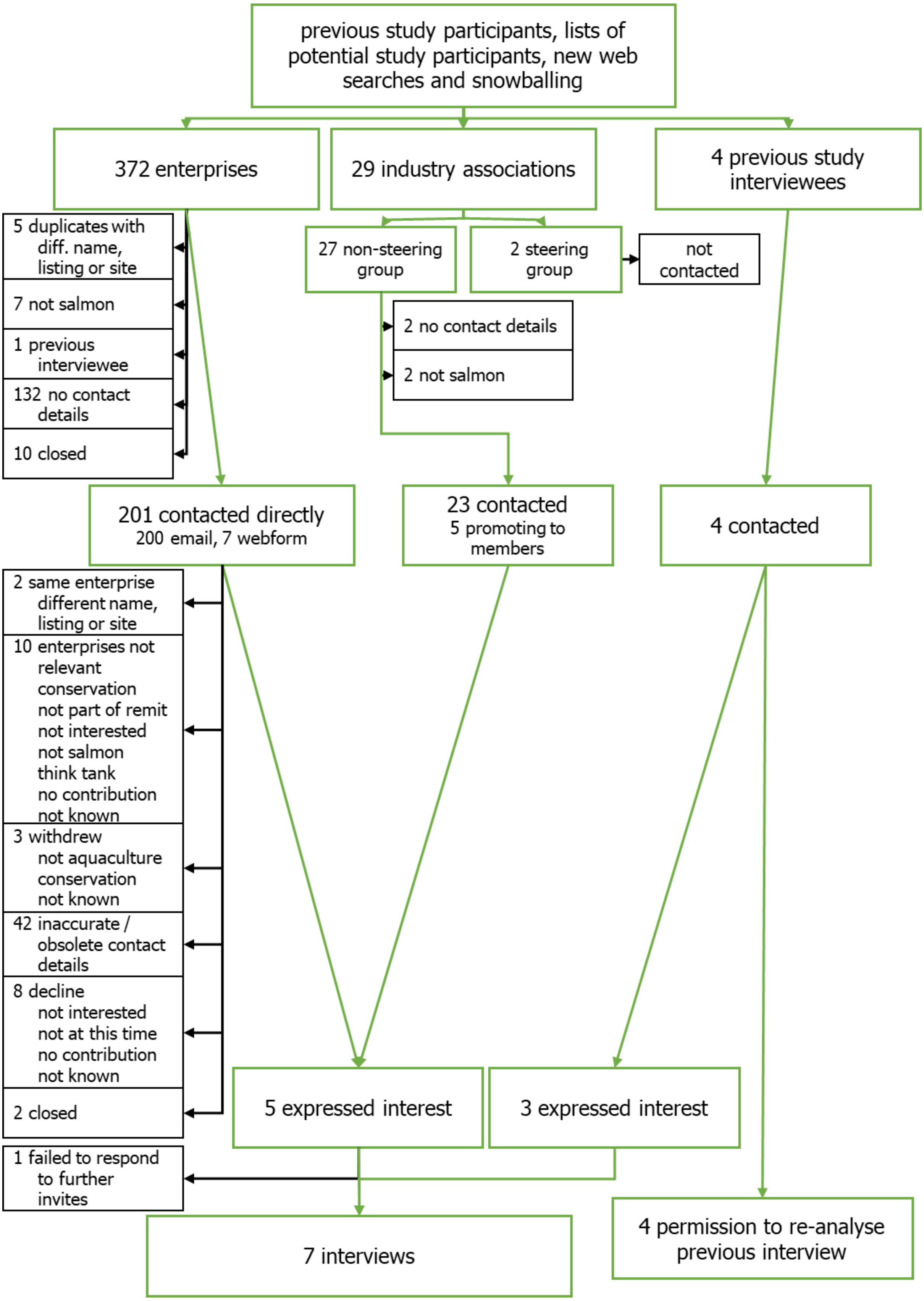
3.1 Participant recruitment

Interviewees were recruited between January and March 2024 using purposive sampling, on the basis of first-hand experience of and/or expertise on the interview topics, and were drawn from those involved in producing, using and marketing salmon products and from those with relevant policy and legal expertise. Several types of source were used to identify potential participants: researchers' contacts in the industry; lists of food producers generated for previous research from internet searches of food sector associations and promotional websites; database searches of relevant producers; and LinkedIn. Snowball sampling was also used, interviewees being invited to pass details of the research to anyone they thought might wish to participate. Selection of enterprises to contact was done by RS and was based on several criteria: involved in salmon production; located in Scotland; background internet searches indicated not part of another enterprise on the list.

More than 400 businesses and industry associations involved in salmon production were identified and 201 were invited to participate in the study. Potential interviewees were contacted by email or web contact forms. Figure 1 (next page) shows the recruitment process and the numbers of potential respondents at each stage.

Figure 1 (overleaf). Selection and characteristics of the interview sample

Notes:
1 from internet search results
2 total number contacted is not a sum of different methods as some enterprises were contacted by multiple methods


previous study participants, lists of potential study participants, new web searches and snowballing
372 enterprises
29 industry associations
4 previous study interviewees
5 duplicates with diff. name, listing or site
7 not salmon
1 previous interviewee
132 no contact details
10 closed
27 non-steering group
2 steering group
not contacted
2 no contact details
2 not salmon
201 contacted directly
200 email, 7 webform
23 contacted
5 promoting to members
4 contacted
2 same enterprise different name, listing or site
10 enterprises not relevant
conservation
not part of remit
not interested
not salmon
think tank
no contribution
not known
3 withdrew
not aquaculture
conservation
not known
42 inaccurate / obsolete contact details
8 decline
not interested
not at this time
no contribution
not known
2 closed
5 expressed interest
3 expressed interest
1 failed to respond to further invites
7 interviews
4 permission to re-analyse previous interview

3.2 Data gathering and analysis

In-depth, semi-structured telephone interviews were conducted in February and March 2024. Interview topics (see Appendix) included: quantity and prices for the specified products; production costs and the trade-offs involved between product quality and processing; the pros and cons of PFN labelling and certification; the policy and trade environment; and the perceived usefulness informal networking and formal networking organisations and events. It was decided to include questions on the impact of ongoing inflationary pressures[2].in the interview schedule.

Seven interviews were conducted, all by RS. Interviews lasted between 33 and 62 minutes, the mean being 44 minutes. Interviews took place using Microsoft Teams and were audio-recorded by RS and transcribed in full by an external contractor. Transcripts were analysed in NVivo 1.6.1 (QSR International, USA) by RS. Data were coded axially according to the interview topics (Table 1).

Code	
Business	Type Size Length of time in business
Products produced	
Inputs	
Outputs	
Assurance schemes	
Policy and trade environment	

Table 1. Axial codes used for analysing interviews.

3.3 Strengths and limitations of this research

The main limitation of qualitative research is that its findings cannot be generalized (Maxwell 1992, Daymon & Holloway 2010). However, such was not the intention here. This research studied specific phenomena in their socio-economic context in order to understand them better. This plays to the strength of qualitative research, which seeks to break down normative assumptions, provide explanatory depth for observed attitudes and patterns of behaviour and allow unanticipated associations and factors to come to light. Its findings form a useful basis for constructing possible interventions

[2] E.g. following the Russian invasion of Ukraine in February 2022.

and the quantitative research necessary to test their impact. It can also provide findings that are useful when seeking to understand the views of people in similar contexts (Maxwell 1992, Daymon & Holloway 2010).

It is important to keep in mind that these interviews are not necessarily representative of the wider population: individuals who are more able and willing to respond are more likely to participate. Interpretation must be taken in the context of the question asked, as not every interviewee answered all the questions, nor provided additional detail.

The main limitation with this research is the small number of participants (n=7). While there is no hard-and-fast rule on the optimum number of interviewees for qualitative research, there remains a risk that we did not reach data saturation. We sought to reduce this risk by drawing on interviews conducted for a previous study (Watts and Slater 2022) on geographical indications (GI), that focused on fish. Transcripts from this study were examined for mentions of fish and salmon, and, after reconsenting the participants concerned, four transcripts were re-coded axially according to interview topics in Table 1. Three previous participants also agreed to be re-interviewed. The difficulties of gaining access to people known to meet the selection criteria, and the small number of people from the selected sample that we were able to contact, meant that this risk could not be reduced further without significant resource expenditure.

While this limitation reduces the analytical weight that can be placed on the findings from this research, the project team will draw on quantitative data and the expertise of project stakeholders in order to further reduce the impact of this limitation.

4. Who spoke with us?

Table 2 lists our interviewees, the pseudonyms assigned to them and their involvement with the Scottish salmon sector small number of interviewees. The small number of participants in the Scottish salmon sector dictates that relatively little information is given here about each interviewee, to minimise the risk of inadvertent identification of research participants. Three were previous interviewees from the previous study. Six were employees and the other an experienced consultant and adviser. All interviewees worked in or with enterprises with sites in Scotland, with one being based in Europe and another in the USA.

Table 2. Interviewees involvement with the Scottish salmon sector

Frank Works for an international aquaculture company. The company produces Atlantic salmon which it supplies to other aquaculture companies.	**Jack** Direct experience of aquaculture for over a decade and advises on standards for a quality assurance scheme.
George Specialist consultant with expertise in industry regulations.	**Kyle** Has 40 years' experience in fish processing in Scotland and global retailing. Currently consulting to the sector on strategy, efficiency, and Brexit regulations.
Hetty Works for a large international aquaculture and processing company with multiple sites in Scotland. The company produces Atlantic salmon and sells to wholesalers and retailers.	**Lee** Works for a processing company in Scotland. The company produces smoked Atlantic salmon and sells to wholesalers, retailers, and online.
Ilya Works for an international scientific analysis company providing support to aquaculture sites. The company is 5 years old.	

5. Involvement with Salmon

Interviewees' enterprises were involved in raising salmon smolts[3] and salmon, processing, retail, aquaculture scientific support, product quality, and business regulations. Details of the businesses are summarised in Table 3. No interviewees were actively involved in aquaculture or processing.

Table 3 Enterprise characteristics of interviewees (names have been pseudonymised)

Name	Type of enterprise	Actively involved?	Employees?	Quality Assurance Scheme?	Network?
Frank (m)	Supplier/Aquaculture	Yes	Yes	Yes	Yes
George (m)	Consultant	No	No	No	No
Hetty (f)	Aquaculture/Producer	Yes	Yes	Yes	Yes
Ilya (m)	Support	No	Yes	No	Yes
Jack (m)	Aquaculture/Marketing	No	No	Yes	Yes
Kyle (m)	Consultant	No	No	No	No
Lee (m)	Processor/Retailer	Yes	Yes	Yes	No
Mike (m)[1]	Marketing	Yes	No	Yes	No
	1 not interviewed				

5.1 Products

Frank produces about 15 million eyed eggs and 1.5 million organic smolts across several Scottish locations to sell to other enterprises. The fish meal used is produced in Scotland and the UK.

[3] Fully silvered juvenile salmon or sea trout ready to be transferred or migrate to sea.

Hetty's enterprise raises salmon from ova to harvest and processing of fresh salmon across several sites in Scotland. 65% of her suppliers are based in Scotland or the UK. Ova are sourced currently from UK suppliers, but the company is investing in its own hatchery.

Lee produces fresh and smoked salmon using only Scottish Atlantic salmon, operating in Scotland. 70% of retail turnover is smoked salmon and he also produces a small amount of organic smoked salmon (10%). He tries to utilize all of the approx. 10,000t of fish he buys: smaller pieces are smoked and sold to other processors to make other food products, and bones and skin are also sold. Lee's other ingredients are sea salt from the middle east and woodchips to smoke the fish which are a byproduct from a local enterprise.

Jack reported that a few Scottish salmon producers also process their salmon. He indicated that salmon that did not make the quality standard to sold as fillets were processed by smoking and into fish cakes etc.

Kyle was involved in processing fish in multiple sites in Scotland and across the UK, but now is an independent consultant on business efficiency and Brexit for other enterprises and a networking group. Ilya's enterprise does not produce salmon but provides scientific analytic support to seawater aquaculture farms across multiple sites in Scotland.

Developing a relationship with suppliers is important to four interviewees. Lee indicated communication as important:

> "[..] but equally the people you're selling to they've got their own costs, they've got their own challenges so it's never a straight line. It's cost us an extra hundred pounds can you please give it to us? There's always an element of negotiation and give and take."

5.2 Sales: "the consumer I've always believed that they don't see the difference. It's a fish" (Kyle)

Three interviewees are involved in retail of salmon. Kyle had experience of selling many fish species including farmed fish to UK to retailers; and Europe, Middle East, Africa, Asia Pacific and North America:

"We've […] sold to whichever market and channel we're targeting" (Kyle).

He said that the EU was the largest market for fresh fish. He has used labels including PGI, regional origin such as Speyside, and national country of origin (COO), "anything that gives a provenance". He indicated that, for export, the UK label was the most understood by consumers. Hetty sells only fresh salmon to wholesalers and retailers equally shared between UK and export markets, with all of the sales RSPCA assured. Lee sells most of his smoked salmon to retailers with some online retail, with smaller pieces exported to Italy and byproducts to China. UK retailers take approx. 65% and the rest is exported to the USA, Canada, Europe, South Africa and the Far East. Different quality assurance schemes are used in different countries such as Global G.A.P. in USA, BAP in Canada. Lee's fresh salmon is sold in the UK to retailers. Jack reported that a few Scottish salmon producers have their own retail brands.

Frank sells 95%of his smolts to in Scotland and the rest in France. He found demand for (his) organic salmon fluctuated.

Lee's enterprise has expanded in the last five years, gaining new contracts with UK and North American retailers and increasing sales with existing retailers. They have expanded in Scotland and a contract to process and distribute in North America. As well as maintaining the UK retailer contract the enterprise wants to increase exports. Hetty's enterprise has bought another company located in Scotland to become one of the biggest producers in the region. The acquisition has increased farm sites, processing capacity and employees and the enterprise has also been investing in improving its farms, hatchery, and processing facilities. She thinks that any future expansion will involve ova and seawater farm sites.

Frank said aquaculture enterprises were showing increasing interest in the genetics of their salmon to produce better and larger smolts. He expects there to be a change in practise so that larger smolts will be taken to sea, this will require more on-land space for raising the young salmon. Ilya said some countries were more willing to adapt to new technologies and adopt regulations than others, particularly if it meant paying for extra services in the current economic climate. He commented that some enterprises were trying to minimise their costs.

5.3 Impact and value for money

The quality of Scottish Salmon was agreed to be high by interviewees. Lee believes his business ethos of "Scottish Scottish" (processing Scottish fish) has been successful for his sales. However, Kyle thought that PFNs were no longer as useful as previously and that salmon "has been homogenized into one product globally and it's a commodity salmon with perhaps different tiers of, what would you, farm assurance but less about the country of origin." Jack also said that salmon was "becoming more and more of a commodity market". An email contributor indicated "as in terms of salmon, the higher value sector is more perception than reality [...] In the simplest terms, premium salmon is the same salmon but cut from the loin rather than the rest of the fish" (sector consultant). Kyle indicated that he thought that as a brand Scottish Salmon was very successful:

> "they've done the right thing, they've made it available, they've made it healthy, perceived healthy, they've made it reachable, predictable. Good job done. Price fantastic."

Jack believes that the sector is inequitable with certifiers and large retailers benefiting over producers. This is supported by other studies (Watts and Slater 2022).

Rising input prices indicated that was affecting the price for the consumer:

> "The biggest obstacle we have for certainly growing our business is values and getting values that work in the bounds of the consumer." (Lee)

as well as consumer freedom to choose more sustainable products (Kyle). Jack thought the return from premium salmon, such as Scottish salmon, was difficult to pass to the consumer as much of the market was now "commodity". However, Frank thought that consumers "understand the value of Scottish reared salmon" such that it had a premium.

Raising higher welfare and organic fish comes at an extra cost to producers. Frank indicated that only a third as many organic fish can be produced compared to conventional. Both Frank and Hetty said that higher welfare, such as RSPCA assured or organic, salmon would attract a price premium so some of the extra cost could be passed on to consumers. However, Frank said that, in the organic salmon sector, there was extra competition from countries where higher stocking densities are permitted and which could therefore produce more fish quicker. Frank thought that non-organic fish were more profitable overall.

George mentioned other benefits from the sector, such as providing employment and maintaining infrastructure such as harbours, which provide benefits to communities. Hetty said that her enterprise provided housing for employees.

5.4 Business barriers

Several interviewees mentioned the same barriers to running their businesses: planning regulations when making applications; marketplace confidence to invest; and consumer awareness.

George, Frank and Jack confirmed sector reports (reviewed in Slater *et al.* 2024, 40) that "Scotland is [...] a relatively high cost operating environment" (Jack), referring to pay and taxes. Jack also mentioned that Scottish planning regulations were more restrictive than countries such as the USA. George indicated that the planning application was a sequential process. Hetty said that multiple planning applications were necessary and that different authorities could object to the same application. George mentioned that local authority planning expertise was lacking as very few applications are made. Frank also had problems with slow regulatory processes, particularly to introduce novel (to Scotland) technologies. Frank indicated that there was no support from investors for introducing new technologies, one possible reason for this, was sector consolidation making it difficult for new producers to enter the sector.

Salmon production is limited by sea farm quotas restricting the number of fish. For organic production Soil Association stocking densities are extra restrictive, and organic salmon supply is limited, as there is only being one major producer (according to processor Lee). For expanding production or creating new farms, Jack mentioned that physical space at sea is an issue, and there are a limited number of technical specialists globally. Hetty also mentioned that weather conditions limited sea farm production although indicated that "they're the ones we can't control".

For processor Lee, competition from cheaper and imported salmon, being processed in Scotland and marketed as Scottish, was a problem.

For retail, Kyle indicated that it was difficult for independent brands to have longevity and that with the commodification of salmon COO labels were disappearing:

> "It's very difficult in some countries now to see where the product came from until you turn the pack over and sometimes see it can be a product of origin…."

Consumer demand was mentioned as a problem by several participants. Kyle said that in all his decades of experience UK consumers will not accept UK fish, particularly if it requires preparation. Kyle thought that consumers do not distinguish much between fish and different labelling schemes, and wanted retailers to provide the reassurance that standards had been followed. Mike thought that there were so many labels on packaging that even knowledgeable consumers would be confused and that most would not understand any of the quality labels. Lee indicated that his customers sought out sustainability labels, but "we are also very conscious of the ones that have public recognition and the ones that actually the public can go, "Oh I'll buy that product because I sort of understand it".

Bad press and lobbying were mentioned unprompted by Kyle and the large number of well-financed lobbying groups by George. Kyle said that anti-fish lobby was now targeting governments rather than individuals, which made them more effective at retarding the sector. Both Jack and Kyle referred to social pressure on expanding sea farms.

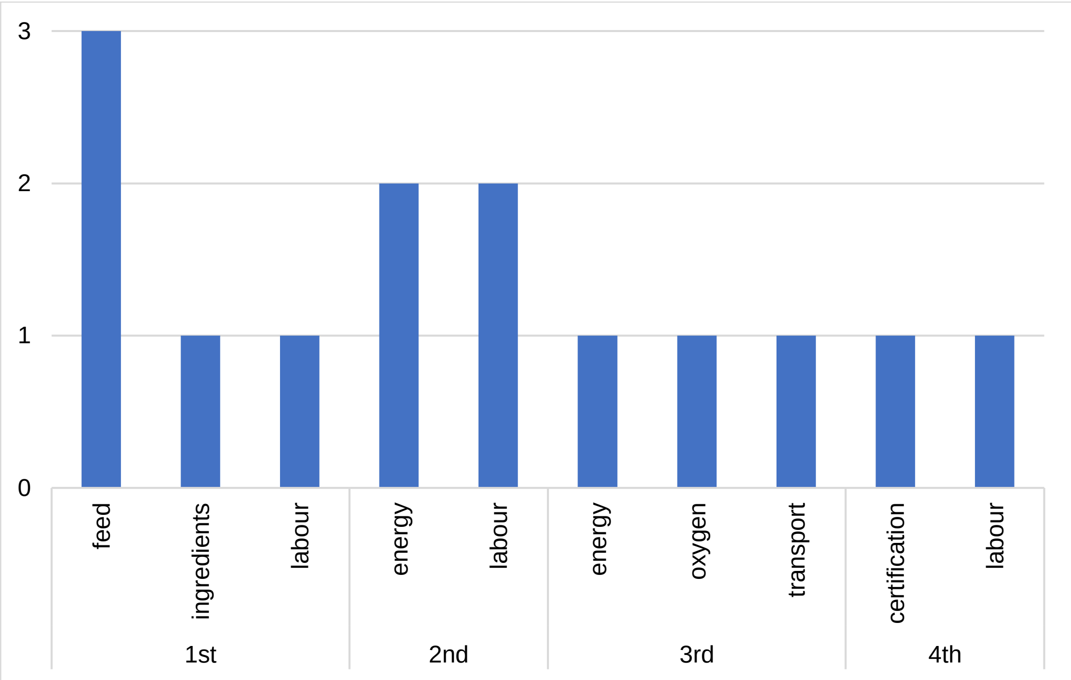
The areas where aquaculture was sited caused problems. Jack and Kyle referred to the impact of aquaculture farms on the landscape and marine welfare. Hetty said that sometimes community facilities were absent which made areas less attractive to some employees. Jack indicated house prices were a problem.

6. Business costs

All interviewees with active knowledge of production gave an indication of what they thought were the biggest costs (Figure 2). Interviewees' opinions as to their biggest costs differed.

Figure 2. Interviewees' largest costs (n=5) as ranked by themselves.

1st is the largest and 4th the lowest cost, and number of interviewees who ranked the cost.



Jack provided information on the lengthy preparation, modelling, and analysis necessary when planning a new farm. He indicated that co-operation and communication with the supply chain were important.

Four interviewees gave information on their employees: Frank has about 25; Lee employs several hundred with a significant increase for Christmas demand; Hetty mentioned they had 650 employees. Employee costs were mentioned by four out of five interviewees who answered this question on biggest costs. Although employee costs were high, they were adding value to Hetty's enterprise:

> "we've got some farm guys who've been on the same farm for twenty plus years who can look at the fish and go: 'Some of these aren't doing well', or, 'Actually, I have no issues, they're all looking fantastic.'"

Feed costs were ranked highest by 3 interviewees: Jack indicated that salmon feed was produced primarily in Scotland however some ingredients, such as soya, are part of the globalised commodity market which means prices often change. Hetty indicated that feed prices had increased significantly in the last year. Energy costs were not the biggest cost for any interviewee. However, Frank and Lee had been impacted by these costs rising.

Interviewees highlighted, in addition to paying for staff, feed/ingredients, and energy, the importance of transport, packaging, labelling, specialist services (such as scientific support), auditing, and quality assurance scheme memberships. Those involved in salmon aquaculture have specialist costs for things such as oxygen, and require sometimes constant energy to supply pumps and chill water. On-land systems have higher costs than sea-based ones. Jack indicated that audit costs for assurance schemes were high and Lee said he has to pay the assurance scheme for every pack that he produces with an assurance label. Several interviewees indicated that their often remote location meant higher procurement and transport costs.

Hetty, Jack, Kyle, and Lee indicated that prices have risen, with suppliers passing on their costs. Lee indicated that prices for the harvested fish had increased in the last few years, increasing the costs of processing.

> "Fish was always expensive, fortunately everything else went up at the same time because the cost of production went up for every protein and so it's, everybody was faced with the same inflationary pressures" (Kyle).

Lee said there were limits to how much of the increased costs of production could be passed to consumers, though this was market dependent, with export markets more able to accept price increases. Hetty said that it had been possible to pass on price increases to some customers when there were no contracts. Ilya indicated that some companies were investing less in improvements due to rising costs, particularly taxes.

7. Involvement with quality assurance schemes

Four interviewees were using or had used quality assurance schemes and two - Jake and Mike - are involved in managing quality assurance schemes. Kyle has retailed using several different schemes including PGI. Frank is involved with schemes including RSPCA assured, GlobalGAP, BAP, Label Rouge, Soil Association, Breed4Food, and Code of Good Practice, although he said he was dropping BAP this year. Lee uses welfare and environmental sustainability schemes including GlobalG.A.P., ASC, and organic, but not Label Rouge despite selling in France. Hetty's enterprise is involved with various schemes including RSPCA assured and until recently ASC.

Jack gave information on the quality grading of salmon indicating that over 95% was graded as superior quality, and that Label Rouge salmon which makes up 6% of production, has a different specification for phenotype but the quality exceeds that of the superior quality graded salmon. Lee indicated that Label Rouge could be applied to fresh and smoked salmon but was difficult to certify for smoked salmon for non-French producers.

For producers, quality assurance schemes are required for retail: Frank, Jack, and Lee indicated that without the correct quality certification scheme it was not possible to sell to large retailers. Lee thought that many schemes were very similar in their specifications. However, it was necessary to use several to access different retailers. Jack said that the PGI had little effect as other standards such as environmental and welfare, were higher. Jack thought certification schemes were a guarantee for the producer of the quality of the salmon but had little economic effect.

Kyle discussed the rationalisation of certification schemes in the sector and movement towards MSC as the main accepted scheme for retailers. He said that the scheme was expensive to join and administer, but had enough influence to drive use. Lee also said that certification schemes were expensive, with costs for participation, audits, and a levy on each packaged fish. Hetty said, about assurance schemes, that "we would roughly say, 'It's a cost of doing business for us.'".

Jack said that having a networking body that was experienced in audits makes the process easier for enterprises. Hetty said that they are experienced in doing the processes so everyone knows what they should do. Kyle thought that having access to and control of the whole production and retail chain "helps with your identity, branding, your quality standards, people standards". He also said that some seafood sectors were more advanced in this respect highlighting farmed fish.

For consumers, Frank said that consumers want high welfare certifications. Hetty said that RSPCA assured was recognised by customers and valued as it was an independent scheme. Kyle said customers valued the MSC.

Frank took the view that Soil Association organic stocking density specifications were not necessarily in the best welfare for the fish, and indicated that the rest of the EU and the European Economic Area (EEA) do not require them. This is supported by an employee of Scottish Sea Farms, who said even at low density fish preferred to shoal together (The Herald 2023). Hetty's enterprise also had welfare concerns regarding ASC certification so had recently stopped using it. However, the ASC reported in that in 2022 there was an increase in applications for its quality certification from Scottish salmon farms (ASC 2022).

8. Informal networking

Ilya indicated that developments were communicated quickly across the sector "at the same time it's a really big industry and really small one, meaning that everyone kind of knows each other". However, he said companies were not very willing to share data even with authorities. Conversely, Hetty said that, as a whole, enterprises seemed happy to share information on potential environmental risks, such as jellyfish. Kyle would like more of the different seafood organisations to collaborate and share best practice, although there were many challenges to doing this.

Four interviewees were involved in networking and sector groups. Jack indicated that Salmon Scotland "represents the main Scottish producing companies" providing technical and regulatory support, but there have been recent changes to membership criteria to include support services. Jack said there were about 50 members – three interviewees said they were members. He said "we need the support of the supply chain. We can't operate without the support of the supply chain". Jack said that Salmon Scotland was going to focus on providing technical support to enterprises and communication with stakeholders in the future.

Other interviewees found Salmon Scotland useful. Frank thought that the expansion of Salmon Scotland's membership was a good thing for the sector and endorsed Salmon Scotland "as an industry, we are one voice, we are aligned on what is best for the direction that the industry goes into, so as a supplier into that industry it is important to have the dialogues with the producers and other suppliers, so it's strategic." Hetty said that Salmon Scotland provided a useful forum for people to meet and share information in a neutral way and for companies to discuss and agree on sector policies. She also found Salmon Scotland's data collation on production and exports helpful.

Lee engages with a range of industry bodies including: Scottish Food and Drink; Seafood Scotland; Scottish Fisherman's Organisation; Chambers of Commerce; Scottish Development International; Department of Business and Trade; and several fisheries. George indicated that there were multiple numbers of groups, often with similar names, with an interest in the sector and sustainability and communities, and that they were not often a representative voice of stakeholders.

9. Policy and trade environments

9.1 Policy environment: “a really big challenge” (Hetty)

Interviewees expressed concern with aquaculture regulations, the length of time taken to negotiate the applications process, and export regulations. Many of the interviewees had negative opinions on the current policy environment which supports our findings in *Costs and opportunities for Scottish products with higher value status: Systematic literature review – salmon update* (Slater *et al.* 2024) that there had been many reviews but no action. The recent report *What about seafood? The role of seafood in UK food systems transformation* (Nicolini *et al.* 2024, 29) concluded that government[4] policies on trade and health were often in conflict. George indicated that the Scottish Government were supportive of making changes to the aquaculture planning regulations to help businesses but said that no one in the sector, nor stakeholders, thought that the current regulations “fit for purpose” and that public bodies were not giving independent advice to Scottish Government. Jack said that the regulatory regime “is more enforcement focused than enabling focused”. George mentioned the distrust amongst stakeholders in the sector. Mike (speaking about PFNs) indicated that constantly changing personnel in governments and organisations, such as Marine Scotland, meant that support for ideas kept altering. A previous study showed that government support for PFNs had ebbed and flowed over the decades (Watts and Slater 2022, 46).

The slow processes in the sector were mentioned by five interviewees. Frank reflected on the slowness of the approval processes overall, not just for new / expansion site regulatory applications. Hetty discussed the planning processes required (see section 5.4). Kyle said the processes required for implementing regulatory changes were slow to be created.

When asked ‘What impact have recent policy developments had on your business? factors have supported growth?’ two interviewees said they could not think of any helpful policy changes. Although another mentioned the new aquaculture planning regulations and the hope that they would allow for better business planning.

[4] Both UK and Scottish

Export to the EU was important to three interviewees, with Jack, Kyle and Hetty indicating that it was one of the largest markets for salmon. Brexit has been an issue for salmon producers and interviewees gave examples of this. Kyle indicated that exporting to the EU is more complicated than 28 months ago with exports now requiring COO assurance. Kyle thought that the trading agreements should have been fairer with equal levels of assurances on imports and exports. Jack said that supply chains are now less efficient but that the sector had been working to combat this by consolidating loads. Hetty said that, for fresh fish exports, delay at the border could be "a really big challenge" and that preparations for Brexit had been long and expensive. Lee indicated that they had lost a third of their business in the EU due to export issues, particularly for composite products, such as pâté. One unforeseen difficulty, mentioned by one interviewee, was access to trained marine employees following the changes in employment regulations, which required applying to the UK Government for an exemption.

In the future, Lee hoped that a trade deal with Australia would make it easier to export there.

Frank was worried about the new sea lice regulatory framework affecting his business, as sea farms he supplied could be closed with little warning due to sea lice which would leave him with smolts to find a new customer for[5]. He and Mike gave examples from Scotland and Canada where policies changed with little consultation or publicity and closed parts of the seafood sector immediately.

Outside the UK, Ilya said that both Norway and Chile had recently made regulatory changes that were increasing operating costs for aquaculture enterprises. This could impact on Scottish production by altering the market.

[5] Smolts take up to 12 months to reach the stage to transfer to sea water

10. The Future of Salmon

Interviewees were ambivalent about the future of the Scottish salmon sector. Several recognised potential difficulties in the future. The main issues discussed were: inertia in Scottish processes; trade with the EU; market conditions; changing consumer attitudes; and climate change.

Interviewees said that the aquaculture sector would grow as consumer demand is still increasing and businesses want to operate in Scotland:

> "the big international companies want to do business in Scotland, if Scotland's a good place to do business in. And I think it's as simple as that because they still see a huge market for the product." (George)

However, they had caveats. George said that if regulations became too difficult and costs too high they would leave. Ilya noted that costs of production may increase due to changing aquaculture methods and sector taxation.

Two interviewees were more pessimistic. Kyle indicated that he thought trade would decline due to the difficulties exporting to the EU and Lee expected it to become more competitive. Kyle believed the full effects of Brexit have not yet been felt, particularly on quality assurance for processing and export, and the loss of the EU quality assurance reputation. He was concerned that UK standards could deviate from EU ones which would further hinder exports.

> "We haven't yet been fully exposed to being a third country that our standards are now not accepted as being European standards of supply chain. And I wonder whether we as a country have aligned ourself to what our standards of importing product for food safety or any of the assurance areas are for the product that we bring in." (Kyle)

Lee was concerned that it increased competition would lead to some enterprises being less than honest in their production processes.

Kyle said that the sector had always been looking to the future and how to create value out of unpopular or by-products but that it was becoming increasingly difficult to do so. However, Frank said "I find a true pity that Scotland always have to wait for others to validate a business model or a plan and then they simply copy it. Why can't we not be at the forefront and have that entrepreneurial environment ourselves here." Ilya thought there would be new sustainability regulations in the future.

Kyle and Frank discussed changing consumers' demands for seafood. Kyle thought that consumers were moving away from heritage attributes and values to sustainability and fair treatment. Frank expressed concern that, if consumers stopped valuing Scottish salmon, the sector would be at risk due to its high running costs. Regarding the lobbying against sea farms in recent years, one interviewee noted:

> "[..] that the industry, a dead salmon is like a manufacturing company breaking something on its production line. It's, it counts it, it costs you more money to do it that way. I mean I get cross a little when I read all these people about dead salmon and if you think about it the industry thinks it's dreadful because that's their money lying dead somewhere" (George)

Kyle thought that having good independent certification schemes and documentation in place would be increasingly useful to combat anti-farming lobbying.

Ilya mentioned that in the last 2 years there has been changes in water quality and increases in, and novel, pests such as jellyfish. He thought it may be necessary in the longer term for sea farms to move geographically to colder water and/or transfer onto land.

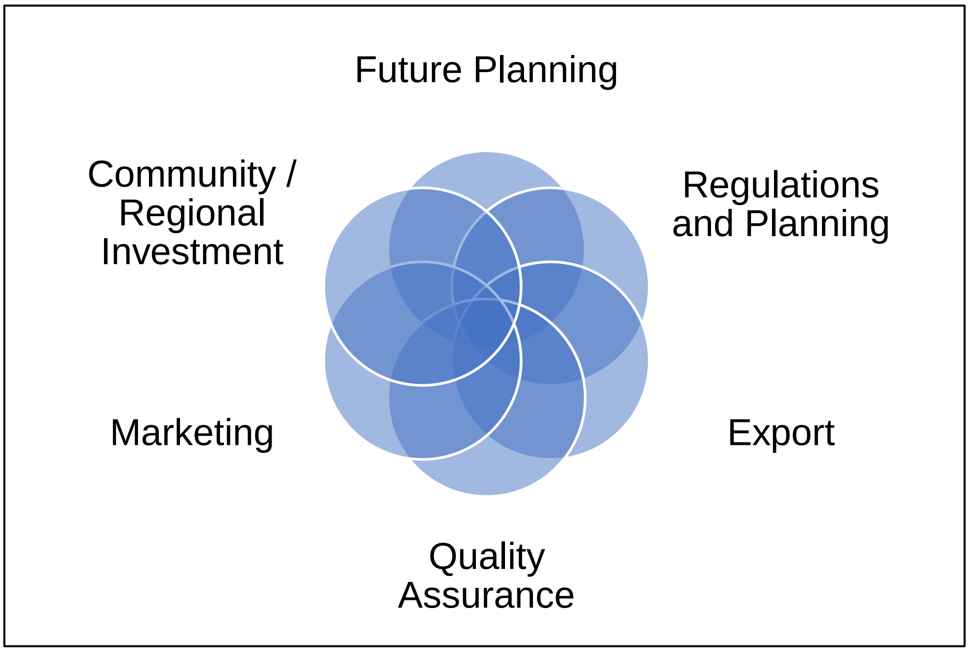
Continuing scientific and technology advances in the sector were expected by George and Lee, and changes in salmon husbandry by Frank, Ilya, and George. They expected smolts to remain on-land for longer so that larger ones were taken offshore, more on-land aquaculture, and that sea-based aquaculture would move further offshore. More land-based aquaculture will require more land area for raising smolts and salmon.

Jack indicated that there had been consolidation in the sector in the last 4 decades, from over a hundred farmers to around five. The Scottish salmon sector is dominated by three big international companies, giving them significant control over production (Slater and Watts 2024, 32). Ilya indicated that competitor countries were adapting, with Chile investing in better technology[6] and Norway moving away from sea to on-land[7], which will affect the quantity and price of salmon entering the market.

10.1 Changes interviewees would like to see

Interviewees were asked what policy changes they thought would be beneficial and five gave suggestions (Figure 3). There was consensus among interviewees; though, given the low number of interviews, that suggestions mentioned do not exhaust views across the sector.

Figure 3. Changes interviewees would like to see in the salmon sector



George thought that there is a need to develop plans for the future and Frank wanted it to be easier to adapt to change and innovate. Ilya thought the sector should focus on sustainable production.

As wanted by Hetty, planning regulations for sea farm licenses are undergoing streamlining (Scot Gov 2022) with new processes being trialled (Scottish Sea Farms 2024). However, George thinks local authority planning offices need more support, as expertise is lacking due to the small number of applications made.

[6] Chilean production methods are not as technologically advanced as those in Scotland and Norway.
[7] To avoid new high taxes on sea farms.

Export to the EU requires streamlining thought 3 interviewees, including an urgent need to introduce electronic health certificates, a trial of which was undergoing more revisions by Defra (Fish Farming Expert 2023), and negotiate a sanitary agreement.

Recent marine policies and planning regulation changes require improved community consultation and benefit from aquaculture. In line with this, George wanted appropriate consultation rather than just the voices of those interested enough to engage with the process. Hetty and Jack want more support from Scottish Government for employee housing.

It was also suggested that anti-fish lobbying could be combatted through: putting in place seafood quality assurance; better marketing; and opening up enterprises to tourism.

11. Next steps

The next phase of this research aims to provide insights into production costs, revenues and profits for higher-value salmon producers in Scotland. However, as no interviewees provided estimated costs for different parts of their businesses, this research cannot provide any direct inputs to it. However, a method has been found to estimate supply and demand elasticities at the retail level. A further objective is to examine consumer WTP for salmon labelling schemes. This work is particularly timely as two participants in this study stated that consumers have poor interest in fish quality schemes and relied on retailers to make quality judgements; something which is reflected in the literature (q.v. Slater *et al.* 2023, 40).

The Scottish salmon sector has consolidated, the industry body – Salmon Scotland – has only about 50 members, despite a recent change in membership criteria to include support services. This was apparent during recruitment (Figure 1), as several enterprises had incorrect contact details and there was evidence of mergers and sales. Interviewees gave evidence of enterprises that were able to produce salmon at all ages, process, and retail salmon, and were expanding into breeding.

Our response rate was lower than Watson *et al.* (2022)'s study of aquaculture stakeholders (54%). However, their respondents producing fish - two in Scotland and one from elsewhere - were very low compared with other parts of the industry. Thus, we recruited more people involved in salmon production based in Scotland than Watson *et al.* (2022). This could suggest a lack of engagement with academic studies or an overburdening of systems amongst producers.

Scotland is perceived to be an expensive place to raise salmon. Those involved in the sector believe in the high quality of their produce. However, the MCS (nd) rates Scottish farmed salmon as 'OK – needs improvement'. Producers' main benefit from assurance schemes appears to be market access, and they incur significant extra costs registering, auditing, and labelling products, whilst sacrificing output. Sector consolidation puts it at increased risk of economic and regulatory pressures as foreign-owned enterprises look to their profits as the cost of inputs increases. Competitor countries, such as Norway and Chile, are investing in technology and new sites which will improve efficiency and reduce production costs. This adds to the competitive risk to the Scottish sector.

Interviewees indicated that there was potential to expand but that slow regulatory processes and export procedures were hindering this. Salmon aquaculture practices are already considered as high welfare and there is some organic production; though this is limited by limited access to organic smolts and low stocking densities. "[B]uilding on Scotland's position as a major producer of organic aquaculture products" is one of Scottish Government's aims to add value to the aquaculture sector in the *Vision for Sustainable Aquaculture* (Scottish Government 2023b, 19), supporting expansion and marketing of organic production is one way that could help the sector to continue to thrive.

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Appendix: Interview schedule

Interview topics

- Questions are bulleted like this under topic headings
- ➢ Follow—up questions / prompts are bulleted like this under the main questions

These questions are about you and your business

- What role(s) does your enterprise have in the provision of food and drink?
- Type of enterprise [– privately-owned, company with tradeable shares, social enterprise, charity, other]
- Enterprise activities [– producer, distributer, retailer, etc.]
- How long have you been in business?
- Size of enterprise [– number of people involved – owners, manager, employees, – quantities of food involved, - number of sites, - revenue]
- In relation to this enterprise, you are: Owner, partner or director, Manager, Employee, Other?
- How has your business developed over recent (e.g. last 5) years? [- Growth, decline, diversification]?
- How is your business likely to develop in the next 5 years? [- Growth, decline, diversification]?

These questions are about your products

- What products do you make?

For each product identified:

- Would you describe this as one of your main products?
- What quantities do you produce in an 'average' year?
- How would you describe the product (e.g. qualities, quality, traditional, craft, taste, organic, welfare, eco, particular breed/species etc.)
- Are you a member of any labelling/assurance schemes? (e.g. Red Tractor, QMS, geographical indication)
- What do you think are the effects of using this (these) label(s)? (increased business/product reputation, (increased business/product visibility)

- Are there any limiting factors to production? (land availability, land quality, input costs, input availability, seasonality of ingredients, delivery condition of ingredients)

These questions are about your product inputs

- What are the main ingredients for this product?
- What proportion of each ingredient comes from a supplier(s) in:
    - Your local area (or as local as reasonably possible)?
    - Scotland?
    - Elsewhere in the UK?
    - Imported?
- Are there any suppliers with whom you have a business relationship that goes beyond the exchange of goods and services for money?
    - If so, could you describe the reason(s) for and importance of such relationship(s)?
- What are the main cost inputs for this product:
    - Labour?
    - Energy?
    - Ingredients?
    - Machinery?
    - Transport?
    - Certification?
    - Etc.
- Could you give me a rough indication of the proportion of the cost of production of this product that is due to each of the main inputs identified:
    - Labour?
    - Energy?
    - Ingredients?
    - Machinery?
    - Transport?
    - Certification?
    - Etc.
- What impacts have recent rising energy prices had on your business?
    - Have your suppliers passed on their extra costs to you?
    - What proportion of the increases in your costs have you been able to pass on to your customers?

These questions are about your product sales

- What proportion of your products are manufactured / sold as assured?

- How do you sell? Direct to customer, wholesaler, retailer, online?
- What proportion of your sales of this product are within:
  - Your local area (or as local as reasonably possible), e.g. at farmers' markets?
  - Scotland?
  - Elsewhere in the UK?
  - Exported?

The pros and cons of assurance schemes and PFN labelling and certification

- You said that your product is / is not QMS assured / a PFN?
- Why was it decided (not) to apply for this certification for this product?
- What is your experience of the certification process itself (e.g. helpfulness of officials, time taken, number of iterations etc.)
- What is your experience of using the certification process itself (cost, admin, helpfulness of officials, time taken, etc.)
- What is the economic impact on your enterprise of using an assurance scheme? (manufacturing costs, packaging costs, labelling costs, on the value chain)
- What are the main advantages of high value (e.g. assurance, PFN) labelling and certification?
  - Price premium?
  - Allows access to markets that would be harder to access otherwise?
  - Etc.?

The policy and trade environment

- What impact(s) have recent policy developments had on your business?
  - Departure from the EU?
  - New British labelling schemes (PDO, PGI, etc.)?
  - New trade deals (e.g. with Australia)?
  - factors have supported growth [– government policies, grants, collaborations]
- How do you see trade changing over the next few years? [- new trade deals, changes to regulations, financial support]
- What future policy developments factors would you like to see?

Perceived usefulness informal networking (e.g. among peers) and formal networking organisations and events (e.g. as provided by membership bodies)

- Do you belong to any co-operatives, professional groups or trade bodies?

- If not, why not?
- Which ones?
- Why did you get involved?
- What is your involvement in the gp? [- member, board member, assessor]
- What is the main purpose of the group/network?
- Do these groups provide any assistance with skills, marketing, assurance schemes, access to funds?
- How often do you meet with other managers/producers/etc?
- Do you share information/skills etc with other enterprises? How often?
- What value do you think the association provides to you?

Is there anything else you would like to add?