AECgroup

Kubin Oyster Farm Feasibility and Business Plan

Zagul Economical Development Company and Torres Strait Island Regional Council

Draft 2.0

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Executive Summary

Background

The Torres Strait Island Regional Council (TSIRC) has commissioned AEC*group* to prepare a feasibility report on a proposed oyster farm aquaculture venture at the Kubin community on Moa Island.

The concept for the oyster farming operation proposed for Kubin is for a floating operation in an offshore channel close to the Kubin community. Oversight and technical expertise would be sought from outside the community and the workforce would be provided from the Kubin community. A joint venture arrangement would be considered by the community. It is suggested the venture would be controlled by a local Board of Directors under the Zagul company structure. Marketing would be via a partner already operating in the industry or through commercial fish markets and brokers.

Product Characterics

Due to the restrictions against introducing the pacific oyster into Queensland, Kubin oyster production will involve either introducing the sydney rock oyster (through spat imported from either South East Queensland or New South Wales) or cultivating the local milky or blacklip oysters. The sydney rock and milky oyster are possibly identical or at least very closely related species and are similar in size, quality and flavour. Blacklip oysters are the most common native species occurring near Moa Island. While blacklip oyster's are collected in large quantities for local consumption, they are generally not considered to have adequate public acceptance for commercial purposes.

Markets

There is currently no formal local market for seafood caught in the Torres Strait. However Mr Daniel Tarki (proprietor of Pearl Island Fisheries) is very positive about the prospect of creating a local market for oysters. Mr Tarki intends to open a seafood store on Thursday Island in the future and believes oysters would sell well. North Queensland oyster supply is currently dominated by pacific oysters shipped from Southern Australian producers and New Zealand. Consultation with local wholesalers indicates that the mainstream retail market prefers the milder flavour, consistency, larger size, and lower price of pacific oysters. While there is currently almost no market for sydney rock oysters in North Queensland, local wholesalers have expressed some interest in sourcing stock from Kubin if a market can be developed.

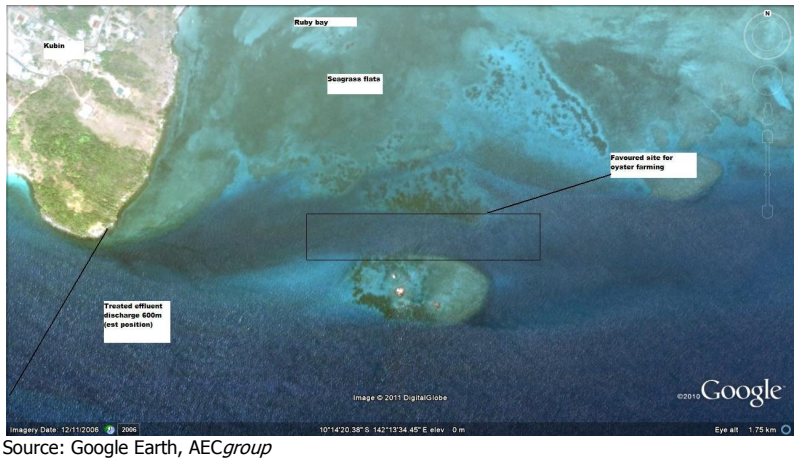
Competition

In order to gain a market share in North Queensland, the Kubin oyster farm will have to compete with established South Australian, Tasmanian, and New Zealand Pacific oyster growers. Pacific oyster growers enjoy a natural advantage due to the size, resilience, and fast growing nature of the pacific oyster.

Site Characteristics

The Kubin community's favoured site is a channel off Ruby Bay. The channel is immediately out from the drop off at the extent of the tidal flats. The proposed site has a rocky reef outcrop on the far side, giving the channel some natural shelter from the predominant south easterly wind that blows into the bay. The channel site is completely sheltered from the strong north easterly winds during the summer monsoon season. The site exhibits moderate tidal flows through the channel. The depth of the channel is estimated to be about 10 to 15 metres. The south easterly winds blow into the bay and may impact on access to the site from time to time. Bottom conditions in the channel are rock, coral and bommies. The current flow through the channel is likely to reduce the amount of loose material. Overall the Ruby Bay Channel site is the most likely candidate for the Kubin oyster farm based on accessibility, growing potential, environmental impacts, and security implications.

Figure E.1: Ruby Bay Channel Site



Source: Google Earth, AEC*group*

Growing Conditions

The pristine tropical waters surrounding Moa Island should prove suitable for oyster growing. Site inspection and community consultation reveals the following indicators of Moa Island's oyster growing potential:

- Local blacklip and milky oysters grow naturally around the 1.4 metre tidal mark, with milky oysters occurring at a slightly higher level;
- The local oysters appear free of fouling, worms, and bores;
- Oysters are consumed locally year round, with locals noting little difference in quality over the seasons;
- Local oyster species are thought to experience solid growth rates, with an average harvest size of 100 mm. (However there is no available local information regarding the length of time taken to reach harvest size); and
- No significant die offs of oyster population have been observed due to disease or weather events.

Small scale trials would need to be initiated to confirm the suitability of the Ruby Bay Channel and other potential oyster farm sites.

Spat Supplies

The two main spat procurement methods available to the Kubin farm are:

- Import sydney rock oyster spat from New South Wales or Southern Queensland;
  - Sydney rock oyster's are a well recognised commercial species, and are considered the best prospect to find a market;
  - Production will be consistently of the one species;
  - Reliable supply levels from year to year; and
  - Ability to obtain a large stock of spat quickly to get operations underway.
- Collection of local oyster spat;
  - Currently there is no reliable estimates of spatfall rates, density or timing;
  - May be insufficient local spat population for commercial purposes;
  - Spat collected would consist of a mix of different oyster types with difficulty and cost involved to separate the more valuable milky oysters from the blacklip oysters as they grow;
  - Further investments of capital, time and labour would be required for collection and sorting;

- Spatfall can be inconsistent and unreliable from year to year depending on the site; and
- Local species are an unknown quantity in terms of commercial marketability.

Risks and Uncertainties

There are several key risks and uncertainties surrounding the proposed oyster farm, including:

- Frequency and timing of spawning (oysters are considered unmarketable for one to two months after spawning);
- Difficulties and expense of procuring skilled labour;
- No established market for sydney rock or other native oysters in North Queensland;
- Untested growing conditions;
- High spat costs relative to competitors;
- Lengthy transport times (five to seven day barge to Cairns);
- Potential extreme weather conditions;
- Queensland Fisheries site and spat transhipment approval; and
- Diseases and predators.

Major Cost Factors

Labour & Fuel

A labourers wage is expected to be around $600 per week. At times of harvest, a larger short term workforce of up to ten people is likely at a cost of between $20-25 per hour. Sourcing outside management is expected to be extremely expensive in the vicinity of $100,000-150,000 per year full time. Fuel will be a major expense. The price of petrol at Kubin is $2.10 per litre, a significant premium over competitor operations.

Spat

Average farm gate prices for large sydney rock spat in 2009-10 were $1.50 per dozen. A more cost effective strategy may be to source smaller spat which sells at a significant discount (average price $0.92 per dozen for medium and $0.26 per dozen for small spat). However the cheaper price must be weighed against the additional growing time required to reach market size. Trial growing will be required in order to determine an optimal spat size and viable price range for the Kubin operation.

The cost of harvesting local spat for on growing will vary greatly dependant on the timing, density and quality of local spat fall. The cost efficiency of local spat collection depends heavily on the quantity and consistency of spat available.

Plant & Equipment

Total estimated costs to set up a 15,000 dozen p.a. oyster farm operation at Kubin, including long-line system, barge, and plant and equipment is $248,432 (see Table E.1).

Table E.1 Estimated Plant and Equipment Costs

Equipment	Cost (Excl GST)	Assumed Life (yrs)
Long-Line System (x2)	$90,132	10
Barge	$45,000	10
Snorkel and Dive Equipment	$2,000	3
Grader	$21,500	10

Rumbler	$4,000	10
Gurney system (x2)	$800	5
Packing Shed	$30,000	20
Ute / Trucks	$25,000	5
Freight	$30,000	n/a
Total	**$248,432**	

Source: AEC*group*

The tropical marine environment tends to take a hard toll on plant and equipment and it is important that adequate finances are retained to make replacements as required. It is estimated on the above assumed plant and equipment life that $23,890 per year needs to be banked to allow for future replacements.

Financing

The most likely source of financing for the project is via the funding programs of the Torres Strait Regional Authority (TSRA). The main funding scheme applying is the Community Economic Initiative scheme. Applications for projects to be funded under the scheme are accepted twice a year (in March and October). Funding available varies from year to year but averages around $800,000. Many applications are received each year (in the current round, proposals worth $4 million were received). While it is hoped that TSRA would be a significant contributor to the project, it is not certain that the fund could fully finance the development of an oyster aquaculture project. Ideally the funding for the set up and operation of the project would be staged incrementally over time.

Another possible approach is to seek a joint venture partner with both capital to contribute and expertise. There would be considerable advantages in this approach with an experienced oyster farm operator. However, the current depressed state of the Queensland oyster industry impacts on the probability of attracting significant private capital to a venture of this risk profile.

Approvals and Environmental Regulations

To grow oysters commercially requires approval by Fisheries Queensland. Prior to the issuing of an authority, oyster areas are assessed to determine the potential environmental impacts that the oysters may be subjected to. Areas can be denied an oyster growing authority if the proposed site is subjected to sewage, stormwater runoff, industrial pollutants or other detrimental influences (Fisheries Queensland, 2009).

Transhipment of oyster spat stock into Queensland also requires a specialist permit issued by Fisheries Queensland. There are significant regulations surrounding the transportation of sydney rock oyster spat, and where spat is allowed to be sourced from. Transhipment permits are granted to growers on a case by case basis. Consultation with Fisheries Queensland resulted in concerns being raised over granting a permit within the Torres Strait on bio-security grounds.

Market Feasibility

Given there is no ready market for sydney rock oysters in North Queensland, there exists significant doubts as to whether a large enough market can be developed to justify a commercial oyster operation. Currently the Queensland oyster industry is in terminal decline, largely due to an inability to compete with product from Southern Australian and New Zealand operators.

However with appropriate marketing it is feasible that a cost efficient operation could generate sufficient demand to justify an modest size Queensland oyster farm. Targeting an annual production of between 10,000-15,000 dozen oysters is considered an appropriate level to supply the perceived Torres Strait, Cairns and broader North Queensland markets.

Development Feasibility

While the development of an oyster farm facility is possible, the remoteness of Moa Island mean development costs will be significantly higher than competitor operations. Developing a 15,000 dozen operation at Moa Island is expected to cost in the vicinity of $250,000 in capital. Oyster farms consist largely of low-tech infrastructure, and long-line systems are relatively simple to implement. Such factors make an edible oyster farm an attractive development option for Kubin.

Management Feasibility

It is highly unlikely that Kubin can import appropriately skilled management on a full-time basis at a cost that is viable to the operation. It may prove feasible for Kubin to source external management on a part-time basis, and rely on local labour for the day to day operations. Edible oysters are one of the simplest, and lowest risk forms of aquaculture, making the sourcing of expertise on an as needs basis to supplement local oversight a viable option.

Financial Feasibility

Based on production of 15,000 dozen Sydney rock oysters and an initial estimate of $50,000 for wages, the Kubin oyster farm would be expected to lose $41,990 in a year's operation (see Table E.2). For such a model to be viable, the Kubin farm would need to receive significantly higher farm gate prices than the 2009-10 Queensland average. The current market domination of pacific oysters in North Queensland makes the probability of receiving such a premium appear unlikely in the near term.

Table E.2: Profit and Loss Assessment

Item	$ (Excl GST)
Revenue	
15,000 dozen oysters @ $5.26 (farm gate)	$78,900
Cost of Goods Sold	
Spat (15,000 dozen @ $2.50 delivered)	$37,500
Gross Profit	*$41,400*
Operating Costs	
Wages	$50,000
Fuel	$5,000
Misc (Lease fees, Maintenance etc.)	$5,000
Depreciation	$23,390
Net Loss	**-$41,990**

Source: AEC*group*

The critical factors to a financially viable operation are minimising wage and spat costs, and ensuring a high percentage of plate grade product (see Table E.3).

Table E.3: Sensitivity Tests

Scenario	Net Profit/Loss	20 Year Net Present Value		
		7%	10%	13%
Base Scenario	-$41,990	-$445,835	-$355,718	-$290,028
60% Plate Grade Product	-$20,540	-139,854	-109,139	-85,634
Source Small Spat	-$19,490	-$124,875	-97,069	-75,629

Owner Operator	$3,010	$196,084	$161,580	$138,770
25% Mortality	-$61,715	-$727,209	-$582,467	-$477,984
Small Spat and 60% Plate Grade	$1,960	$181,106	$149,510	$128,765
Owner Operator and Small Spat	$25,510	$517,044	$420,229	$353,170

Source: AEC*group*

Business Plan

Based on the best estimates of market demand, cost factors and site assessments, the most viable course of action would be for the Kubin community to aim towards a long-line, sub-tidal, sydney rock oyster farm operation. Following extensive small scale trials and market development, initial full scale production should be targeted at around 15,000 dozen oysters per year. Financing would ideally be sourced through the TSRA and similar funding schemes. Marketing should be aimed at the Torres Strait and Cairns regional area. Initial operations will only require one to two people, with a larger casual team to assist with the harvest. Management if at all possible should be sourced locally, with external expertise brought in as required. Should the operation prove successful, opportunities for further expansion should be considered. The proposed operation has a high risk profile and therefore implementation should be incremental. Significant capital expenditure should only be undertaken after key uncertainties surrounding lease and transhipment approval, growing conditions, and market demand have been addressed.

Table E.4: Action Plan

Action	Responsibility	Measure
Submit applications for oyster farm lease and spat transhipment approval	Zagul Economical Development Company	Oyster area lease & transhipment approval
Initiate trials for local spat collection and investigate local spawning patterns	Zagul Economical Development Company, Kubin Community	Information regarding Local spatfall rates/consistency
Investigate opportunities for alternative New South Wales spat suppliers	Zagul Economical Development Company	Supplier list
Investigate costs / opportunities to procure management	Zagul Economical Development Company	Response
Investigate market development opportunities within the Torres Strait	Zagul Economical Development Company	Response
Initiate pilot programs for sydney rock oysters	Zagul Economical Development Company, Kubin Community	Trial Results
Prepare a marketing plan for Kubin sydney rock oysters	Zagul Economical Development Company	Marketing Plan
Prepare funding application for TSRA Community Economic Initiative Scheme	Zagul Economical Development Company	Response

Source: AEC*group*

Conclusion

There are several features that make an oyster farming operation at Kubin attractive. An edible oyster farm appears to be one of the more viable development options available to the Kubin community, and is likely worth pursuing further. Positive factors which support the feasibility of the project include:

- Established and relatively low cost production technology;
- Comparably simple, low risk, and low maintenance production;
- Pristine growing environment; and
- Low transport costs to the North Queensland market for sales.

However, the proposed oyster farm is currently subject to considerable commercial, regulatory, and economic uncertainty. Therefore at this stage the proposed farm must

be considered a high risk venture. Key factors, information gaps, and uncertainties which cast doubt over the proposed venture include:

- The current depressed state of the Queensland edible oyster industry;
- High cost of procuring spat relative to competitors;
- No established North Queensland market for sydney rock or other native oysters (e.g. blacklip oysters);
- Highly competitive supply in the market currently dominated by pacific oysters;
- Perceived cost and difficulties of sourcing skilled labour to Moa Island;
- Unknown spawning and quality characteristics of oysters grown in the Torres Strait; and
- Regulatory concerns surrounding approval to source sydney rock oyster spat.

For the project to proceed, many of the information gaps and uncertainties surrounding the operation need to be addressed. Before any trial work can commence, approval must be gained from Fisheries Queensland regarding lease and transhipment approval. As a priority action trial programs should be initiated to address key uncertainties surrounding spawning cycles, site viability, product growing times and quality, shelf life, and potential pests / diseases before significant capital expenditure is undertaken. Should approvals be gained and the results of trial growing and market development prove positive, then the development of a 10,000-15,000 dozen sydney rock oyster farm operation appears a feasible alternative for the Kubin community, provided that the project is carefully managed and driven at the local level.

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1. Introduction

1.1 Background

The Torres Strait Island Regional Council (TSIRC) has commissioned AEC*group* to prepare a feasibility report on an oyster farm aquaculture venture at the Kubin community on Moa Island.

In 2009 AEC*group* prepared a report "Review of Torres Strait Island Council's Freezer and Fishing Operations". That study identified that the Kubin community had little involvement in commercial fishing. The prospect of aquaculture was recognised as a potential opportunity for communities with lesser advantages and involvement in respect to commercial fishing.

During consultation in Kubin for the 2009 report, AEC*group* was made aware of an approach by a New South Wales based firm proposing the establishment of an oyster farm aquaculture venture with the Kubin community. The proposal involved the supply of spat, technical advice, supervision and marketing of product. Sydney rock oysters were the variety proposed.

Members of the Kubin community have visited the New South Wales firm to gain an insight into operation of an oyster farm. Interest in the Kubin community in pursuing the proposal is high. AEC*group* visited the Kubin community in late October, 2011 to speak to community leaders to gain an appreciation of the proposed venture, examine proposed sites and to assess local factors such as workforce, freight links, naturally occurring oyster types and weather conditions.

The operation would be a venture of the Zagul company set up to run businesses of the Kubin community.

1.2 Project Proposal

1.2.1 Concept

The concept for the oyster farming operation proposed for Kubin is for a floating operation in an offshore channel close to the Kubin community. Oversight and technical expertise would be sought from outside the community and the workforce would be provided from the Kubin community. A joint venture arrangement would be considered. It has been suggested the venture be controlled by a local Board of Directors under the Zagul company structure. Marketing would be via a partner already operating in the industry or through commercial fish markets and brokers.

1.2.2 Industry Context

1.2.2.1 Australian Industry

The edible oyster industry in Australia produced 14,008 tonnes (approximately 20.5 million dozen) of oysters in 2008-09. Annual production has almost doubled since 2000-01, with the farm gate value of oyster production rising from $55.2 million in 2000-01 to $94.6 million in 2008-09. There are over 500 registered oyster farms in Australia, with the majority of production (98.4%) occurring in South Australia, Tasmania, and New South Wales. Only 3% of Australian oyster production is exported, predominantly to Hong Kong, Singapore, and Japan (Austasia Aquaculture, 2011).

The pacific oyster (*Crassostrea gigas*) and the sydney rock oyster (*Saccostrea glomerata*) are the two major edible oyster varieties produced in Australia. Small scale harvesting of natural stocks of milky oyster (*Saccostrea amasa*) and blacklip oyster (*Saccostrea echinata*) also occur in Northern Australia. Pacific oysters are produced in Tasmania, South Australia, and small quantities in New South Wales. Pacific oysters's are the largest volume species produced in Australia, with a national output reaching 10,018 tonnes (approximately 14 million dozen) in 2008-09. The main attractions of farming pacific oysters include:

- Fast growth rates (12-18 months to reach market size);

- Large sizes achievable;
- Established and reliable hatchery production of spat;
- Hardy and disease resistant; and
- Mild flavour (popular for mainstream consumption).

Pacific oysters are native to Japan, and were introduced to Australia for the purposes of aquaculture. Pacific oyster's hardy nature and fast growth make them ideal for cultivation. However these same traits mean pacific oysters can displace native intertidal species. Introduction of pacific oysters for aquaculture has been banned in most of New South Wales, and all of Queensland, Victoria, and Western Australia.

Sydney rock oysters are native to New South Wales and much of Australia, with small scale production also occurring in Southern Queensland. While sydney rock oysters are now produced on a smaller scale then pacific oyster's (4,071 tonnes or approximately 6.5 million dozen in 2008-09), this variety fetches a higher farm gate price across all grades (see Table 1.1). Other key points of farming sydney rock oysters include:

- Slower growth rates (3 years to reach plate size);
- Smaller marketable size (60-80 mm);
- Susceptible to QX disease; and
- Stronger flavour which is less popular with mainstream tastes (marketed as a connoisseur product in top line New South Wales restaurants).

Table 1.1 Farm Gate Oyster Prices 2009-10

Sydney Rock	Farm Gate Price / Dozen	Pacific	Farm Gate Price / Dozen
Plate Grade	$8.26	Select & Prime Grade	$7.47
Bistro Grade	$6.41	Bistro Grade	$6.28
Bottle Grade	$4.52	Mini Grade	$4.65

Source: NSW Aquaculture Production Report 2009-10

1.2.2.2 Queensland Industry

Currently all of Queensland's aquacultured oyster production occurs south of Hervey bay. Production is confined to sydney rock oysters, with spat sourced exclusively from New South Wales. There are currently 25 active oyster farms in Queensland; with production sizes ranging from 40 dozen to 19,500 dozen (see Table 1.2). As of 2009-10 the industry provided 21 full time equivalent (FTE) jobs (Wingfield and Willet, 2011).

Table 1.2: Queensland Oyster Farms (2009-10)

Production (dozens)	No. of Growers
1-500	8
501-1,000	2
1,001-2,000	4
2,001-5,000	6
5,001-10,000	1
10,000+	4
Total Oyster Producing Areas	**25**

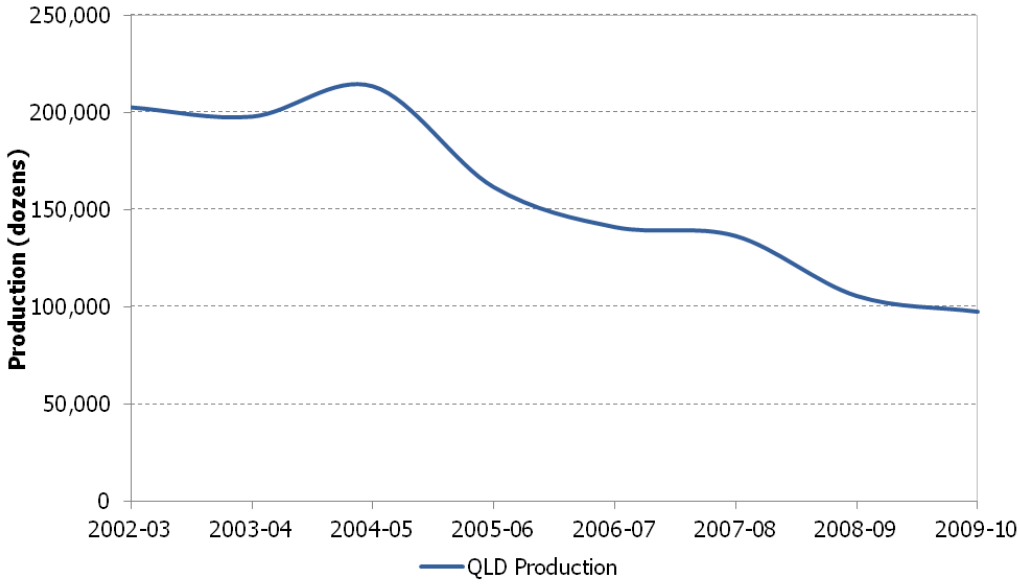
Source: Wingfield and Willet (2011)

Over the last five years the Queensland oyster industry has been in continual decline, with annual production levels halving since 2004-05 (see Figure 1.1). Fisheries Queensland has launched two industry development plans (in 2004 and 2008) in an attempt to revitalise the industry, however production volumes have continued to fall.

Major issues identified in the 2004 and 2008 development plans as responsible for the decline in the Queensland edible oyster industry include:

- An inability to differentiate Queensland product from Southern Australia and New Zealand grown oysters;
- A lack of specific demand in Queensland for sydney rock oysters;
- Strong competition from South Australian, Tasmanian, and New Zealand pacific oysters;
- Difficulty sourcing QX disease free spat from New South Wales;
- High cost of sourcing spat from New South Wales; and
- Large incidence of growers acquiring prime lease areas and not producing.

Figure 1.1: Queensland Edible Oyster Production

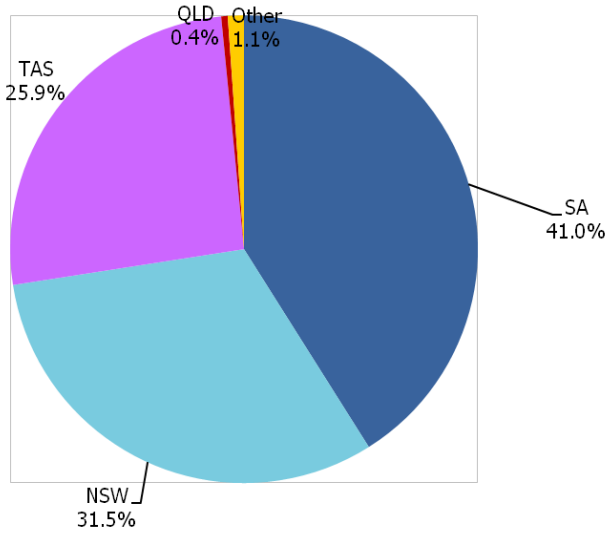


Source: Wingfield & Willet (2011)

1.2.3 Existing Oyster Farms

The existing Australian oyster industry consists of approximately 550 individuals and businesses. Approximately 98.4% of oyster production occurs in the states of New South Wales, South Australia, and Tasmania (see Figure 1.2). The predominant industry model is a family owner-operator business. In aggregate the industry employs an estimated 2,000 full and part time employees (Austasia Aquaculture, 2011).

Figure 1.2: Australian Oyster Production by State



Source: Austasia Aquaculture (2011)

1.2.4 Culture Methods

There are various culture methods used to farm oysters across Australia. Cultivation methods are generally divided between intertidal and sub-tidal methods.

1.2.4.1 Spat Collection

Spat are the baby oysters when they first settle from plankton onto something solid. For farming purposes spat are collected either on pre placed plastic catching slats in the wild, or reared at a specialist hatchery. The captured spat are then translocated to the farming site for growing purposes.

1.2.4.2 Intertidal Methods

Intertidal farms use a series of wooden racks to support sticks, trays, or bags of growing oysters. Intertidal farms are built in shallow, sheltered waters between the high and low tide marks (New Zealand Ministry of Fisheries, 2011). The racks are generally set so that the oysters sit just above the water level at low tide and are covered by at least one metre of water at high tide. Collection and maintenance work is generally carried out via standard trucks and 4WD's or custom built aqua tractors during low tide depending on the scale of the operation.

Advantages of intertidal operations:

- Stronger and more consistent shells;
- A longer shelf life (due to stronger abductor muscles);
- Easier maintenance and collection;
- Lower equipment and labour costs; and
- Generally a cleaner and higher quality product.

Disadvantages of intertidal operations:

- Slower growth rates.

Common variations of intertidal oyster farming identified by Queensland Fisheries (2009):

- **Stick Cultivation:** Stick cultivation is where the sticks used for spat collection, are retained, excessive spat is removed and the remaining oysters are left to mature. The major difference is that the battery of sticks from the spat collection stage is separated and laid out more extensively onto the racks. With spacing of 15-20 cm

between each stick they are then fixed to the racks. A disadvantage with this system is that if the oysters are not thinned out they will grow in clumps and produce smaller and irregular-shaped oysters. Demand for single seed product has seen stick cultivation phased out in Australia over recent years;

- **Tray Cultivation (single seed):** Tray culture utilises wood, aluminium or plastic frames with bases of galvanised wire or plastic mesh. The tops of the trays are usually covered with a wire mesh or netting which is removable to enable the stock to be inspected. The tray is designed so that the height of the frame is equivalent to the height of one oyster only to maximise the water flow to each oyster in the tray and reduce the likelihood of oysters being flipped over. As with the stick method, overspatting is avoided by placing the trays in the water column above or below the optimum settlement region for spat;
- **Long-line systems (single seed, can be adapted to sub-tidal):** Long-line systems consist of a line tensioned between two anchoring posts (with intermediate posts to keep it above the bottom). From the long-line, a series of PVC mesh bags are suspended on clips. Adjustments can be made to the height quickly by adjusting the height of the line on the intermediate posts. Bags can be removed or placed quickly by the use of stainless steel or plastic attachment clips; and
- **Rack and basket system (single seed):** Bags of PVC mesh with two longitudinal sticks through either end are suspended between a rack structure.

1.2.4.3 Sub-Tidal Systems

While intertidal farming methods are far more common in Australia, some oyster farm operators utilise sub-tidal farming practices. In sub-tidal systems the oysters are grown in deep waters, (remaining below the surface of the water at all times). Most commonly the oysters are suspended in trays or baskets attached to long-lines supported by plastic floats. Growing depth is adjusted to accommodate an optimum balance between meat and shell growth, and oyster quality. Optimal growing depth is determined through trial and error for each site. Collection and maintenance works are usually carried out via a specialist barge equipped with a crane.

Advantages of sub-tidal systems:

- Faster growth rates as the oysters are able to feed continuously; and
- Greater range of potential sites.

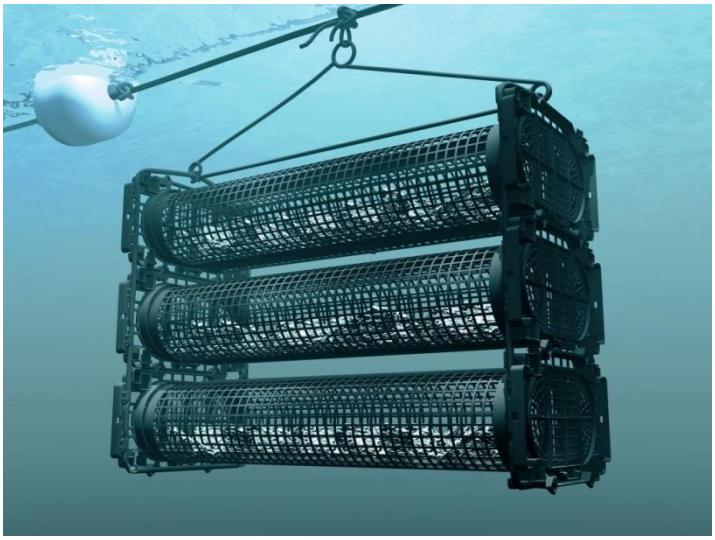
Disadvantages of sub-tidal farming:

- Typically poorer shell development;
- Higher incidence of fouling;
- Inconsistent growth rates;
- More difficult collection and maintenance;
- Higher equipment and labour costs; and
- A shorter shelf life.

Examples of sub-tidal systems are displayed in Figure 1.3.

Figure 1.3: Examples of Subtidal Oyster Farms

Source: http://www.cameronsoysters.com/



Source: http://www.seapa.com.au

1.3 Document Structure

In order to assess the feasibility of the proposed Kubin edible oyster farm, this document first assesses the market demand conditions likely to be faced by the Kubin operation. Factors including product characteristics, market demand, and existing competitors have been analysed to indicate a maximum likely scale of production for Kubin. Analyses of factors including site location, growing potential, equipment and labour availability provide an indication of Kubin's potential as an oyster farm site. Key risk, cost, and regulatory factors have then been reviewed in order to evaluate the risk profile of the proposed operation. Based on research findings, market, development, and financial feasibility assessments of the project are provided, with an appropriate business and action plan recommended for the most viable business model.

2. Demand Factors

2.1 Product Characteristics

2.1.1 Species

Due to the restrictions against introducing the pacific oyster into Queensland, Kubin oyster production will involve either introducing the sydney rock oyster (through spat imported from either South East Queensland or New South Wales) or cultivating the local milky or blacklip oysters. The sydney rock and milky oyster are possibly identical, or at least very closely related, species and are almost identical in size, quality and flavour. Blacklip oysters are the most common native species occurring near Moa Island. While blacklip oyster's are collected in large quantities for local consumption, they are generally not considered palatable enough for commercial purposes.

2.1.2 Size and Quality

For an edible oyster farming operation to be viable, production needs to be aimed at the top grade (Plate) market to ensure sufficient demand and viable prices. A plate grade sydney rock or milky oyster is a minimum 70 mm in length, and weighs approximately 50 grams. A sydney rock oyster typically takes three years to reach plate size, however sub-tidal farming practices can significantly reduce the time required. Furthermore, oysters grown in warmer waters may grow faster.

Quality and consistency are important considerations to ensure oyster production is marketable. Oysters must now be produced through a single seed method (to enable consistent size and shell shape). Oysters must be clean and free of pests such as mud worm which will spoil the product's appearance and can impact on flavour. Oysters are best harvested when they are "full". In this sense oysters are most "full" and marketable prior to spawning. Spawning involves the release of sperm or eggs into the ocean and reduces the bulk of the oyster considerably. Harvesting oysters too soon after spawning results in a flaccid texture and flat, watery taste.

2.1.3 Seasonality

No-one consulted in the Kubin community by AEC*group* could definitively state when oysters spawn in the Torres Strait region. Oysters are harvested for local consumption year round. However it is felt that the seasonal indicators and the breeding patterns of other marine life, particularly corals, in the Torres Strait provide a good guide. On this basis it is felt that the best time to harvest oysters would be in the cooler months from March/April through to about September.

There is a risk of some spawning occurring throughout the winter months in the warm waters surrounding Moa Island. Even a small percentage of spawning throughout the harvest season would significantly decrease the desirability of supply from the Kubin oyster farm. Buyers do not want to buy oysters where even one or two per dozen are spawned out on opening. The only way to test for spawning patterns is via a trial program, with potential species opened and checked every few weeks to identify the timing and consistency of spawning patterns. This would provide a better indication however spawning can be triggered by water temperatures and conditions and is not completely consistent from year to year.

The time required for oysters to recover market condition from spawning tends to be in the vicinity of one to two months, though varies greatly between individual sites. Again a trial program would have to be implemented to gauge the length of time required for Kubin grown oysters to become commercially marketable after spawning.

2.2 Markets

2.2.1 Local

There is currently no formal local market for seafood caught in the Torres Strait. Nearly all seafood is sold to a limited number of local buyers and exported from the region.

Currently the Torres Strait seafood catch is confined mainly to fish and crayfish (tropical rock lobster).

Mr Daniel Tarki (proprietor of Pearl Island Fisheries) is very positive about the prospect of creating a local market for oysters. Mr Tarki intends to open a seafood store on Thursday Island in the future and believes oysters would sell well. Mr Tarki currently supplies oysters from southern sources to all the hotels and restaurants on Thursday Island. While Mr Tarki believes that all farm output could be consumed in the region, it is likely that he is not aware of the size of output that a commercial oyster farm would produce. While Mr Tarki would make an ideal seafood buyer for local distribution and further afield, the potential size of the Torres Straight market is at this stage unclear.

There may also be the opportunity for sale of oysters to other communities in the Torres Strait. However, the potential costs involved in facilitating small scale sales of this nature need to be carefully assessed. Commercially produced oysters are a luxury item and not likely to be consumed regularly by most Islanders.

2.2.2 Cairns

Oysters can be shipped chilled to Trinity Bay in Cairns via Sea Swift at a cost of $548.85 per cubic metre. Average shipping times are between five and seven days which oysters should tolerate live, though condition of Kubin sub-tidally grown oysters for such transit times would need to be tested. It is possible that sub-tidally grown oysters may need hardening in inter-tidal conditions prior to shipment to strengthen their abductor muscles and subsequently their shelf live out of water.

Cairns' oyster supply is currently dominated by pacific oysters shipped from Southern Australian markets and New Zealand. Consultation with local wholesalers indicates that the mainstream retail market prefers the milder flavour, consistency, larger size, and lower price of pacific oysters. While there is currently no significant market for sydney rock oysters in Cairns, local wholesalers have expressed some interest in sourcing stock from Kubin if a market can be developed. Some potential for market penetration exists due to the high transport costs associated with procuring pacific oysters from interstate and overseas. Demand from wholesalers is dependent on acquiring consistent, quality, and cost efficient supply.

There may be potential for the development of a niche market for locally produced product with higher end and specialist restaurants and hotels, though demand would still exist only on a small scale.

2.2.3 Beyond Cairns

Longer-term potential exists to expand production to supply broader North Queensland (Mackay north). As is the case in Cairns, no significant established market currently exists for sydney rock oysters, and supply is dominated by pacific oysters. As is the case for the Queensland oyster industry as a whole, capturing market share depends on price competitiveness and differentiating local product.

2.3 Competition

2.3.1 Fresh Sydney Rock Oysters

Approximately 98.4% of sydney rock oysters are produced in NSW, with remaining production occurring in Southern Queensland. A total of 334 NSW registered operators produced 5,812,934 dozen sydney rock oysters in 2009-10, a decline of 726,352 dozen from 2008-09 (New South Wales Department of Primary Industries, 2011). The New South Wales sydney rock oyster industry was established in the 1870's and consists of some large, well established operations and a very competitive market. The cooler waters in New South Wales enable farmers to operate with less downtime for the spawning season. Due to the transport cost differentials, an efficient operation would enable the Kubin oyster farm a price advantage over New South Wales and Southern Queensland producers to supply North Queensland.

2.3.2 Fresh Pacific Oysters

Fresh pacific oysters from South Australia and Tasmania now dominate the Australian mainstream market, with some production also occurring at Port Stephens in New South Wales. As late as 1990 pacific oysters only accounted for 27% of Australian production (Nell, 1993). However more efficient farming methods, competitive prices and the broader acceptance in the market of the milder flavoured pacific oysters have seen the market share of pacific oysters rise sharply over recent years. Pacific oysters accounted for a record 70.3% of Australian production in 2008-09 (Austasia Aquaculture, 2011). The enhanced growth rates, larger size, disease resilience, and popular flavour make fresh pacific oysters extremely competitive in the Australian market.

2.3.2.1 South Australia

South Australian pacific oysters are produced by efficient and established growers along the pristine Eyre Peninsula from Kangaroo Island to Smokey Bay. South Australian oysters are recognised as world class, with fresh pacific oysters grown in the Coffin Bay area considered among the best in Australia. South Australia is now responsible for 41% of Australian oyster production, with a harvest season that generally lasts from April to November.

2.3.2.2 Tasmania

Tasmanian Pacific oyster production accounts for 25.9% of total Australian production, with 70 registered growers producing 3.6 million dozen oysters annually. Since oysters rarely spawn in the cold waters surrounding Northern and South East Tasmania, growers are able to produce almost all year round.

2.3.3 Frozen Pacific Oysters

Frozen pacific oysters are sourced primarily from South Australia, Tasmania and New Zealand. Frozen pacific oysters are often of high quality, and provide a cheap and convenient alternative to fresh oysters for the lower end of the market.

3. Supply Factors

3.1 Site Characteristics

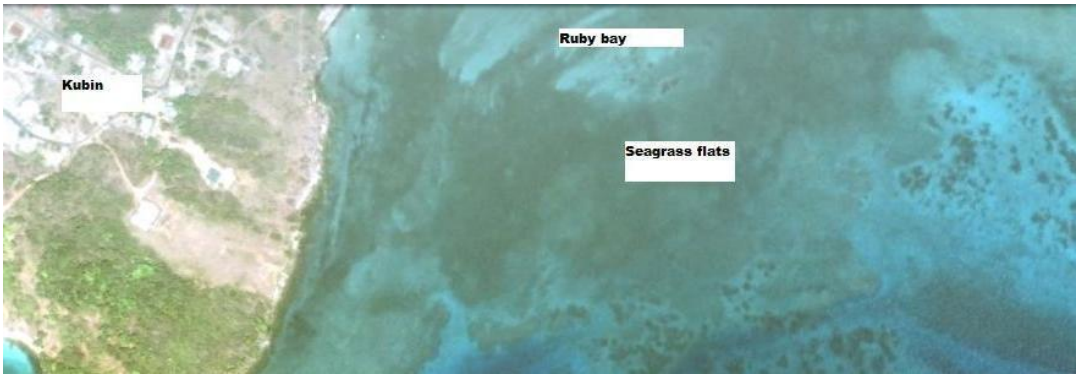
3.1.1 Physical Characteristics

3.1.1.1 Ruby Bay

Around the Kubin community, there are extensive tidal flats which are exposed to about 1.4 metres of water at high tide level. In most instances the tidal flats end in a sharp drop off with reef formations beginning in the deeper water. While the tidal levels, and close proximity to the Kubin community make Ruby Bay an ideal intertidal farm location, the flats are a high quality environment for seagrass beds. There is also some tidal coral beds exposed. There is currently a seagrass monitoring project in Ruby Bay run by local rangers and supervised by TSRA and QLD DPI officers.

In addition to the close proximity to the Kubin community, the tidal flats exhibit a relatively hard bottom (suitable for an aquatic adapted vehicle to access). However it is unlikely that an intertidal oyster farming operation would be allowable on the flats surrounding the Kubin community on environmental grounds.

Figure 3.1: Ruby Bay Site



Source: Google Earth, AEC*group*

3.1.1.2 Natural Oyster Beds

Another possible site is the area of natural oyster beds in the channels just off Moa Island opposite the Badu community (the site of the former pearl farm). The moderately deep channel appears subject to considerable current flow in the narrow strait between Moa and Badu. The site is sheltered from the south easterly winds entirely and also has some reef and island protection from the north easterly winds in summer. There is a small tidal creek that flows into the area but there does not appear to be disturbance upstream in the catchment, so pollutants flowing from the creek are unlikely. The reported health of the oyster beds indicates that the site is suitable for both spat collection and oyster growing.

Unfortunately security is a major concern regarding this site. The channel area some distance from the Kubin community and is considerably closer to the Badu community. There is a lot of boat traffic past the site and it is a traditional area of local oyster gathering. While there is the possibility of permanently stationing a caretaker on the oyster farm site, it would be expensive, hard to maintain long term, and generally impractical.

Figure 3.2 Natural Oyster Beds Site

Source: Google Earth, AEC*group*

3.1.1.3 Ruby Bay Channel (Sub-Tidal)

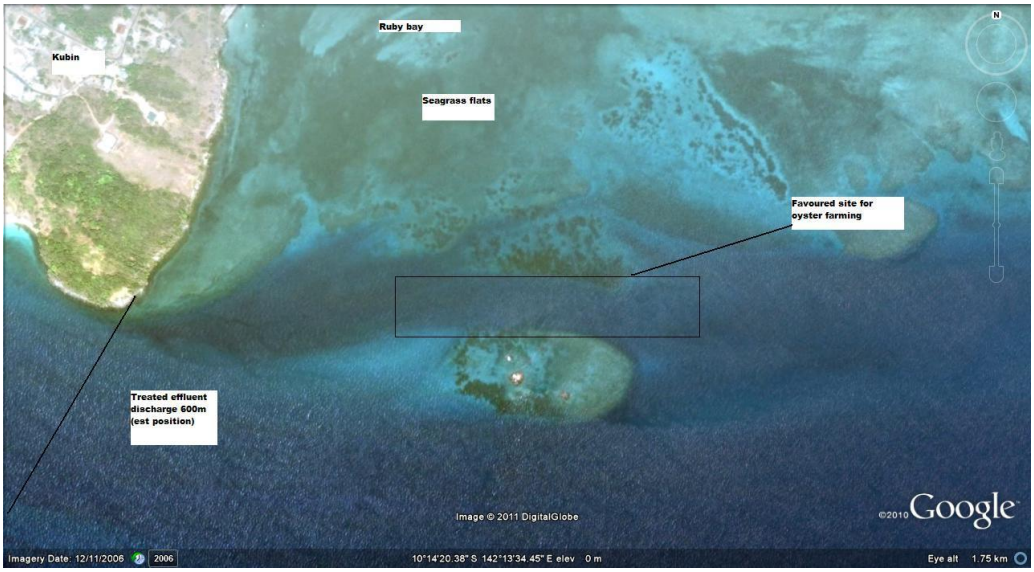
The Kubin community's favoured site is a channel off Ruby Bay. The channel is immediately out from the drop off at the extent of the tidal flats. The proposed site has a rocky reef outcrop on the far side, giving the channel some natural shelter from the predominant south easterly wind that blows into the bay. The channel site is completely sheltered from the strong north easterly winds during the summer monsoon season. The site exhibits moderate tidal flows through the channel. The depth of the channel is estimated to be about 10 to 15 metres. The south easterly winds blow into the bay and may impact on access to the site from time to time. Bottom conditions in the channel are rock, coral and bommies (the current flow through the channel is likely to reduce the amount of loose material).

Access to the site would be by boat either from the Ruby Bay or Kubin barge landing side. The barge landing side would require travel around the Kubin point, a short distance but uncomfortable in rough weather. The Ruby Bay channel is close to the Kubin community, with several homes on the hill overlooking the site providing a higher level of security.

A potential concern with the sub-tidal site is its proximity to the sewerage plant for the Kubin community. The sewage plant has an outfall pipe that extends 600 metres out from the Kubin headland. Consultation with the Kubin community indicated that the outfall flowed well away from the proposed Ruby Bay channel into a deeper channel further out (cleared by strong currents). It is also likely that the standard of sewerage treatment is to the tertiary level, further reducing the potential pathogen and nutrient load. However due diligence through testing of oysters grown in a pilot stage would have to be undertaken should the proposed Ruby Bay Channel site be selected.

Overall the Ruby Bay Channel site is the most likely candidate for the Kubin oyster farm based on accessibility, growing potential, environmental impacts, and security implications.

Figure 3.3: Ruby Bay Channel Site



Source: Google Earth, AEC*group*

3.2 Construction Needs

Establishing the sub-tidal Ruby Bay Channel site would require laying out moorings for long-line infrastructure. Shore based infrastructure for grading and equipment storage would also be required. Improving barge access from Ruby Bay would also improve efficiency and productivity.

3.3 Skills Base

The Kubin community has a ready supply of labour with the skills level required for the day to day work associated with running the oyster farm. However, the technical expertise and industry experience required to manage the farm would prove difficult to initially source from within the community. In the initial setup and operational stages some technical and management expertise would need to be sourced from mainland Australia.

Over the longer term a local supervisor would be far more suitable and cost effective, due to the accommodation and travel expenses associated with importing management. Once the oyster farm is operational, appropriate training should enable farm management to be sourced from within Kubin. The hardy and resilient nature of edible oysters means that a reliable, observant, and hard working individual would be able to succeed as farm manager without possessing a high level of scientific or technical skills.

3.4 Operating Equipment

Operations of the proposed Ruby Bay Channel sub-tidal site would require the following equipment and infrastructure:

- Long-line system;
- Bags/baskets/trays to suspend the oysters;
- Barge with sufficient room for trays and a hiab crane to lift up lines;
- Snorkel and dive equipment (to monitor the oysters);
- Grader;
- Rumbler to help harden & clean the sub-tidal oysters;
- Gurney system on barge and shore;
- Packing area and equipment; and

- Ute / trucks.

3.5 Spat Supplies

All Queensland oyster spat is currently imported from New South Wales. As the sydney rock oyster industry is adequately serviced with wild spat and the Kubin operation would only be small, the setting up of a specialist hatchery would be financially impractical. The two main spat procurement methods available to the Kubin farm are therefore:

- Import sydney rock oyster spat from New South Wales or Southern Queensland; and
- Collection of local oyster spat.

3.5.1 Import Sydney Rock oyster Spat from New South Wales or Hervey bay

The original proposal for oyster farming at Kubin floated by the New South Wales firm Whittens and Lambert involved the Kubin community purchasing sydney rock oyster spat and translocating them to Moa Island. There are several advantages to this proposal, including:

- Sydney rock oyster's are a well recognised commercial species, more likely to find a market;
- Production will be consistently of the same species;
- Reliable supply levels from year to year; and
- Ability to obtain a large stock of spat quickly to get operations underway.

However there are also considerable risks and drawbacks to sourcing sydney rock oyster spat. Translocation of sydney rock oyster's in Queensland requires a specialist permit issued by Fisheries Queensland. There are significant regulations surrounding the transportation of sydney rock oyster spat, and where spat is allowed to be sourced from. Transhipment permits are granted on a case by case basis. Consultation with Fisheries Queensland resulted in concerns being raised over granting a permit within the Torres Strait on bio-security grounds. Some initial indicators appear good, however it is still uncertain how well sydney rock oysters from New South Wales or Southern Queensland will adapt to growing in the warm waters surrounding Moa Island; therefore a small scale trial program would have to be undertaken to assess feasibility.

Whittens & Lambert propose to supply up to 1.5 million (125,000 dozen) 12 to 18 month old oysters for on growing at a cost of $4 per dozen plus shipping costs.

3.5.2 Local Spat Collection

The second alternative involves collecting local milky and blacklip oyster spat. Whilst milky oysters (essentially identical to sydney rock oysters) are a marketable species, there is no way to prevent blacklip oyster spat from settling with them.

The most likely area would be the naturally occurring oyster beds in the old pearl farm area opposite Badu. Utilising the local spat population would overcome the bio-security and performance uncertainties associated with imported sydney rock oyster spat. There may also be greater potential for niche market development within the Torres Strait and Cairns region from patrons seeking a local, native product. However there are several key concerns surrounding the commercial viability of harvesting local spat:

- Currently there is no reliable estimates of spatfall rates, density or timing;
- May be insufficient local spat population for commercial purposes;
- Spat collected would consist of a mix of different oyster types with difficulty and cost involved to separate the more valuable milky oysters from the blacklip oysters as they grow;
- Large amounts of time and labour would be required for collection and sorting;
- Spatfall can be inconsistent and unreliable from year to year; and
- Local species are an unknown quantity in terms of commercial marketability.

While sourcing local spat offers several advantages, choosing this method would introduce a further element of experimentation and delay in getting operations off the ground. It would also result in a proportion of oysters produced being lower value blacklip oysters and additional labour costs in sorting the blacklip oysters from the milky oysters. For these reasons, local collection is considered the less preferred option.

3.6 Growing Conditions

The pristine tropical waters surrounding Moa Island should prove suitable for commercial oyster growing. Site inspection and community consultation reveals the following indicators of Moa Island's oyster growing potential:

- Local blacklip and milky oysters tend to thrive around the 1.4 metre tidal mark, with milky oysters occurring at a slightly higher level;
- The local oysters appear completely free of fouling, worms, and bores;
- Oysters are consumed locally year round, with little difference noted in quality;
- Local oyster species appear to experience solid growth rates, with an average harvest size of 100 mm. (However there is no available local information regarding the length of time taken to reach harvest size); and
- No significant die offs of oyster population have been observed due to disease or weather events.

Small scale trials would need to be initiated to confirm the suitability of the Ruby Bay Channel and other potential oyster farm sites.

4. Risks and Uncertainties

4.1 Technical Risks

4.1.1 Growth Rates

The warm topical waters and utilisation of sub-tidal farming methods should ensure relatively fast growth rates. It should be noted that both sydney rock and local oyster varieties mature more slowly than pacific oysters, although the warm waters should maximise growth rates.

4.1.2 Consistency of Quality

There is a key risk to batch quality should the tropical conditions enable some spawning during the winter months. Even a spawning rate as low as one in a dozen out of season will lead to an inferior batch quality relative to established producers. Consistency of species is also a concern should the farm source local spat.

To be a viable operation, the Kubin oyster farm must be able to consistently produce plate quality product. As the operation will face higher spat import costs, the Kubin farm will only be able to recover fixed costs by producing plate and bistro grade oysters. Low value bottle grade product commonly accounts for between 40%-50% of Queensland grower output (see Table 4.1).

Table 4.1: Queensland Edible Oyster Prices (2008-09 and 2009-10)

Packaging Grade	2008-09		2009-10	
	Price per Dozen	% of Market	Price per Dozen	% of Market
Bottle	$3.46	47%	$4.43	39%
Bistro	$5.63	28%	$6.08	35%
Plate	$7.75	19%	$7.76	17%
Others	$2.81	7%	$2.81	10%
Average Return (All oysters)	**$4.83**		**$5.26**	

Source: Wingfield and Willet (2011)

4.1.3 Spat Supplies

A key uncertainty is whether the Kubin community can obtain a permit to translocate sydney rock spat from either New South Wales or Hervey Bay (Southern Queensland). There are also doubts as to whether spat can be sourced and transported at low enough prices for on-growing to be viable. The long travel distance required to transport spat will place the Kubin operation at a cost disadvantage to New South Wales and Southern Queensland operations. Importing smaller sized spat will reduce transport costs per dozen and should be pursued if the smaller oysters survive the transport well. Should the farm utilise local spat sources, there is considerable uncertainty surrounding the quantity and reliability of supply. Concerns also surround the consistency and commercial marketability of the species mix produced via local spat collection.

4.1.4 Extreme Weather Issues

Tropical cyclones are a remote event as far North as Moa Island. However, the area does experience strong winds which could potentially disrupt operations. The favoured Ruby Bay Channel site has a rocky reef outcrop on the far side giving the channel some natural shelter from the predominant south easterly wind. In addition the channel is completely sheltered from the strong north easterly winds during the summer monsoon season. Despite the natural protection provided by the potential farm site, a contingency plan for extreme, potentially cyclonic weather would be prudent. One strategy for sub-tidal operations is to cut the long-lines in preparation for an extreme weather event, sending

the oysters to the ocean floor. The oyster baskets/trays can be recovered by divers once the threat from extreme weather has passed.

4.1.5 Diseases and Predators

While there are numerous diseases and predators with the potential to disrupt Kubin's oyster farm, there are no major observable threats currently impacting the local oyster population. Major known oyster predators and diseases identified by Fisheries Queensland (2009) include:

- **Mudworms:** A segmented worm that infects oysters grown too close to the ground. While mudworms do not harm oysters directly, they hamper oyster growth and create unsightly brown blisters which greatly reduce marketability;
- **Oyster Drills:** Drills bore a hole into an oysters shell and digest the soft tissue. Various methods exist for controlling oyster drills including immersing the oysters for periods of time in fresh or hot water;
- **Barnacles and Mussels:** Barnacles and mussels inhibit oyster spatfall by colonising the spat collecting areas first. These pests can be avoided by placing the spat catchers out at the right time and height, avoiding the main barnacle and mussel spatfall; and,
- **QX Disease:** QX oyster disease is caused by the microscopic parasite *Marteilia sydneyi*. The parasite invades the oyster's digestive system and multiplies in the digestive gland. Once infected the oyster is unable to absorb food and starves to death. Oyster fatality in an infected bank can be as high as 95%. The sydney rock oyster is particularly susceptible to QX disease. QX disease is known to occur in areas from Southern Queensland and across New South Wales. It is not known if it occurs in the Torres Strait.

4.1.6 Water Quality

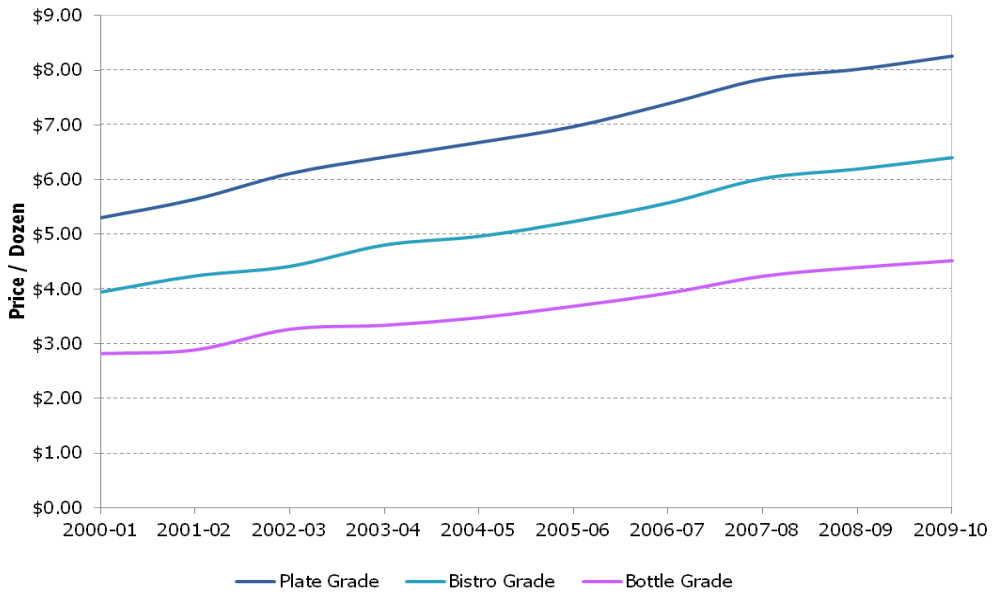
Prior to the issuing of an authority to produce, oyster areas are assessed by Fisheries Queensland to determine any potential environmental impacts that the oysters may be subjected to. The Ruby Bay Channel site in particular must be assessed to ensure production is not impacted by any stormwater or sewage plant run-off.

4.2 Market Risks

4.2.1 Price Risk

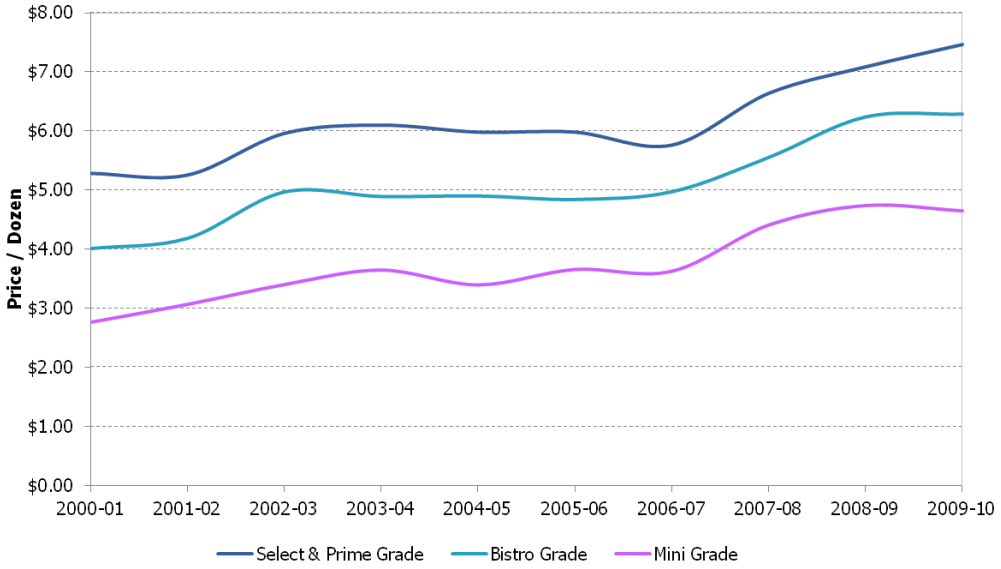
Sydney rock oyster prices have enjoyed continual steady increases over the last ten years. Annual price increases have averaged 5.6% for plate grade product (see Figure 4.1). While the stable price increases are an encouraging sign, the Kubin operation will enjoy far less price stability than established New South Wales operators. To develop a market for sydney rock oysters in North Queensland, it is likely the Kubin operation will have to be price competitive with the cheaper pacific oyster (see Figure 4.2) and/or invest heavily in marketing and branding.

Figure 4.1: Average Farm Gate Sydney Rock Oyster Prices



Source: NSW DPI (2010)

Figure 4.2: Average Farm Gate Pacific Oyster Prices



Source: NSW DPI (2010)

4.2.2 Transport to Market

Oysters can be shipped chilled to Trinity Bay in Cairns via Sea Swift at a cost of $548.85 per cubic metre. While the cost of shipping the oysters appears to be attractive, average shipping times are five to seven days. Sydney rock oysters are renowned for a long shelf life as a live oyster. However, the proposed sub-tidal method of farming has been known to significantly reduce shelf life (due to weaker abductor muscles). Small scale trials would be required to determine the ability of stock to cope with travel times. If oysters are not strong enough they may need to be acclimated to sub-tidal conditions prior to shipping – adding additional complexity and cost to the operation. The long travel period between Moa Island and Cairns greatly reduces the potential to supply fresh stock to broader North Queensland.

4.2.3 Competition

In order to penetrate the North Queensland market, the Kubin oyster farm will have to compete with established South Australian, Tasmanian, and New Zealand pacific oyster growers. Pacific oyster growers enjoy a competitive advantage due to the size, resilience, fast growing nature and broader market acceptance of the pacific oyster. In order to be competitive, the Kubin operation must produce as cost efficiently as possible. The farm must leverage both the favourable transport costs to North Queensland markets, and any possible niche markets for locally produced product. There is no immediate threat from local competition. However, market entry from other local sources is a strong possibility should the Kubin venture prove successful in developing a market for locally produced oysters.

4.3 Major Cost Factors

4.3.1 Labour

A labourers wage is expected to be around $600 per week. It is likely that a commercial operation will need to pay the minimum wage. Permanent employment will be relatively low, about two workers are envisaged. At times of harvest, a larger short term workforce of up to fifteen people may be required at a cost of between $20-25 per hour. Sourcing outside management is expected to be extremely expensive. To attract a suitably qualified individual to the Torres Strait, in addition to travel and accommodation expenses is expected to cost in the vicinity of $100,000-$150,000 a year.

4.3.2 Fuel

Fuel will be a major expense. It is provided by Caltex throughout the Torres Strait. The price of petrol at Kubin is $2.10 per litre, a significant premium over competitor operations in the southern states.

4.3.3 Spat

Whittens & Lambert propose to supply up to 1.5 million (125,000 dozen) 12 to 18 month old oyster spat at a price $4.00 per dozen plus freight costs. Assuming the Kubin operation receives the 2009-10 Queensland farm gate average of $5.26 per dozen for final output, it is extremely unlikely the farm will remain viable.

New South Wales Department of Primary Industries (2010) figures indicate average farm gate prices for large Sydney rock spat in 2009-10 were $1.50 per dozen. Large spat from the Port Stephens area fetched the highest average price of $2.22 per dozen (see Table 4.2). A more cost effective strategy may be to source smaller spat which sells at a significant discount (average price $0.92 per dozen for medium and $0.26 per dozen for small spat see Table 4.2) and would be cheaper per dozen to freight. However the cheaper price must be weighed against the additional growing time required to reach market size. Trial growing will be required in order to determine an optimal spat size and viable price range for the Kubin operation.

Table 4.2: New South Wales Spat Sales by Estuary (2009-10)

Estuary	Large Spat		Medium Spat		Small Spat	
	Quantity (Dozens)	Average Price per Dozen	Quantity (Dozens)	Average Price per Dozen	Quantity (Dozens)	Average Price per Dozen
Hastings River	269,958	$1.55	489,833	$1.05	1,016,667	$0.16
Port Stephens	108,333	$2.22	120,583	$0.67	998,708	$0.34
Other	432,187	$1.29	258,205	$0.80	804,167	$0.29
Total	**810,478**	**$1.50**	**868,622**	**$0.92**	**2,819,541**	**$0.26**

Source: NSW DPI (2010), AEC*group*

The cost of harvesting local spat for on growing will vary greatly due to labour costs. The cost efficiency of local spat collection depends heavily on the quantity and consistency of

spat available. Trial collection would need to be undertaken to begin to understand the costs and practicalities involved.

4.3.4 Equipment

A typical long-line bag system with five metre row spacing for a one hectare oyster farm (approximately 15,000 dozen Sydney rock oysters) could be set up at an approximate cost of $45,066 plus freight (see Table 4.3). As each oyster crop will take at least two years to mature, a 15,000 dozen oyster a year farm would require a two hectare long-line system.

Table 4.3: Estimated Long-Line System Set Up costs

Long Line System Costs (One Hectare)	Price	Quantity	Cost (Excl GST)
Floating Bags	$12.99	3,360	$43,646
8mm Marine Grade Rope	$0.20/m	2,300m	$460
Plastic Floats	$12	80	$960
Total			**$45,066**

Source: ZAPCO Aquaculture (2011), AEC*group*

Total estimated costs to set up a 15,000 dozen oyster farm operation at Kubin, including long-line system, barge, and plant and equipment is $248,432 (see Table 4.4).

Table 4.4: Estimated Farm Set up Costs

Equipment	Cost (Excl GST)	Assumed Life (yrs)
Long-Line System (x2)	$90,132	10
Barge	$45,000	10
Snorkel and Dive Equipment	$2,000	3
Grader	$21,500	10
Rumbler	$4,000	10
Gurney system (x2)	$800	5
Packing Shed	$30,000	20
Ute / Trucks	$25,000	5
Freight	$30,000	n/a
Total	**$248,432**	

Source: AEC*group*

The tropical marine environment tends to take a hard toll on plant and equipment and it is important that adequate finances are retained to make replacements as required. It is estimated on the above assumed plant and equipment life that $23,890 per year needs to be banked to allow for future replacements.

5. Project Support and Implementation Practicalities

5.1 Financing

The most likely source of financing for the project is via the funding programs of the Torres Strait Regional Authority (TSRA). The major applicable funding scheme is the Community Economic Initiative scheme. Applications for projects to be funded under the scheme are accepted twice a year (in March and October). Funding available varies from year to year but averages around $800,000. Many applications are received each year (in the current round, proposals worth $4 million were received). While it is hoped that TSRA will be a significant contributor to the project, it is unlikely that the fund could fully finance the development of an oyster aquaculture project. Ideally the funding for the set up and operation of the project would be staged incrementally over time.

Another possible approach is to seek a joint venture partner with both capital to contribute and expertise. There would be considerable advantages in this approach with an experienced oyster farm operator. The arrangement would require a tangible commitment from both sides. The original approach from the New South Wales firm might prove an avenue to pursue. However the original proposal does not appear to have a joint venture character, more a fee for service approach, a new market for spat and a marketing service for output. The current depressed state of the oyster industry in Queensland makes the probability of attracting significant private capital to a venture of this risk profile less attractive.

Given the green field nature of the project, alternate sources of funding such as research monies may provide a source of funds for the initial experimental stages of the venture.

5.2 Project Management Needs

It is likely that much of the project management requirements will have to be initially sourced from outside the Kubin Community. The Kubin oyster farm project will require higher skilled persons in the following areas:

- Operations management;
- Husbandry;
- Marketing;
- Business management; and
- Financial control / book-keeping.

While it is envisioned that a single full-time individual could be acquired to oversee all aspects of the operation, the cost of acquiring such an individual would be in the vicinity of $100,000-$150,000 per year. A more cost efficient alternative would be to source expertise from mainland Australia either part-time or on an as required basis (possible in the presence of a reliable supervisor/leading hand on site). Another option is to acquire a less experienced individual who is sufficiently motivated, observant, and willing to learn. Much of the marketing and book keeping may be initially sourced externally. Based on the likely scale of initial operations, the farm will only require one or two employees, with a larger casual staff during harvesting times.

5.3 Project Advocacy

The community advocate for the project is Cr David Bosun. Cr Bosun has pushed the project for some time and has been involved in a visit to the New South Wales oyster farm. Cr Bosun has indicated a clear desire to continue to advocate for the project, and serve on the Board of Zagul to oversee the project. However, Cr Bosun indicates no desire for direct employment in the project.

To successfully develop both an efficient oyster farming operation, the project will require strong advocates who believe in the project and have considerable technical and business

skills. Both market development and farming operations setup is possible through the use of external consultants and management, but the expected costs would prove well beyond the scope of the project.

5.4 Approvals and Environmental Regulations

To grow oysters commercially requires approval by Fisheries Queensland. Prior to the issuing of an authority, oyster areas are assessed to determine the potential environmental impacts that the oysters may be subjected to. Areas can be denied an oyster growing authority if the proposed site is subjected to sewage, stormwater runoff, industrial pollutants or other detrimental influences (Fisheries Queensland, 2009).

Transhipment of oyster spat stock into Queensland also requires a specialist permit issued by Fisheries Queensland. There are significant regulations surrounding the transportation of Sydney rock spat, and where spat is allowed to be sourced from. Transhipment permits are granted to growers on a case by case basis. Consultation with Fisheries Queensland resulted in concerns being raised over granting a permit within the Torres Strait on bio-security grounds.

The issue of native title may also arise but given the community desire for the project, this should simply be endorsed by the community native title group.

6. Feasibility Assessment

6.1 Market Feasibility

Given there is no ready market for sydney rock oysters in North Queensland, there is significant doubts as to whether a large enough market can be developed to justify a commercial oyster operation. Currently the Queensland oyster industry is in terminal decline, largely due to an inability to differentiate its product from Southern Australian and New Zealand operators.

However with appropriate marketing it is feasible that a cost efficient operation could generate sufficient demand to justify a modest scale Queensland oyster farm. Targeting an annual production of between 10,000-15,000 dozen oysters would be sufficient to supply the perceived Torres Strait, Cairns and broader North Queensland markets. A market for Sydney rock oysters in North Queensland would have to be developed over time. An appropriate strategy would be to source small amounts of product to wholesalers throughout the farm's trial phase. Such a move would provide a good indication of acceptance and demand prior to undertaking significant capital expenditure. A marketing effort emphasising the unique flavour and benefits of Kubin oysters would also need to be considered.

6.2 Development Feasibility

While the development of an oyster farm facility is possible, the remoteness of Moa Island makes development costs significantly higher than competitor operations. Developing a two hectare operation at Moa Island is expected to cost in the vicinity of $248,432. Oyster farms consist largely of low-tech infrastructure, and long-line systems are relatively simple to implement. Such factors make an oyster farm an attractive alternative for Kubin. To develop a Sydney rock oyster operation, Kubin will need to acquire lease area and transhipment authority from Fisheries Queensland as well as undertake trial production over several years before any significant capital expenditure is undertaken.

6.3 Management Feasibility

It is highly unlikely that Kubin can import appropriately skilled management on a full-time basis at a cost that is viable to the operation. It may prove feasible for Kubin to source external management on a part-time basis, and rely on local labour for the day to day operations. Edible oysters are one of the simplest, and lowest risk forms of aquaculture, making the sourcing of expertise on an as needs basis with local oversight a viable option.

A scale of operations large enough to justify full time management and more than one or two labourers is currently beyond the plausible scope of demand. It should be noted that the entire Queensland edible oyster industry only produced 97,500 dozen oysters in 2009-10. It is imperative should the Kubin community proceed with the oyster operation, that suitable local persons are identified and involved with the project as early as possible.

6.4 Financial Feasibility

Based on a 15,000 dozen Sydney rock oyster output and an initial estimate of $50,000 for wages, the Kubin oyster farm would be expected to lose $41,990 per annum (see Table 6.1). For such a model to be viable, the Kubin farm would need to receive significantly higher farm gate prices than the 2009-10 Queensland average. The current market domination of pacific oysters in the North Queensland market makes the probability of receiving such a premium highly unlikely in the near term.

Table 6.1: Profit and Loss Assessment

Item	$ (Excl GST)
Revenue	
15,000 dozen oysters @ $5.26 (farm gate)	$78,900
Cost of Goods Sold	
Spat (15,000 dozen @ $2.50 delivered)	$37,500
Gross Profit	*$41,400*
Operating Costs	
Wages	$50,000
Fuel	$5,000
Misc (Lease fees, Maintenance etc.)	$5,000
Depreciation	$23,390
Net Loss	**-$41,990**

Source: AEC*group*

The critical factors to a financially viable operation are minimising wage and spat costs, and ensuring a high percentage of plate grade product. Sensitivity testing analysis of the original profit and loss assessment was undertaken considering the following scenarios:

- High quality output consisting 10% bottle, 30% bistro, and 60% plate grade product;
- Sourcing small spat at a cost of $1 per dozen delivered;
- An owner-operator model, paying $5,000 for casual wages during harvest periods;
- A 25% mortality rate for imported spat;
- Combination owner operator and high quality output;
- Combination owner operator and small spat sourcing; and
- Combination of small spat sourcing and high quality output.

Net Present Values (NPV's) have been calculated for each scenario based on a 20 year period, using discount rates of 7%, 10% and 13%.

Table 6.2: Sensitivity Tests

Scenario	Net Profit/Loss	20 Year Net Present Value		
		7%	10%	13%
Base Scenario	-$41,990	-$445,835	-$355,718	-$290,028
60% Plate Grade Product	-$20,540	-139,854	-109,139	-85,634
Source Small Spat	-$19,490	-$124,875	-97,069	-75,629
Owner Operator	$3,010	$196,084	$161,580	$138,770
25% Mortality	-$61,715	-$727,209	-$582,467	-$477,984
Small Spat and 60% Plate Grade	$1,960	$181,106	$149,510	$128,765

Owner Operator and Small Spat	$25,510	$517,044	$420,229	$353,170

Source: AEC*group*

The project is particularly sensitive to labour costs, and spat costs / mortality. Therefore the financial feasibility of the oyster farm rests on sourcing both skills and spat at an affordable price. An owner operator model is NPV positive under the assumption that the majority of farm profits are reinvested in replacing plant and equipment. A combination of high grade product and procuring small spat at a cost of $1 per dozen delivered also results in a highly positive NPV ($420,229 at 10% discount rate). Most scenarios result in a significantly negative NPV, largely due to the cost of replacing the long line system, barge, ute/trucks, grader, and rumbler in year 10.

Profit and Loss Assessment Assumptions

- Spat is sourced at a price of $2.50 per dozen delivered;
- A 100% spat survival rate;
- Kubin farm receives the average 2009-10 Queensland farm gate price of $5.26 per dozen;
- No marketing costs;
- Farm is set up via grant money (no interest expense); and
- All production is sold.

Net Present Value Assumptions

- Average annual inflation rate of 3%; and
- Kubin farm pays all equipment replacement costs.

7. Business Plan

Based on the best estimates of market demand, cost factors and site assessments the most viable course of action would be for the Kubin community to aim towards a long-line, sub-tidal, sydney rock oyster farm operation. Following extensive small scale trials and market development, initial full scale production should be targeted at around 15,000 dozen oysters per year. As much financing as possible should be sourced through the TSRA and similar funding schemes. Marketing should be aimed at the Torres Strait and Cairns regional area. Initial operations will only require one to two people, with a larger casual team to assist with the harvest. Management if at all possible should be sourced locally, with external expertise brought in as required. Should the operation prove successful, opportunities for further expansion can be considered. The proposed operation has a high risk profile and therefore implementation should be incremental. Significant capital expenditure should only be undertaken after key uncertainties surrounding lease and transhipment approval, growing conditions, and market demand have been addressed.

7.1 Detailed Site Assesment

Each of the proposed sites needs to be assessed for environmental impacts by Fisheries Queensland in order to gain oyster growing approval. Approval must also be granted to introduce sydney rock spat before any trial growing is allowed to proceed.

7.2 Pilot Programs

Should site and transhipment approval be granted, rigorous trial programs need to implemented to determine the optimum growing sites, levels, varieties and cultivation methods. This is an ideal stage to bring potential local workers into the project to gain experience. Key uncertainties that need to be addressed before significant capital expenditure is undertaken include:

- Optimum growing site / depth;
- Assess local workforce for potential manager / operator;
- Investigate costs and opportunities to procure outside expertise;
- Optimum cultivation method;
- Trial spat of different sizes & from different suppliers;
- Mortality rates;
- Transportation / shelf life;
- Sydney rock oyster growing suitability;
- Growth rates and quality;
- Cost of production;
- Potential diseases / pests;
- Spawning cycles; and
- Trial local spat collection.

During the pilot program phase it is vital that the Kubin farm begin to supply local wholesalers on a small scale in order to test demand. Various culture methods should be trialled, and a best practise model decided on. Once the uncertainties surrounding the oyster farm have been addressed, a strong case for TRSA funding approval can be put together. Management must be confident that production will be purchased at a viable price, and in sufficient quantities before full scale production can begin.

A suggested program for pilot investigations is provided below:

Table 7.1: Suggested Pilot Program

Pilot Step	Timeline	Costs	Key Factors to Test
Preliminary approvals from Fisheries Queensland (for spat transport and site utilisation)	Undertake at confirmation that the pilot program is to be undertaken. Assumed that about 3 months will be required to obtain approvals for spat transport and pilot farming – however could take longer.	• Time costs of project proponents in communicating with, and applying to, Fisheries Queensland • May be some nominal costs associated with paperwork issuance	• Approvals process and treatment by Fisheries Queensland
Pilot Program set-up	Assume 3 months to procure long-line gear and trays, transport all to site, assemble and establish. Should be undertaken just prior to first potential import of spat.	• Assuming 3 pilot sites x 3,000 oysters per site (250 dozen per site) • $5,000 assumed expenditure on long-line systems • Assumed boat can be borrowed from within community for laying pilot setup and servicing oysters. Fuel and maintenance allowance (e.g. $100 per month) should be allowed from the pilot • 3 sites suggested as one at the jetty and two in the Ruby Island channel	• Obtaining long-line systems • Finalise pilot sites • Establishing long-line system
Trial import of spat (small, medium and large sizes) x 2	Assume spat imported in two batches – one in autumn (April/May) and one in spring (October/November).	• 250 dozen small, 250 dozen medium and 250 dozen large assumed to cost $1,250 delivered • Order would be split into two batches (autumn and spring)	• Transport logistics • Survival through transport and establishment
Growth Trial	Assume pilot operates for 3 years however could be as short as 2 years (depending on growth rate of oysters)	• Assumed boat can be borrowed from within community for laying pilot setup and servicing oysters. Fuel and maintenance allowance (e.g. $100 per month) should be allowed throughout the pilot period • Labour requirements throughout the pilot period will be minimal and may be able to be undertaken by local volunteers • Tasks such as rumbling of shells can be undertaken manually if required (e.g. knock frills off shells with light iron bars) for the small quantities involved in the pilot • May desire an oyster farming specialist to visit the site regularly and provide any advice on culture practice, sampling and performance. Cheapest option would be a university or government (e.g. DEEDI)	• Survival (check monthly) • Growth Rates (individually weight and measure 20 per spat size (total 60 per pilot site or 180 total) monthly) • Spawning season (at 1yr or 1.5yr (depending on growth rate) sacrifice the monthly sample and check condition (if spawned) and weight the meat. If oysters are detected to be spawning halve sample size and increase sampling to fortnightly until oysters recover from spawning (Regain marketable condition)) • Fouling / overspatting • Best site for growth • Best depth for growth (Oysters can be moved deeper or shallower in the lines to maximise growth rates) • Local interest / commitment to the project (i.e. interest in maintaining the long-lines and sampling oysters

Pilot Step	Timeline	Costs	Key Factors to Test
		technician that could possibly conduct the work within their own funding. A consultant would be the most expensive option (e.g. 2 day visit every 2 months would be in the vicinity of $30,000 per year when travel included)	doesn't abate after a year or so) • Security issues
Transport Hardiness	Undertake in the final months of pilot stage (when oysters are reaching marketable size)	• Labour requirements should be minimal if untaken on a volunteer basis by the community	• Shelf life (pack sample of oysters as would be transported and check daily for any mortalities (i.e. open shells). At end of 7 days open to check condition of remaining oysters) • If shelf life poor will need to consider system for gradually adapting oysters to inter-tidal conditions over several weeks (e.g. by raising on a fixed post system every couple of days)
Market Acceptability	Undertake in the final months of pilot stage (when oysters are reaching marketable size	• Food safety testing (e.g. tests for E.coli) will require shipping of samples to appropriate laboratory (e.g. Townsville or Brisbane) and payment of fees. Assume in the vicinity of $300 to $500 per test of a sample of two dozen oysters. Possible that a university partner or DEEDI would undertake tests at minimal cost for the pilot stage • Shipping samples of market size oysters to distributors in Cairns is a nominal cost for small quantities if using Sea Swift. If transported by air costs could be considerable (and would be unviable beyond the pilot stage) • Assume no revenue obtained for supplying sample oysters to potential buyers in Cairns	• Food safety testing (should be undertaken monthly over the expected harvest period) • Acceptability to market and quality
Assessment of Results	Undertaken at the end of the pilot stage. Assume 3 months to complete	• Assume that the assessment of results will be undertaken with a view to update this feasibility study. If updated market data and the like included likely to cost similar to the current feasibility study.	• Feasibility of a commercial scale oyster farm (with actual site data as inputs)

Source: AEC*group*

The pilot investigation suggested in

Table 7.1 could by undertaken for cash costs of as little as $14,000 over the 2-3 year pilot period if volunteer labour was utilised, a boat was borrowed from within the community (with cash provided for fuel and upkeep) and consultants were not employed to oversee the pilot program. It is suggested that upkeep of the oysters and the sampling project would require at a minimum 1-2 days of a community member's time per month.

A full-cost consultant to guide the project and conduct regular site visits (e.g. every two months) could add $60,000 to $100,000 over the 2-3 year pilot period to the costs. A saving could be achieved if an academic or government technician could oversee the project from their own budget. It should not be considered essential that an outside consultant or technician be employed – the pilot phase could be conducted entirely by the community provided that commitment existed to establishing the project and to regular monitoring and data collection.

7.3 Full Scale Set Up

Once the key uncertainties have been addressed and a market established, construction and assembly of the full scale operation can begin. Materials for the preferred cultivation system and remaining plant equipment must be procured and installed. Once the long-line system is prepared, the first full scale spat shipment can be ordered. Significant market development also needs to be undertaken in preparation for full scale production. Key tasks to be performed during set up:

- Plant and equipment procurement;
- Long-line system installation;
- Marketing / market development; and
- Packing / equipment shed construction.

7.4 Production

Production of the initial years should be carefully monitored, with outside expertise brought in as required. Production methods should continue to be finetuned as operations progress to ensure maximum cost efficiency. Growing time could take between two and two and a half years, with production aimed at a 70-80 mm plate grade product. It is envisioned that the majority of product will be barged to Cairns live and chilled for sale to local wholesalers / retailers.

7.5 Expansion

Depending on the success of the Kubin oyster farm, opportunities may exist to expand operations to include further staff and source broader domestic and international markets. Potential for expansion depends on how cost effectively Kubin can produce oysters, and the ability to gain market share from established pacific oyster marketers.

7.6 Action Plan

Table 7.2: Action Plan

Action	Responsibility	Measure
Submit applications for oyster farm lease and spat trans-shipment approval	Zagul Economical Development Company	Oyster area lease & transhipment approval
Initiate trials for local spat collection and investigate local spawning patterns	Zagul Economical Development Company, Kubin Community	Information regarding Local spatfall rates/consistency
Investigate opportunities for alternative New South Wales spat suppliers	Zagul Economical Development Company	Supplier list
Investigate costs / opportunities to procure management	Zagul Economical Development Company	Response
Investigate market development opportunities within the Torres Strait	Zagul Economical Development Company	Response

Action	Responsibility	Measure
Initiate pilot programs for sydney rock oysters	Zagul Economical Development Company, Kubin Community	Trial Results
Prepare a marketing plan for Kubin sydney rock oysters	Zagul Economical Development Company	Marketing Plan
Prepare funding application for TSRA Community Economic Initiative Scheme	Zagul Economical Development Company	Response

Source: AEC*group*

8. Conclusion

There are several features that make an oyster farming operation at Kubin attractive. An edible oyster farm appears to be one of the more viable development options available to the Kubin community, and is likely worth pursuing further. Positive factors which support the feasibility of the project include:

- Established and relatively low cost production technology;
- Comparably simple, low risk, and low maintenance production;
- Pristine growing environment; and
- Significantly lower transport costs to the North Queensland market for final output.

However, the proposed oyster farm is currently subject to considerable commercial, regulatory, and economic uncertainty. Therefore at this stage the proposed farm must be considered a high risk venture. Key factors, information gaps, and uncertainties which cast doubt over the proposed venture include:

- The current depressed state of the Queensland edible oyster industry;
- High cost of procuring spat relative to competitors;
- No established North Queensland market for sydney rock or native oysters;
- Highly competitive industry currently dominated by pacific oysters;
- Perceived cost and difficulties of sourcing skilled labour to Moa island;
- Unknown spawning characteristics of oysters in the Torres Strait; and
- Regulatory concerns surrounding approval to source sydney rock oyster spat.

For the project to proceed, many of the information gaps and uncertainties surrounding the operation need to be addressed. Before any trial work can commence, approval must be gained from Fisheries Queensland regarding lease and transhipment approval. As a priority action trial programs should be initiated to address key uncertainties surrounding spawning cycles, site viability, product growing times and quality, shelf life, and potential pests / diseases before significant capital expenditure is undertaken.

Should approvals be gained and the results of trial growing and market development prove positive, then the development of a 10,000-15,000 dozen sydney rock oyster farm operation is a feasible alternative for the Kubin community. However success of the operation will require prudent business practice, and is best suited to an owner-operator model.

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