

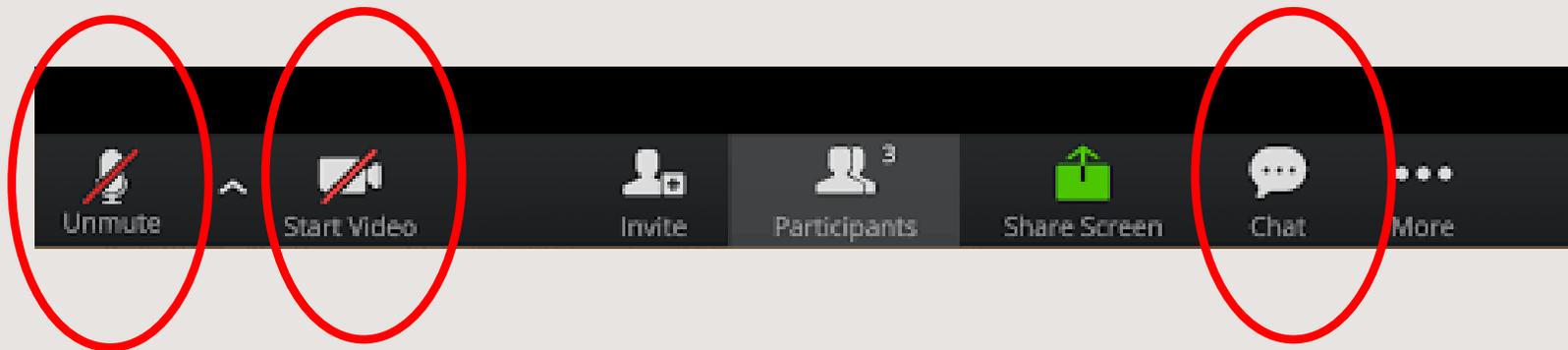


A new business  
opportunity for  
Aberdeenshire:  
**Seaweed Cultivation**

# Welcome

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- This presentation will last 45 minutes with 15 minutes at the end for any questions you may have.
- All participants **MUST** be muted and cameras should be turned off to enable the speakers to present without interruption
- Questions can be submitted via the Chat function and will be collated and answered at the end (time permitting). If any questions are not answered, we will seek to send out an email response.
- This presentation is being recorded and a link will be emailed to all attendees in due course.





*“Delivering projects, strategy and innovation”*

We are a multi-disciplinary consultant, providing project management, engineering and strategic business consultancy with a focus on the Blue Economy.



Corpach Marina Project



The Blue Economy



Barcaldine Salmon Hatchery

# Agenda for Presentation

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- Introduction to seaweed farming
- Overview of the seaweed cultivation study
  - Environmental and technical feasibility
  - Routes to market and opportunities
  - Cost benefit analysis
- Summary & recommendations
- Q&A

# What is seaweed cultivation?

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**Seaweed farming** is the practice of cultivating and harvesting seaweeds.

In its simplest form, it consists of the management of naturally found batches – known as wild harvesting.

In its most advanced form, it consists of fully controlling the life cycle of the algae.



# Global Market

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- The market is hugely dominated by East and Southeast Asia.
- The world production has more than tripled since 2018.
- Growth is expected to continue
  - valued at \$4,097.93 million in 2017,
  - projected to reach \$9,075.65 million by 2024
  - CAGR (compound annual growth rate) of 12% from 2018 to 2024.



# Environmental Benefits

- No feed, no waste, no pollution
- Removes and sequesters carbon dioxide, produces oxygen
- Removes toxins from seawater
- Provides suitable habitat for many species of marine life
- Excellent alternative food source for growing population
- Valuable nutrients for human and animal consumption

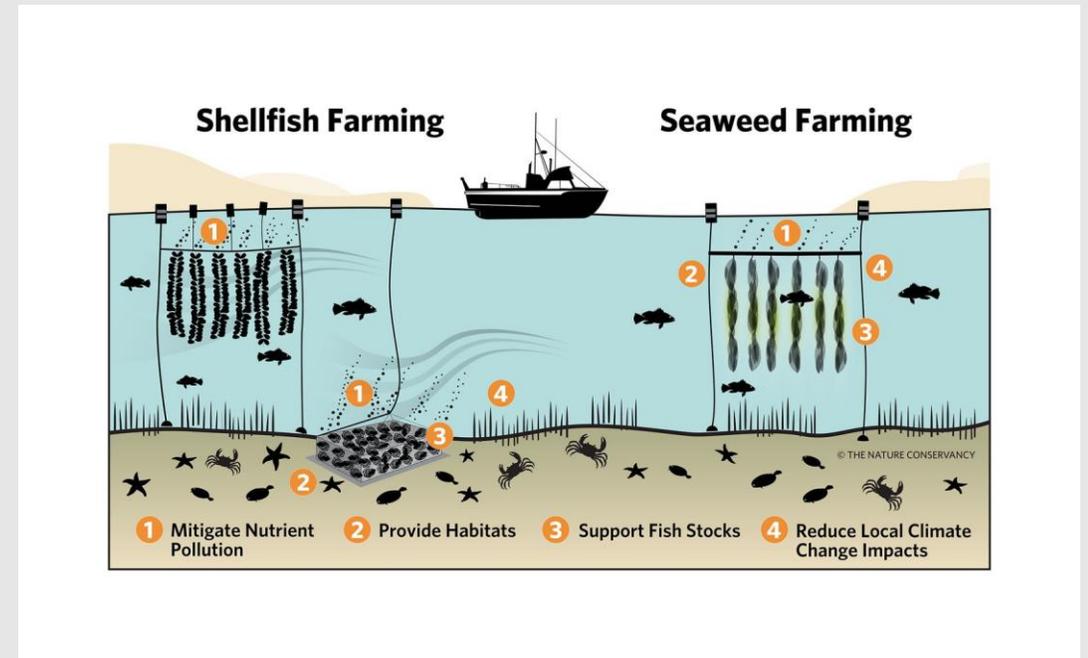


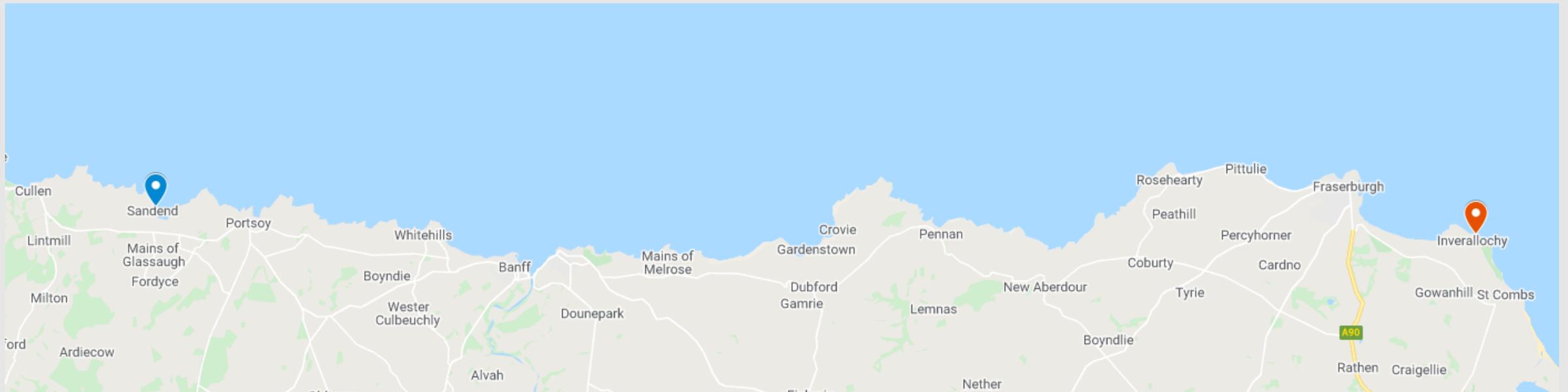
Image ©Nature conservancy

# The aim of the study

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To determine if seaweed cultivation is a viable and acceptable proposition for the North Aberdeenshire Coast

**Location: Banff and Buchan coastline from Sandend in the West to Inverallochy in the East.**



# Study Overview

- Target species
- Identification of potential sites
- Equipment and costs
- Licensing and Consents
- Timescales
- Routes to market
- Financials / cost benefit analysis
- Local business opportunities
- Case studies of existing operators
- Social license



# Target Species



## **Sugar Kelp** *Saccharina latissima*

- Already growing naturally
- Fast growing
- The most cultivated European seaweed
- Thrives in wave-exposed sites
- High commercial value
- Food, bio-packaging, cosmetics



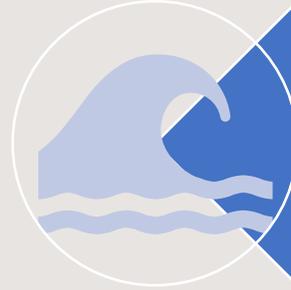
## **Dabberlocks** *Alaria esculenta*

- Alternative option with value for food grade export

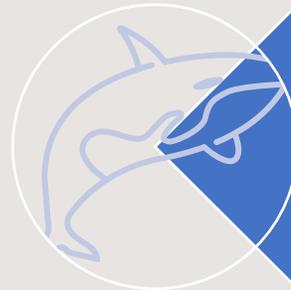
# Site Selection: Technical and Environmental



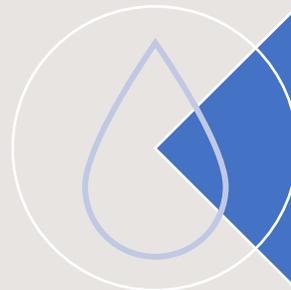
Image wild seaweed harvesting ©Marine Scotland Info / Scot Gov



Physical characteristics such as bathymetry/seabed geology, water depth, wave height, tidal range etc



Biological diversity, protected areas, habitats etc



Water quality (including salinity, temperature, light, sediment and water flow, sewage/industrial waste effluent discharges)

# Site Selection: Social and Economic



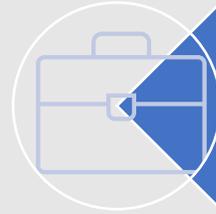
Image ©treehugger.com



Existing businesses which could support or benefit, considering additionality.



Existing commercial fisheries, marine tourism/leisure and recreation or other competing interests



Socioeconomic factors e.g., employment, skills, health etc



Existing infrastructure (physical and non-physical) to support development of seaweed farming

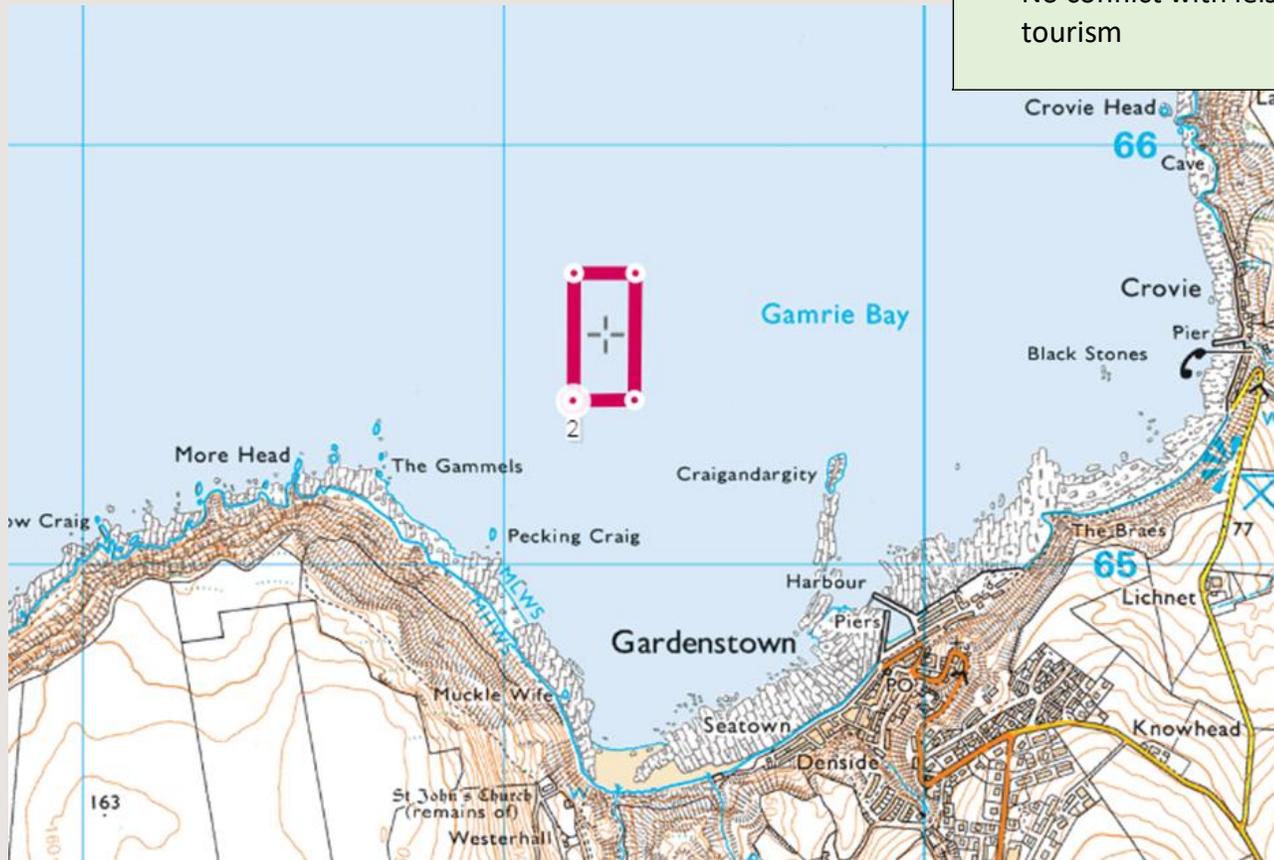
# Boyne Bay, Portsoy

For	Against
<ul style="list-style-type: none"><li>• Sandy, gravelly seabed</li><li>• 15-20m depth of water</li><li>• No protected designations or habitats</li><li>• Lower fishing vessel density</li><li>• Relatively close to Whitehills Harbour</li><li>• No conflict with leisure activities/marine tourism</li></ul>	<ul style="list-style-type: none"><li>• Less sheltered than other locations but lower wave intensity further West</li><li>• Portsoy harbour itself is tidal and can be difficult to access in certain sea states</li></ul>



# Gamrie Bay, Gardenstown

For	Against
<ul style="list-style-type: none"><li>• Sandy, gravelly seabed</li><li>• 15-20m depth of water</li><li>• Lower fishing vessel density</li><li>• More sheltered from prevailing wind and open sea</li><li>• Very close to harbour</li><li>• No conflict with leisure activities/marine tourism</li></ul>	<ul style="list-style-type: none"><li>• Within the Troup Head SAC but unlikely to be significant development impact</li><li>• 1km from secondary treated WWTW discharge</li><li>• Potentially visible from Seatown and Crovie</li></ul>



# Aberdour Bay

For	Against
<ul style="list-style-type: none"><li>• Sandy, gravelly seabed</li><li>• 15-20m depth of water</li><li>• More sheltered from prevailing wind and open sea</li><li>• No settlements nearby</li><li>• No WWTW or industrial discharges</li></ul>	<ul style="list-style-type: none"><li>• Within the Troup Head SAC but unlikely to be significant development impact</li><li>• Higher vessel density (safe anchorage)</li><li>• Marine leisure activities (scuba diving) at East end of bay</li></ul>



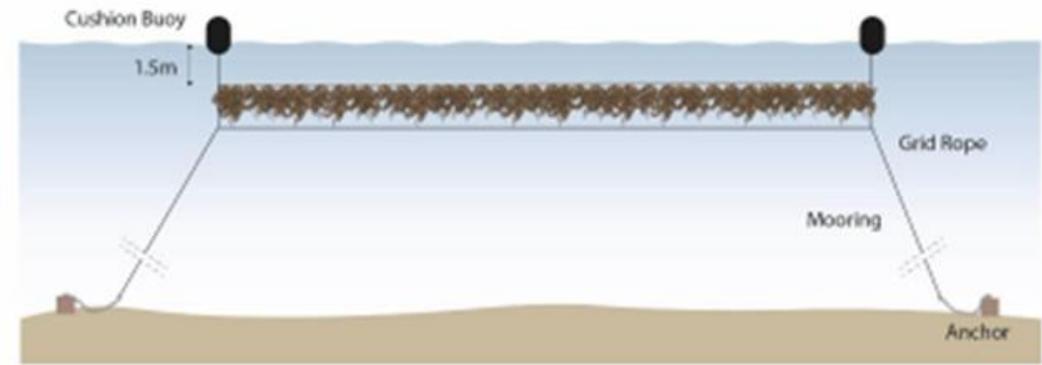
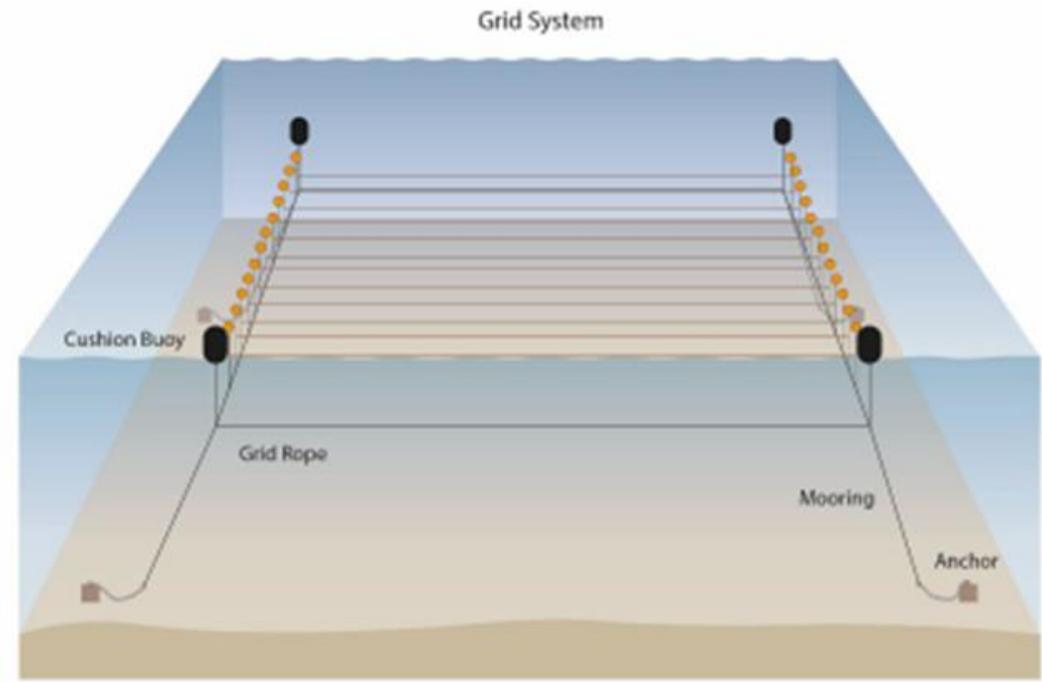
# Infrastructure Required

- Seaweed farm design consists of two main components – **moorings and long lines** – supported by floatation buoys.
- The footprint of a farm with 3,000m of growing line, with lines spaced at 8m, would be approx. 150 x 150 metres (22,500m<sup>2</sup>)
- A farm with 6,000m of growing line would be approx. 300 x 150 metres (45,000m<sup>2</sup>).
- The day-to-day operation of a kelp farm has many similarities with any farmer or fisherman's work.

# Seaweed farm design

## Capital Costs

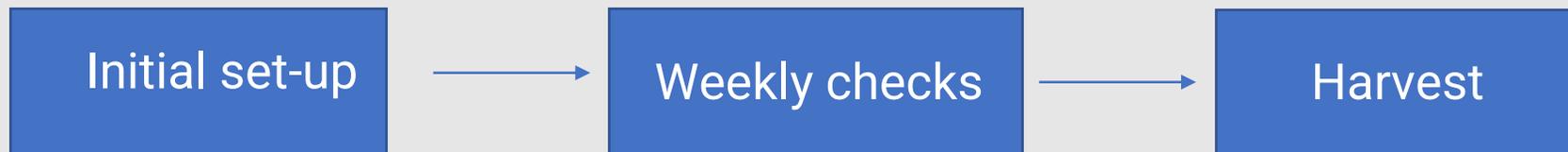
Length of Growing Line	3000	6000
Ropes & Shackles	£3,000	£5,000
Anchors, chain and large cushion buoys	£6,000	£10,000
Small trawl buoys	£1,500	£2,500
Mooring node rings	£4,800	£8,000
Navigation lights (x2)	£2,000	£2,000
Marine safety equipment	£2,500	£2,500
Installation	£12,000	£20,000
Sub Total	£31,800	£50,000
£/m Growing Line	£11	£8



© 2019 SAMS Research Services Ltd.

Figure 21. Diagrammatic view of a grid based system used for seaweed cultivation.

# Farming Operations



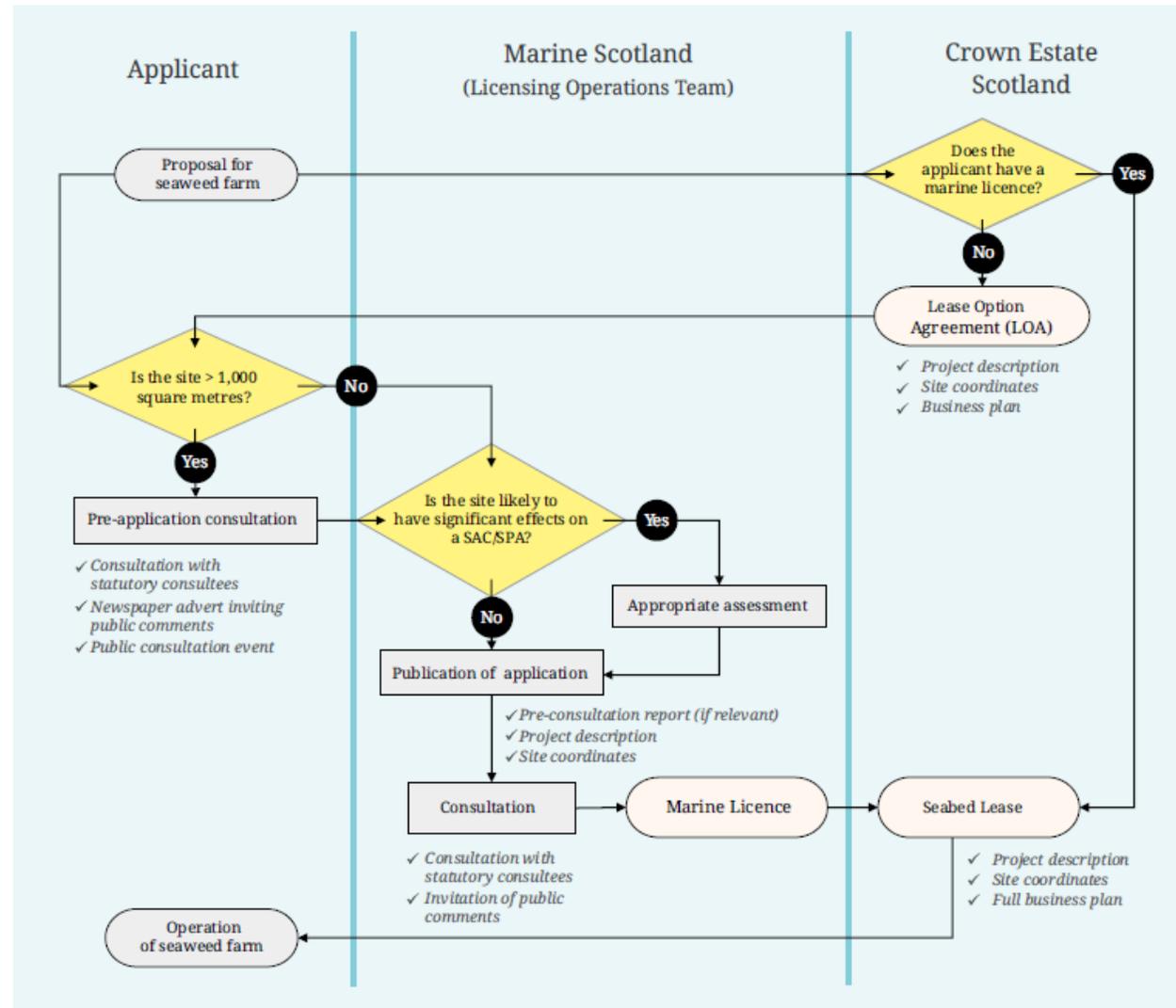
# Consents and permissions

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**Table 4.1. Summary of licences, consents and assessments required for Scottish aquaculture including finfish (FF), shellfish (SF) and seaweed (SW)**

Application	Authorising regulator	Legislation	Aquaculture type		
			FF	SF	SW
<b>Planning Permission</b>	Local Authority (LA)	Town and Country Planning (Scotland) Act 1997	✓	✓	
<b>Environmental Impact Assessment</b> (if necessary, mainly relevant to FF, but can be required for SF)	Local Authority (LA)	The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011	✓	✓	
<b>Marine Licence</b>	Marine Scotland Licensing Operations Team (MS-LOT)	Marine Scotland Act 2010	✓	✓	✓
<b>Seabed Lease</b>	The Crown Estate	The Crown Estate Act 1961	✓	✓	✓
<b>Authorisation to operate an Aquaculture Production Business (APB)</b>	Marine Scotland Science Fish Health Inspectorate (MSS-FHI)	The Aquatic Animal Health (Scotland) Regulations 2009	✓	✓	
<b>Controlled Activity Regulations (CAR) licence</b>	Scottish Environment Protection Agency (SEPA)	The Water Environment (Controlled Activities) (Scotland) Regulations 2011	✓		
<b>Habitats Regulations Appraisal</b> (if necessary)	All of the above	The Conservation (Natural Habitats, &c.) Regulations 1994 and its amendments	✓	✓	✓

# Process and Timeline for consents



Credit: Pakatida Suwonnawong



Image ©NatureScot



# Scottish Seaweed Industry

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- The Scottish industry is not new but has seen significant growth in recent years.
- Most seaweed harvested and processed in Scotland is wild (not farmed) and there is a limit to sustainable production
- There are significant barriers within the supply chain, specifically in terms of processing capabilities, licensing, and regulation.

# Seaweed in Scotland

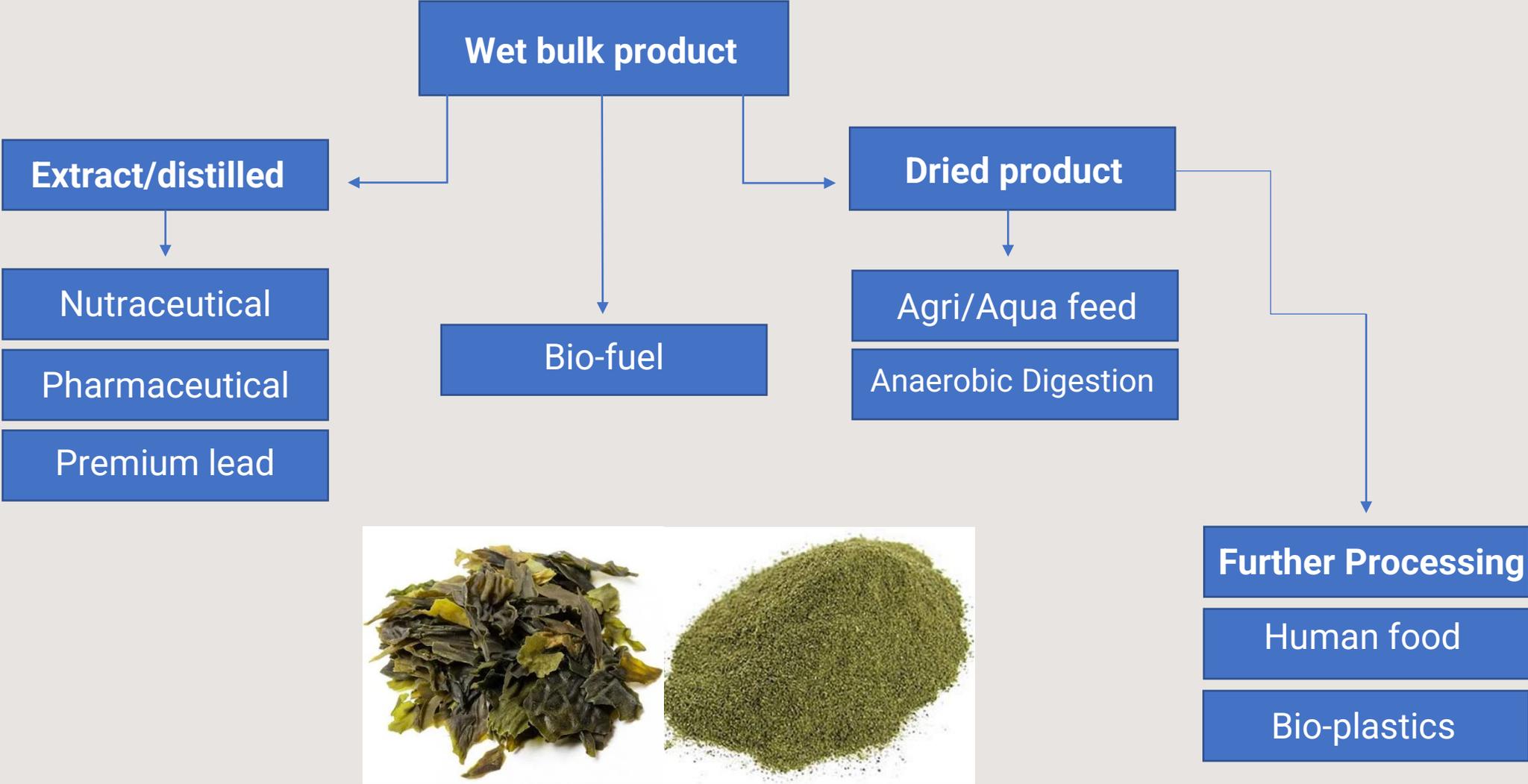


<https://www.youtube.com/watch?v=rlxwiOuZ61o&t=8s>



<https://www.youtube.com/watch?v=IW4d0gUBxD0>

# Processing Capabilities



# Current processing in Scotland

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# Market opportunities



# Opportunities for Diversification

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## Potential farmers

- The most obvious potential industry sector that could diversify into farming of seaweed would be inshore fishermen
- Any other marine related organisations including third sector /social enterprise

## Potential Processors

- Several options available in the area to explore further

## Potential end-users

- Several options available in the area to explore further



Image Aberdeenshire Coastal Route ©VisitScotland.com

# Cost benefit analysis

Existing studies on economic feasibility of farming seaweed are inconclusive

Need for market development

All analysis built on published or provided data

Alternate real life scenarios considered to identify lowest risk viable model for investment and development

Optimism bias addressed by use of HMRC Green Book multipliers and standard discount rates. Conservative position adopted throughout.

# Scenarios

## 3000m farm

- Investment £46,200
- Operating cost £62,300

## 6000m farm

- Investment £68,775
- Operating cost £79,700

- Yield 12kg per m
- £1.50 per kg

Non-food product (wet)

- Yield 8kg per m
- £3.00 per kg

Food product (wet)

- Yield 8kg per m
- £70.00 per kg

Food product (dry)

# Payback periods

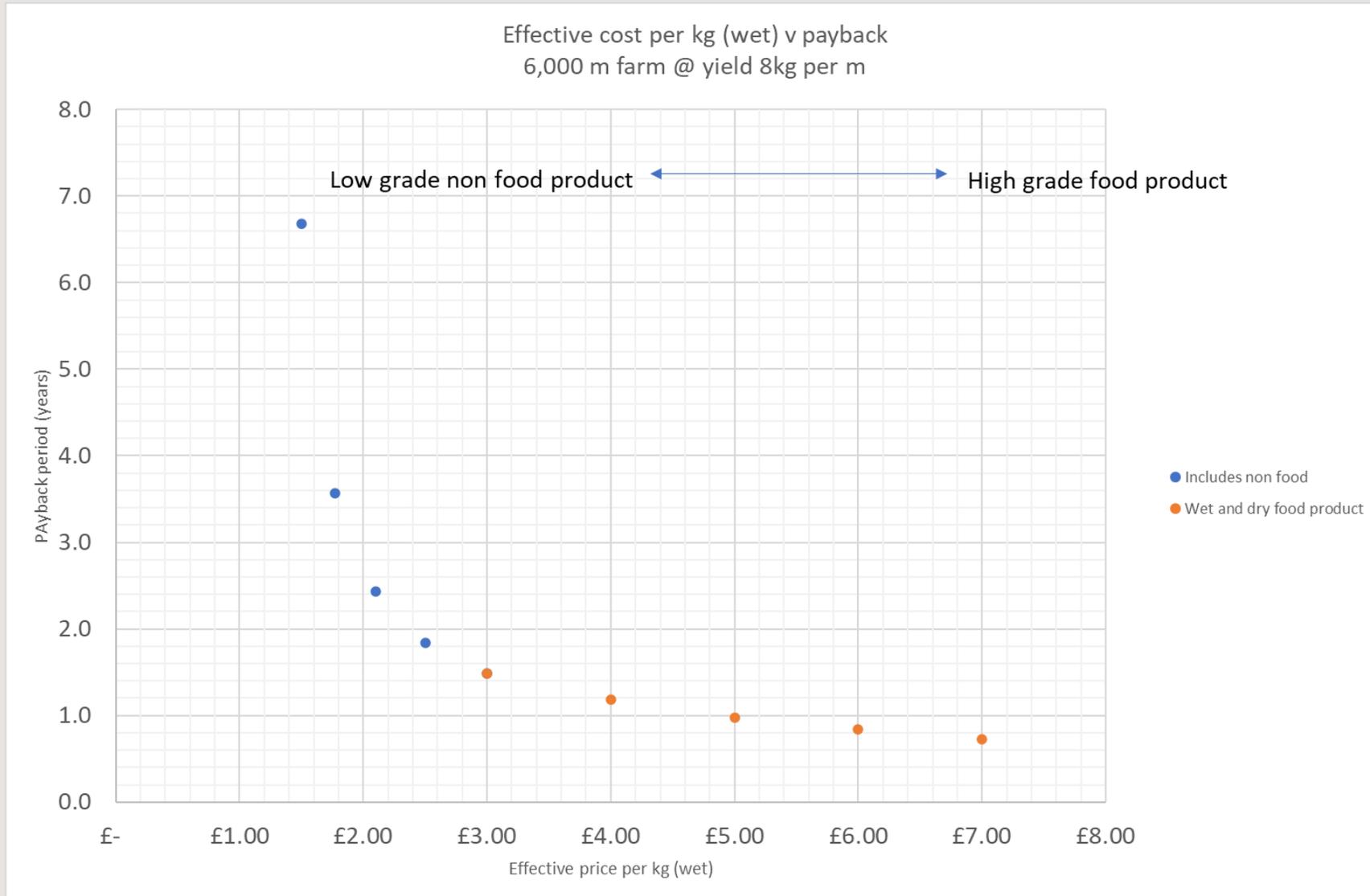
			Yield (wet) kg per metre						
Farm	Product	Price per kg	6.0	7.0	8.0	9.0	10.0	11.0	12.0
3000	Wet	£1.50	-	-	-	-	-	-	-
		£3.00	-	66.0	4.8	2.5	1.7	1.3	1.0
	Dry	£70.00	4.8	2.1	1.4	1.0	0.8	0.7	0.6
		£80.00	1.7	1.1	0.8	0.6	0.5	0.4	0.4
6000	Wet	£1.50	-	-	-	-	-	52.9	6.7
		£3.00	6.7	2.4	1.5	1.1	0.8	0.7	0.6
	Dry	£70.00	1.5	1.0	0.7	0.6	0.5	0.4	0.4
		£80.00	0.8	0.6	0.5	0.4	0.3	0.3	0.3

# Findings

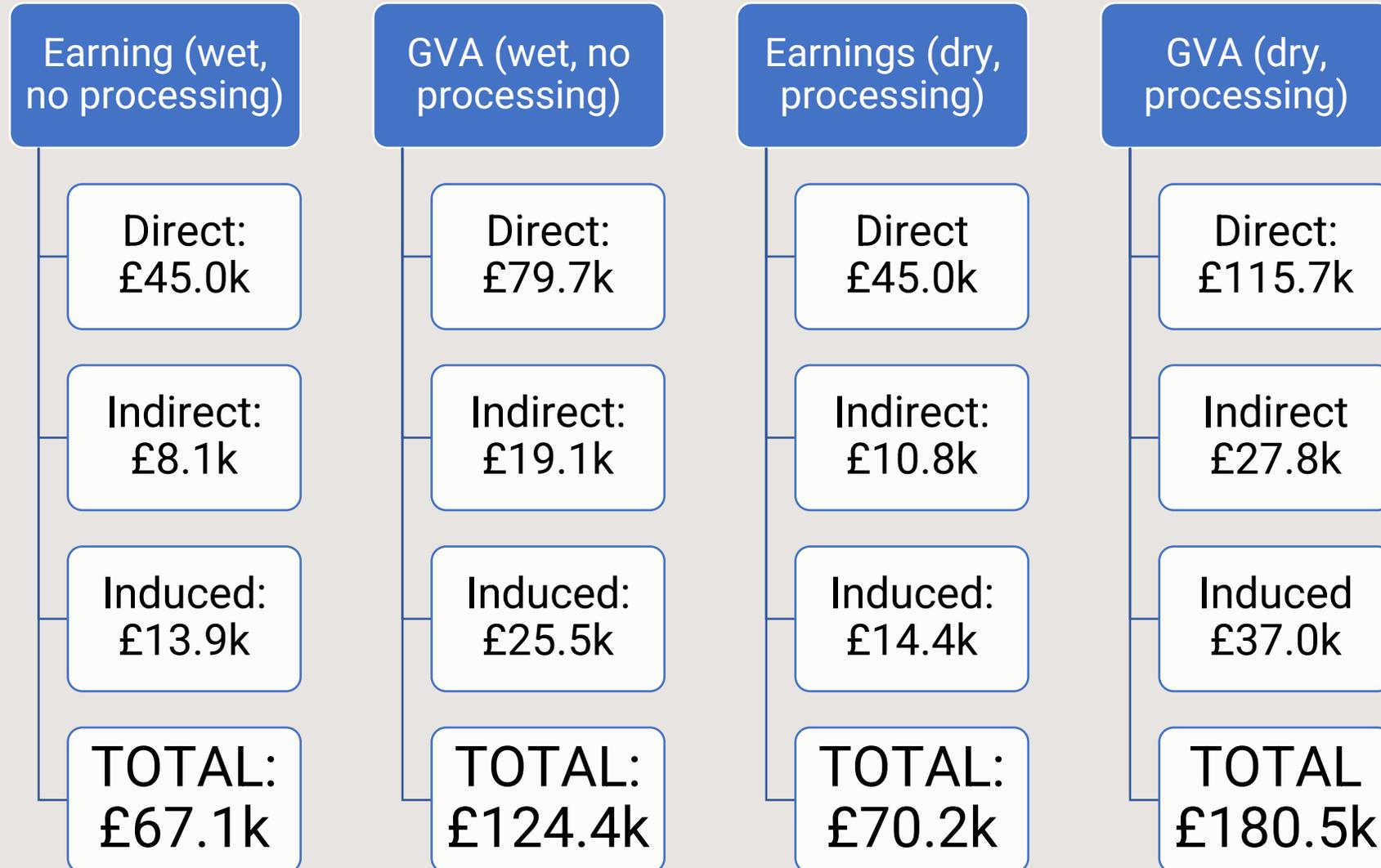
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- Drying costs vary with the load size – maximising loads reduces the costs of drying (£4.50 per kg to £1.50 per kg)
- **3,000m** and **6,000m** farms need to supply food grade material to be viable and sustainable
  - A 6,000m farm can provide a 3 year payback on an effective sales price of £1.96 per kg
- **6,000m farms are a lower risk investment as operating costs can be covered with lower yields**
  - 3000m x £3.00 per kg x 9kg per m: payback 2.5 years
  - 6000m x £3.00 per kg x 7kg per m: payback 2.4 years

# Pay back periods



# Net benefits (25% displacement)



# Community benefits

- Construction phase
  - Employment
    - Trainees, under employed, unemployed
  - Supplier development
    - Sub contracting
    - Training and advice
  - Community
    - Project delivery
- Operations phase
  - Diversification
  - Entrepreneurism

# Social License

For the purposes of this project, we have used the definition of social license as:

*“social licence requires any business to ensure its activities respect the rights of all of those in any community.”* (Ethical Leadership, 2021)

And by extension not to impact in a negative way on existing communities, groups or businesses.

# Summary & Recommendations

Through investigation, consultation and analysis we have concluded that there is a viable business opportunity for seaweed cultivation on the Aberdeenshire Coast.

We recommend undertaking a **small scale grant funded trial**; with **confirmed project partners for each stage of the value chain**.

*Thank you for attending!*

We will now take questions from the **chat box function.**

If you have any further questions please place them now in the chat box or contact us following the presentation.

Contact details are on the next slide at the end of the Q&A session.



# Contact us

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