# ASLEE: Empowering Rural Industries
# Glasgow 2017
# Scottish Aquaculture Innovation Centre
# Don Fowler

# Scottish innovation landscape

SFC core funding

| | |
|---|---|
| **Aquaculture** | **£11.2M** |
| Stratified Medicine | £8M |
| Sensors and Imaging | £10M |
| Digital Health | £10M |
| Industrial Biotech | £10M |
| Oil and Gas | £10.6M |
| Construction | £7.5M |
| DataLab | £10M |

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Stratified Medicine Scotland

CENSIS

DIGITAL HEALTH INSTITUTE

IBioIC

OGIC Oil & Gas Innovation Centre

CONSTRUCTION SCOTLAND INNOVATION CENTRE

THE DATA LAB value from data

**SAIC is 1 of 8 ICs funded by SFC**

Scottish Funding Council
Promoting further and higher education

# Scottish aquaculture: a snapshot

- Scottish aquaculture: worth over £1.8bn to UK economy & 8,000 jobs
- Salmon production 179,000 tonnes 2014 and exports worth approx. £500m
- Mussel production 2015, 2nd highest ever at 7,720 tonnes
- 5 main salmon producers, circa 140 active sites
- 3 main feed companies
- Active supply chain (genetics – equipment)
- Strong academic base, global links and alumni
- Strong Scottish SF&D brand
- Circa >£200m of planned investment/pa
- **BUT**, market share is falling


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# **Aquaculture: driving growth** in one of Scotland's **key industries** through innovation and international ambition

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# Ambitious growth plans

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**Vision 2030 Strategy**

- Doubling of current production value to £3.6Bn
- Associated job creation 18,000
- Major drive to catalyse innovation in the supply chain

**It’s our job to actively seek out and fund innovative, transformational aquaculture research that delivers growth in the Scottish aquaculture industry…**

**….. we’re here to problem solve and help ensure that great projects get funded.**

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# 4 Priority Innovation Areas

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1. **Environmental and health challenges**
   With a specific focus on sea lice and gill health (Inc. Diagnostics)

2. **Sustainable Feeds and Nutrition**: Optimizing raw materials and associated health benefits

3. **Unlocking additional capacity and facilitating growth:**

4. **Development of secure, health certified Scottish mollusc spat production systems**:

# Industry Partners

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# Academic Partners

# Funding guidance

- Collaborative projects must have **a lead industry sponsor paired with a Scottish HEI research partner**.
- Applications MUST:
  - Be novel with strong scientific basis
  - Meet a commercial need
  - Deliver a benefit to the Scottish sector
  - Demonstrate ability to drive economic growth
- Typically technology readiness levels 4-7
- Open Call for expressions of interest, also themed Calls directed by industry priorities

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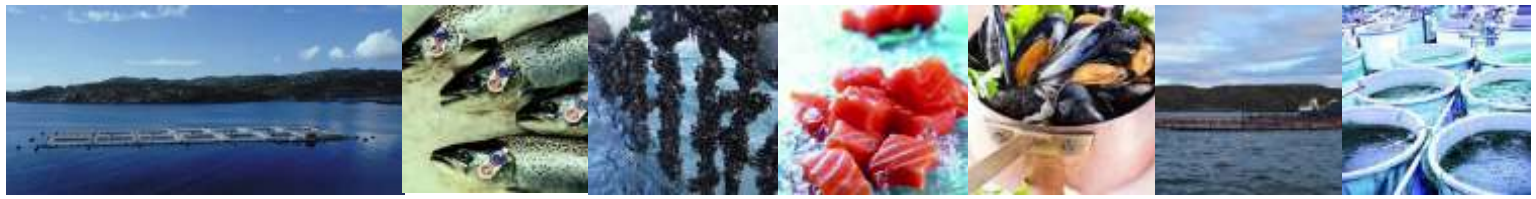

# Total project value (Q3 2016)

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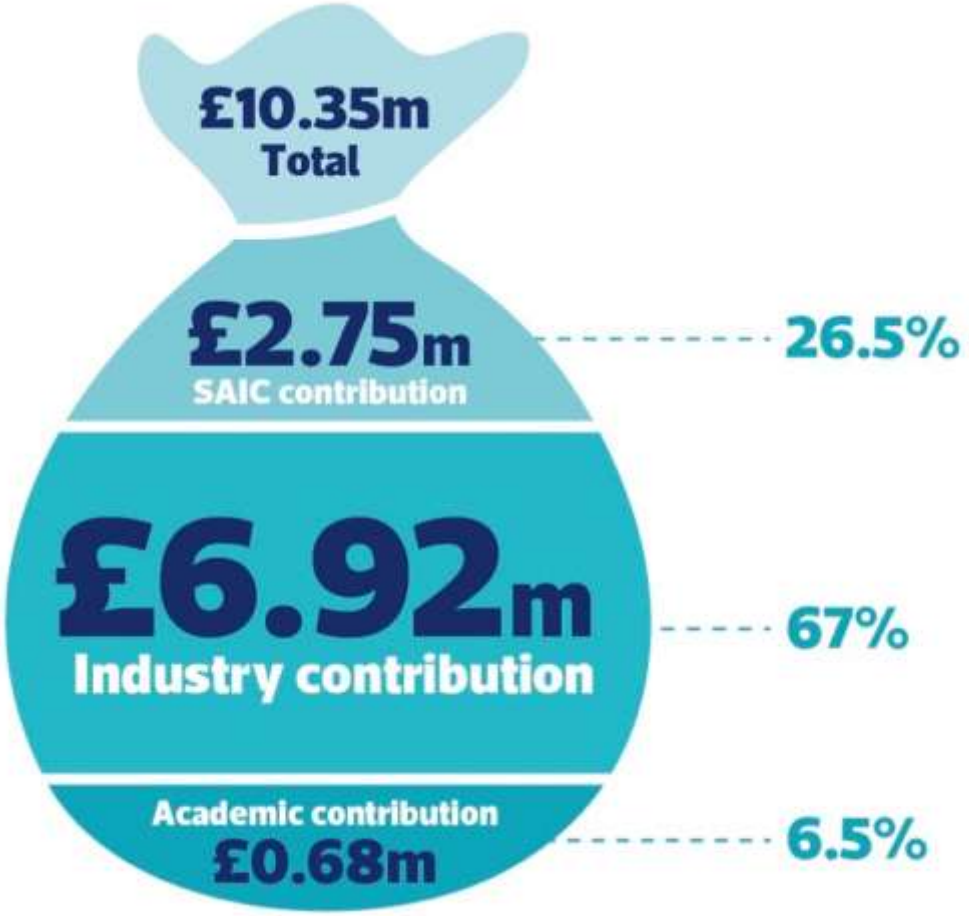

# Global challenge:

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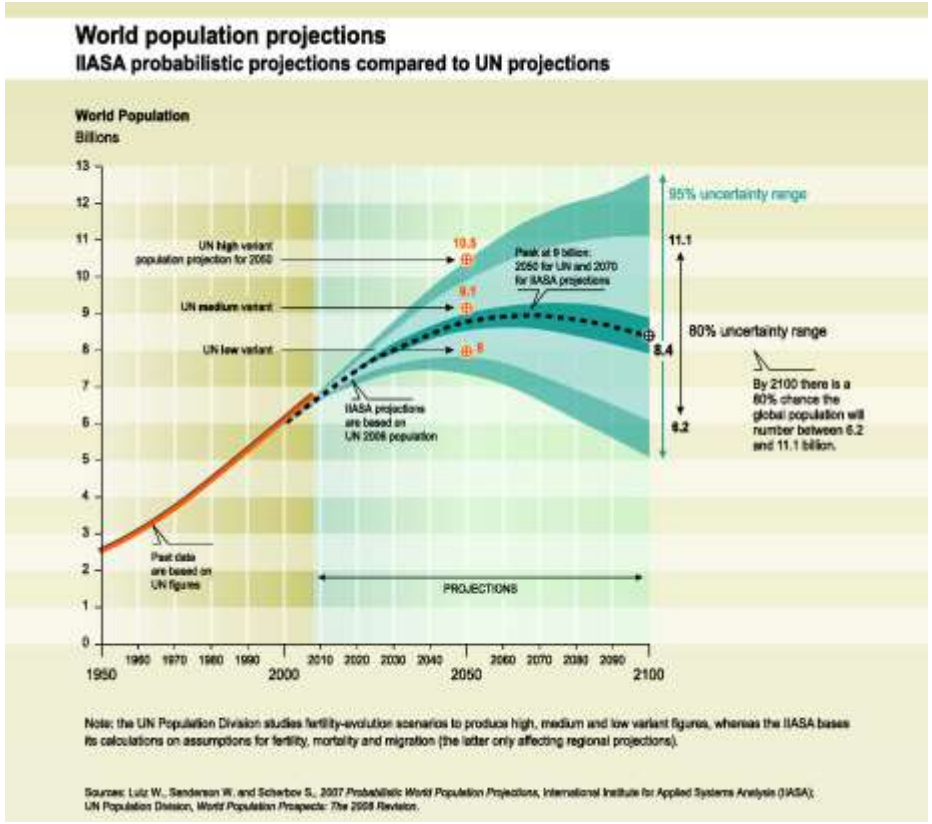


# The Global Challenge

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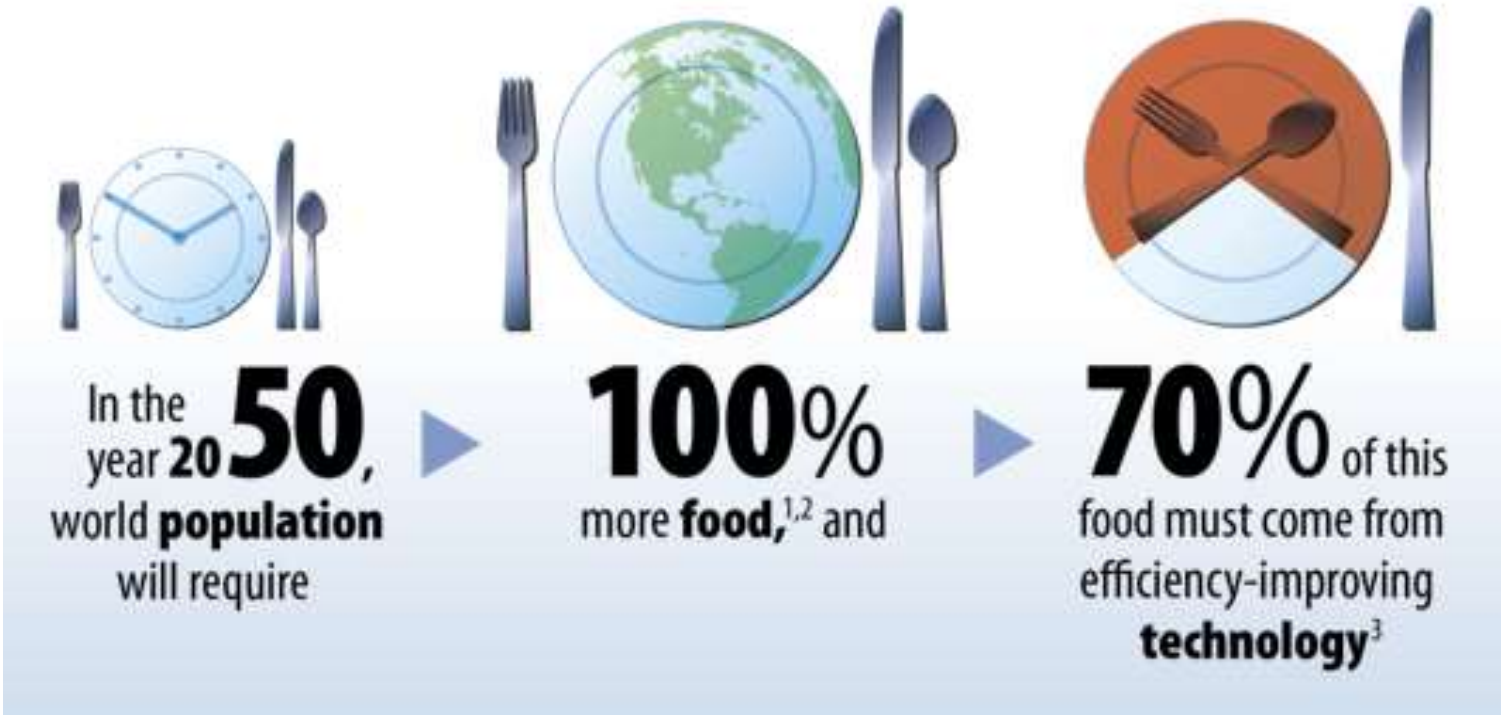

# Challenges = Opportunities

## €30million United Fish Industries Fishmeal & Fish Oil Plant in Killybegs officially opens

UFI

An investment by United Fish Industries (UFI) and the Pelagia Group of €30 million has seen one of the iconic fish

The result and redesigned plant now houses state of the art Steam Generation, Production processes, Waste Heat Evaporative capacity, Computer control systems and Environmental Control systems.

The Minister for Agriculture, Food and Marine, Michael Creed, TD officially

as essentially the old factory was demolished and a new one rebuilt during two phases, while the plant still took in raw materials and provided a service to the fishing industry.

"The flexibility and ingenuity of our staff in the plant and wider group were central to this successful process.

## Farmed fish could solve pending population crisis

Farmed fish has gotten a bad rap, but it's the only way the world is going to feed the additional 2.4 billion people added to the Earth's next 34 years, experts food conference. With land maxed out and ifished, aquaculture is

month.

Currently just 15% of world animal protein consumption comes from aquaculture but that can quickly be ramped up. It's a hard sell in the United States. Panellists blamed part of the U.S. prejudice against aquaculture on NIMBYism (i.e. Not In My Backyard.)

the more eco-conscious in the United States because of early unsustainable fishery examples, especially farmed salmon and shrimp. In South America and Asia, Asian seafood producers have been cleaning up their acts but damaging stories about aquaculture

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## Aquaculture's issue with fishmeal, oil is economic sustainability, not environmental

Rising prices and increasing demand for fishmeal and fish oil are issues that far outweigh environmental concerns. According to Giovanni Turchini, of Deakin University in Australia. The industry has

human consumption, will be where fish oil ends up, he said. "So, where does leave aquaculture? Should we just sell up?" Fish and shrimp can both be farmed without fishmeal, however, he said. "No

not necessary for farming, they are essential to satisfy the "human requirement for fish to remain as the major providers of EPA and DHA", he said. "That is the big problem. It is

## The challenges faced with the finite supply of fish oil

A recent BBC news article (6th October, 2016) has highlighted the current challenges of including omega-3 fatty acids in farmed salmon. The article focuses on the reduction of fish oil in salmon diets, stating that one of the causes is the cutting back on the amount of anchovies fished and used for feed. This however is not the case as there is very little demand for anchovy for direct human consumption. The industry has reduced fishing, not because of resistance to use in feed but due to responsible management of the fish stocks. The production of fish oil has thus come down to 900/800,000 metric tonnes per year from its peak of more than 1 million mt. Over 40% of global fish oil production is certified under an independent scheme for responsible supply[1], a higher percentage than plant based ingredients can offer.

The farmed salmon industry has enjoyed huge growth with approximately 60% of the world's salmon production now being farmed[2]. Farmed salmon is key part of a healthy balanced diet, with popularity ever-increasing largely due to the huge health benefits of this omega-3 rich fish.

It is the all-important long chain omega-3's known as EPA and DHA within fish oil that makes it liquid gold for the fish farming sector. Health benefits for the consumer are widely known, most notably helping heart and neurological health, as well as foetal development. It also plays an important role in the health of the fish. The industry has continued to produce highly nutritional farmed salmon despite the challenges of a finite supply of fish oil by supplementing marine feed ingredients with plant-based ingredients, mainly of oilseed origin. As mentioned in the BBC article, levels of fish oil in farmed salmon still make it one of the best sources of long chain omega-3 fatty acids. In the future however, this finite supply of fish oil does present the industry with a crucial challenge. There are various potential alternatives to fish oil currently under development, but an alternative that is both economical and feasible in terms of supply is still undetermined.

The amount of fish oil used in salmon feed, and therefore the levels of omega-3 in the fish, varies around the world. To allow consumers to make informed choices, it is important that farmers and retailers make informed decisions on nutrition and in turn communicate these to consumers with clear labelling on their products.

References:

1. The Global Standard for Responsible Supply (IFFO RS) - http://www.iffo.net/iffo-rs
2. Global Salmon Initiative http://globalsalmoninitiative.org/about-us/about-farmed-salmon/

In support of this article we would also like to highlight IFFO's video on the importance of omega-3's in salmon, available here on the IFFO website.

Finally, please note that a similar article was also published by the Daily Mail— http://www.dailymail.co.uk/health/article-3826135/Healthy-fats-farmed-salmon-HALVED.html

## Algae Products Market is expected to reach US$ 44.6 Bn by 2023 – Credence Research

According to a new market report published by Credence Research "Algae Products Market – Growth, Future Prospects, Competitive Analysis, and Forecast 2016 – 2023," the algae products market is expected to reach US$ 44.6 Bn by 2023, expanding at a CAGR of more than 5.0% from 2016 to 2023.

market and is expected to retain its position in the near future. Growing use of algae biomass is expected to provide high revenue to the algae producers worldwide. Growing demand for algae products from the neutraceuticals and pharmaceutical industries is the major factor driving global algae products market worldwide. Rising health

Growing demand for algae from the pharmaceutical and neutraceuticals industries is driving the demand for algae products in the region. North America is also expected to boost high demand for algae products in the near future due to growing algae research industries in the region. Other regions such as Asia Pacific, Latin America and

## BioMar and Morrisons weighing up use of poultry derived protein in salmon feed

BioMar, in partnership with UK retailer, Morrisons and Scottish research institutes will evaluate the use of poultry derived protein for use in salmon feed, as part of an industry and academic funded initiative. The two companies are also set to work with the Institute of Aquaculture at the University of Stirling and the SARIA group to identify alternative protein sources for salmon farming.

The Scottish Aquaculture Innovation Centre (SAIC) announced support to the tune of £140,000 ($186,129) for the protein quest and for another feed project involving Alltech, the University of Glasgow, Marine Harvest and NOFIMA. The initial six month phase of the project involving BioMar is to focus on collecting data from retailers and consumers to identify the issues related to adopting poultry proteins.

Currently, global salmon feed production relies on three major protein sources: soy meal, fish meal and land animal protein. However, in the UK industry there is a higher proportion of ingredients from marine resources and imported vegetable protein sources like soy protein concentrates. Adopting avian protein could significantly reduce feed costs and, in doing so, overall production costs, claimed SAIC.

Although Chilean and Australian salmon farming sectors have been using poultry derived proteins for over a decade without issue, there are still some challenges around consumer acceptance of introducing these products into the UK's food chain, noted Huw Thomas, Morrisons' fisheries and aquaculture manager.

Alex Obach, managing director of Skretting Aquaculture Research Centre (ARC), told this publication previously: "The market's reluctance to use processed animal proteins in feed arising out of retailer and consumer pressure, despite the huge amount of fish imported into Europe that has been reared on such inputs, is also placing additional restrictions on growth – a policy that, long term, will have to be reviewed as it is an extremely good feed raw material for carnivorous aquaculture species such as salmon, and it is a sustainable option as well."

If consumer perception around poultry proteins is found to be positive, later phases of the project could comprise nutritional and fish quality analysis, said SAIC.

Source: FeedNavigator.com

# Salmon compared with other protein sources:

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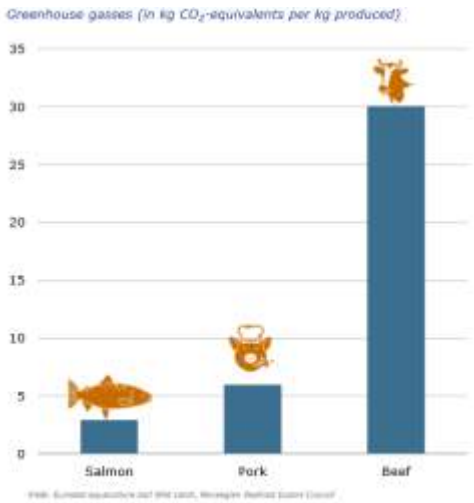
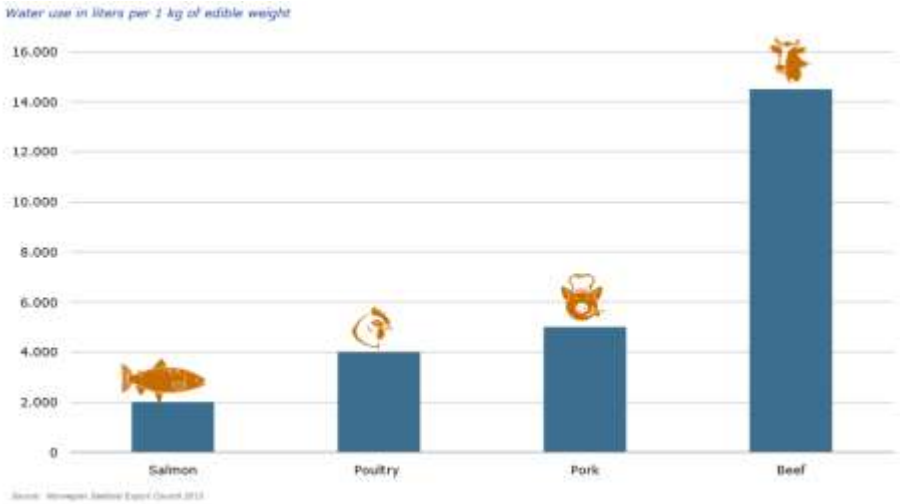
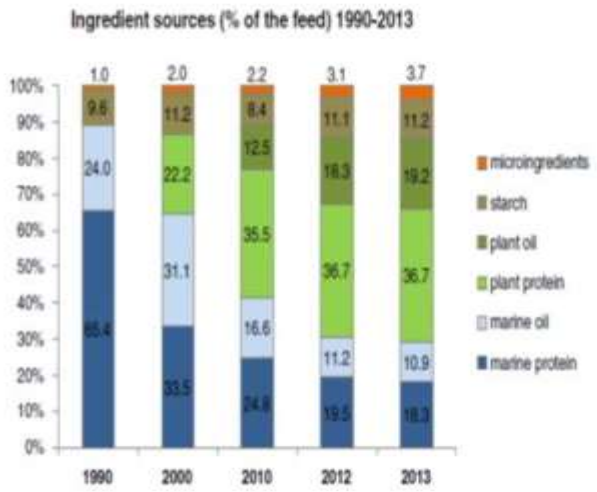
| | | | | |
|---|---|---|---|---|
| **Protein Retention** | 31% | 21% | 18% | 15% |
| **Energy Retention** | 23% | 10% | 14% | 27% |
| **Edible Yield** | 68% | 46% | 52% | 41% |
| **Feed Conversion Ratio (FCR)** | 1.1 | 2.2 | 3.0 | 4-10 |
| **Edible Meat per 100 kg fed** | 61kg | 21kg | 17kg | 4-10 kg |

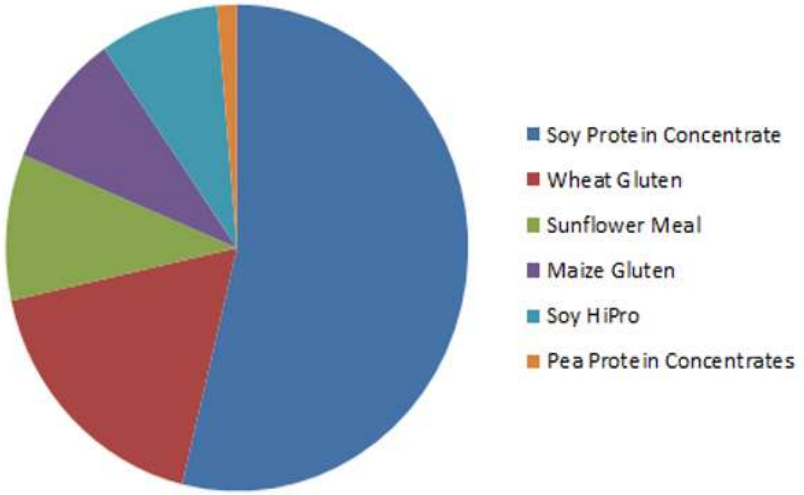


# Changing Diets: Protein




Ytrestøyl et al 2015




- Aquaculture utilizes 80% of fishmeal availability
- Most other protein comes from non GM Soy – niche market

# Changing diets: Fish Oil

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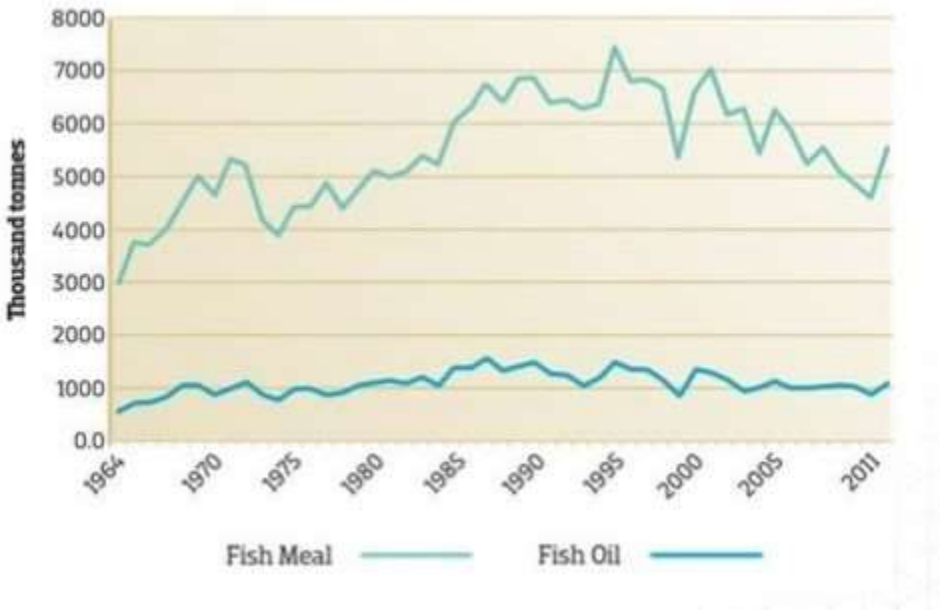
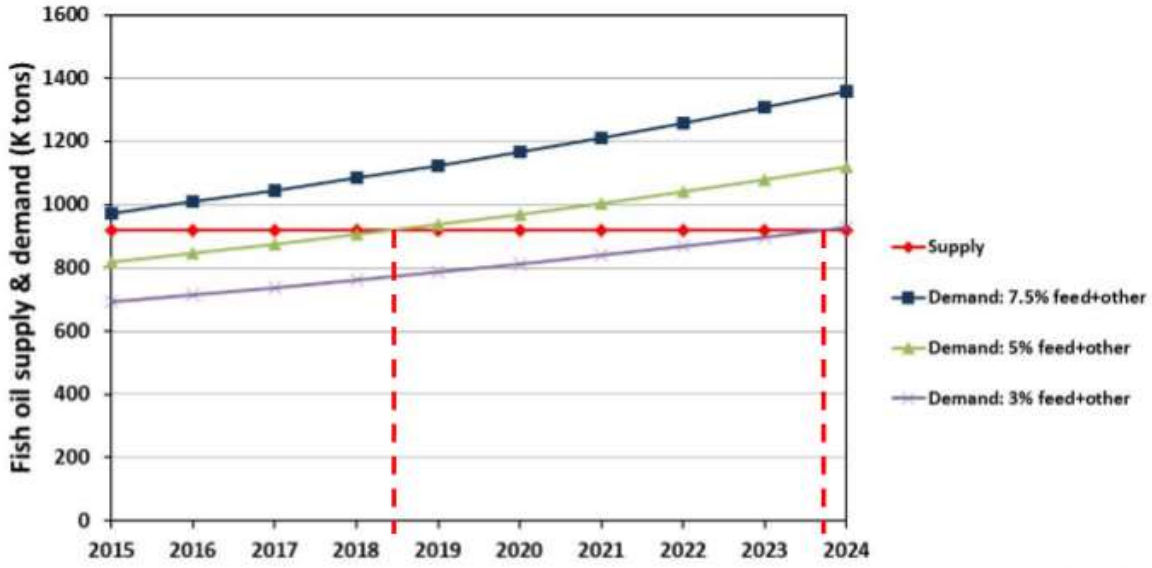



Source IFFO

- Fish oil supply is finite and demand is growing aquaculture uses 70%
- Micro algal or plant sources?



# Opportunities Circular economy feedstocks and production methods:

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Chitosan
Fiber from the sea

# Potential alternative sustainable sources:

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- Opportunities for supply protein and lipid
- Must be the right profile, free from contaminants, non GM.
- No anti-nutrition factors – pro nutrition
- Oils rich yield in EPA and DHA.
- Available – space in diet - cell walls
- Quantity >$10^3$ tonnes security or speciality diets
- >200,000 tonnes fish feed annually in Scotland
- Price competitive, low Co2

# Changing context

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## Independent Review of Innovation Centres Programme – led by Professor Graeme Reid

This independent review will focus on the delivery of the original vision, aims and objectives of the Innovation Centres Programme. It will be led by Professor Graeme Reid and supported by an Advisory Committee and economic assessment consultants, EKOS Ltd. This approach has been chosen to ensure transparency of the review and the credibility of its recommendations.

# Connect and collaborate

- Sign up to our Connect+Collaborate service at **http://eepurl.com/8yBWv**
- Call us on 01786 278 322 or visit us at Stirling University Innovation Park
- Email us at **info@scottishaquaculture.com**
- Visit our website **www.scottishaquaculture.com**
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