PRELIMINARY DESIGN AND COSTING OF AN INTENSIVE OYSTER

CULTURE TIDAL RACEWAY SYSTEM IN NSW (SACCOSTREA commercialis)

ORIGINAL DOCUMENT

KEL GORDON
1985

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Published Dec 2015

(surviver of the 2012 Qld Floods)

This document was a self-funded second year university project based on the reference documents as mentioned at the end.

It was one of a few documents to survive the 2012 Queensland floods. Having found it again, all stuck together, such alien technology as we have today, makes it possible to share with all.

The concept back then was to develop oyster aquaculture as the inefficient ranching or trays on leases was driving people into bankruptcy, even back then.

Oddly enough, sophisticated research has not prevented the continual slide, or suicide, of the oldest form or aquaculture in Australia, even though this was the main reason to instigate the research facilities.

Like so many so-called PhD researchers, the main goal of their work is to do as little as possible for as long as possible.

The mind boggles when we spend hundreds of millions of aquaculture research in NSW and yet there has not been a new aquaculture venture in fourteen years.

Disgraceful NSW....

General Plant Operation

The theoretical site has been based on a 5 ha property approximately 3km from the sea. The site is on a swampy peninsula near the entrance to a lake. It has good flowing water on both sides which is approximately 7 meters deep.

Water would enter the system through the filters which would consist of graded gravel and coarse calcareious sand, placed in vertical layers. This, it is hoped, would prevent a large percentage of fouling and minimise preditors.

From this point water would travel through the ducting system to either the earthen algal ponds or the concrete raceways at pond entry and exit points.

Large valves or monks would permit or prevent water access as the tide rose.

At high tide closure of the valve arrangements would prevent water levels dropping and the ponds could then be used for their given purpose.

1. Raceway.

The raceway is designed to effectively hold a large density of oysters and, to either maintain, or increase their normal growth. This would be achieved by simulating constant current flow while at the same time increasing food levels.

The flow would be increased by air lift pump arrangements along the side of the raceway. These, it is intended, will force water down through the racks and up again along the sides (as per diagram) while depositing faeces in the sump. The faeces can then be flushed out when the raceway is opened.

2. Algal Pond.

The algal ponds would be of earthen design and approximately 1 meter deep. The food level for the oysters would be increased by blooming the naturally occuring life (phytoplankton) in the seawater. This would be achieved by addition of various fertilizers. Any undesirable blooms would be discarded.

A bloomed pond can then be transferred to a raceway without any pumping costs by simply opening at low tide. Gravity feed will empty the pond into the desired raceway which can then be topped up eith seawater as the tide rises. Algal densities would be a personal judgment on the day. Any further addition of algae while maintaining the initial seawater would have to be done using mechanical pumps.

3. Settling Pond.

The settling ponds would, it is hoped, trap oyster faeces and other waste products from becoming pollutants. It may be feasible for settling pond No 1 to produce an organic fertilizer as an extra income.

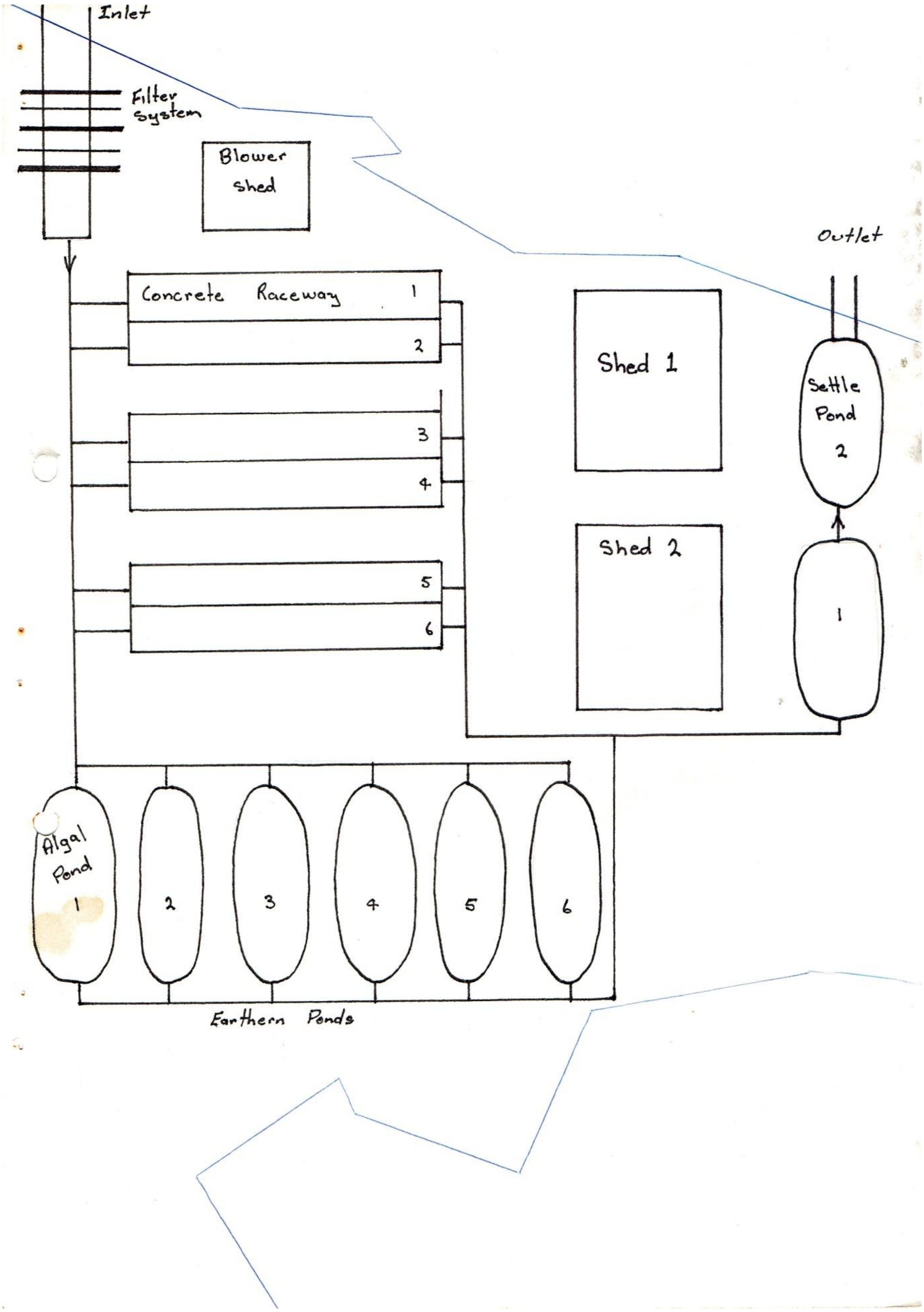
Generally the system can utilise the algal blooms or be left to rise and fall with the tide. If the raceway is opened when the tide is half out the flushing effect should wash out faeces build up and minimise cleaning.

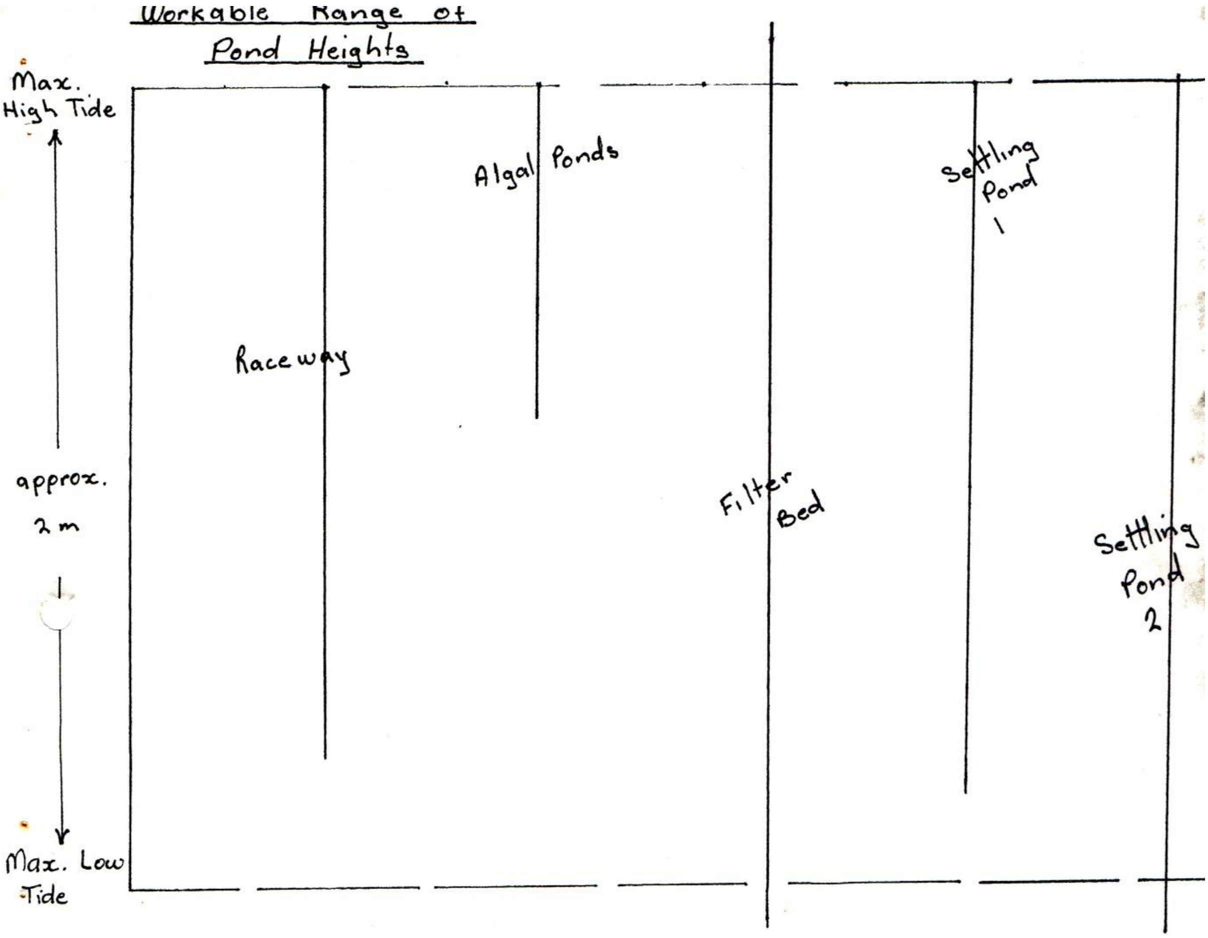
A hiab type crane would be used to move the oysters to the sorting shed where, it is intended that, a mechanical sorting device would be used inplace of manual labour. As the initial spat used would be singles from a hatchery or stick scrappings, the sorting involved would be minimal as compared with a conventional oyster culture system.

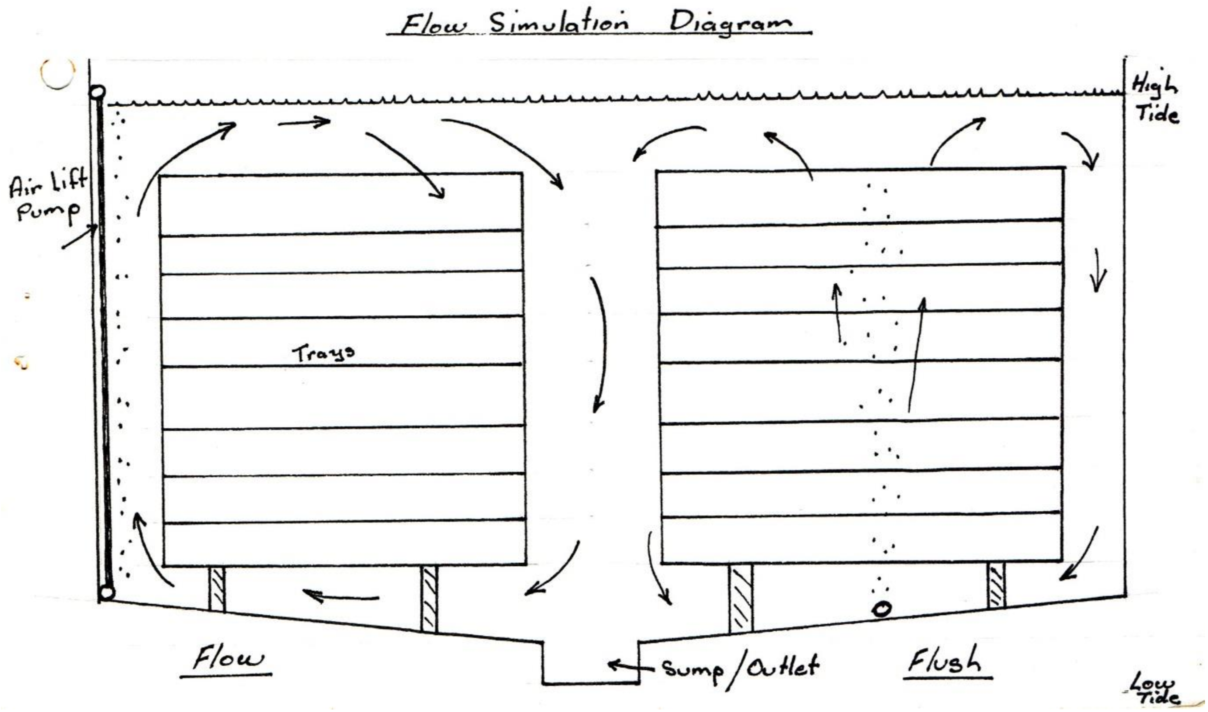
Financially, the system could produce an income in the first year by growing out and fatening seconds. This would hlep minimise set up costs.

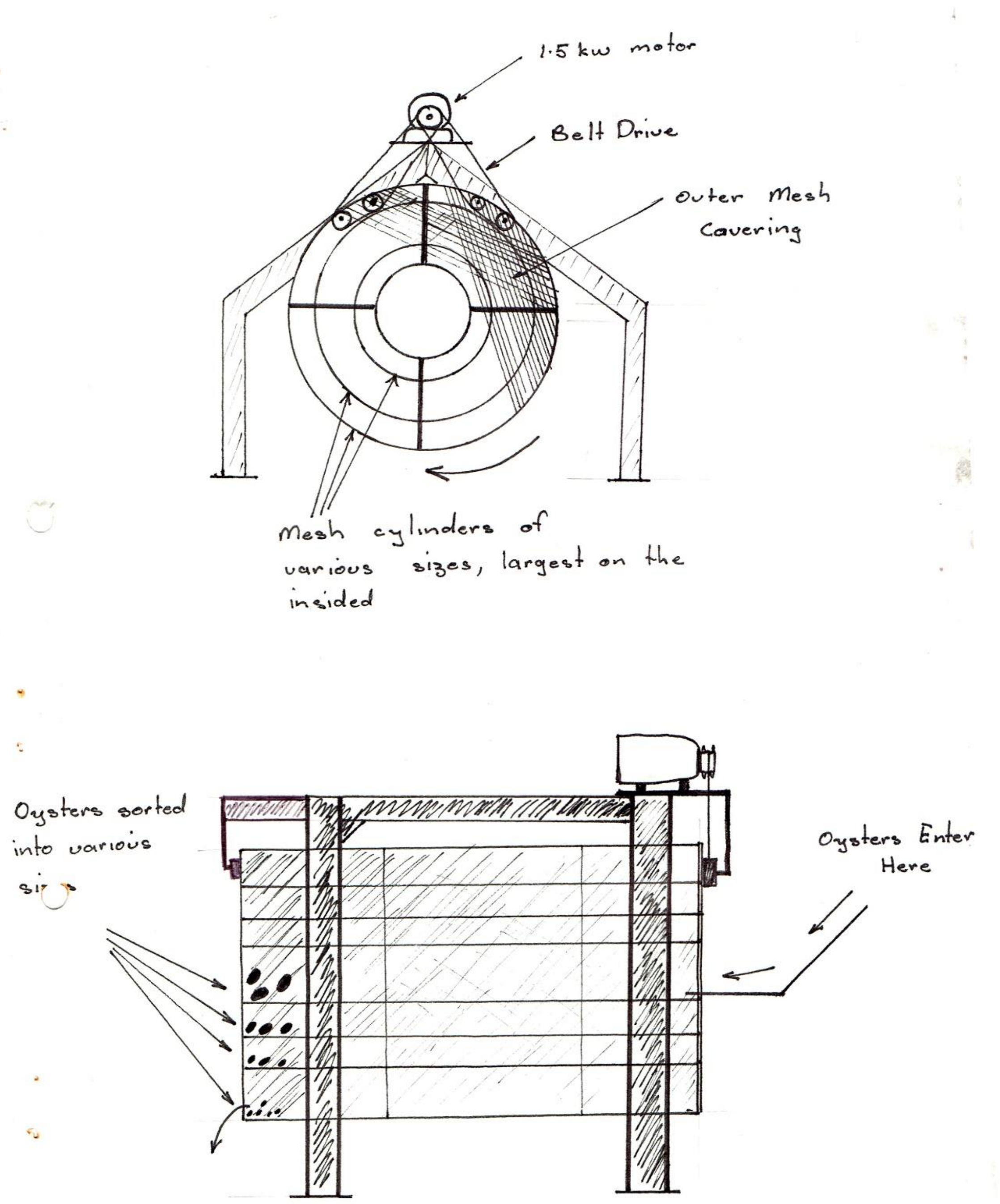
The figures used are reasonably conservative on the income sheet and slightly exaggerated on the expenditure sheet to allow for inflation and unforeseen problems that will arise.

The intensive system described here is intended as a pilot scale commercial operation. The system has the potential to utilise areas of coastal swamp land which at present are unproductive.


Inlet
Filter system
Blower shed
Concrete Raceway
1
2
3
4
5
6
Shed 1
Shed 2
Outlet
Settle Pond 2
1
Algal Pond 1
2
3
4
5
6
Earthern Ponds


Workable Range of Pond Heights
Max. High Tide
approx. 2 m
Max. Low Tide
Raceway
Algal Ponds
Filter Bed
Settling Pond 1
Settling Pond 2


Flow Simulation Diagram
Air Lift Pump
Trays
High Tide
Low Tide
Flow
Sump/Outlet
Flush



Rotating Oyster Sorter, Design
K.G.

Preliminary Design And Costing Of An Intensive Oyster Culture Tidal Raceway System

Income Examples

A

Workable Tray Area	= 4 x 4 x 25 x 6
	= 2400 m squ.
No of oysters/ m squ.	= 400/ m squ.
Total oysters	= 2400 x 400
	= 960,000
No of bags at 1100/bag	= 960,000 ÷ 1100
	= 872 bags
At $250/bag	= $218,181/ 2 years
Annual Gross Income	= $109,090

B

Workable Tray Area	= 6 x 4 x 25 x 6
	= 3600 m squ.
No of oysters/ m squ.	= 400/ m squ.
Total oysters	= 400 x 3600
	= 1,440,000
No of bags at 1100/bag	= 1,309
At $250/bag	= $327,272/ 2 years
Annual Gross Income	= $163,363

Set Up Cost

Concrete Raceways ($150/m)	$22,000
Excavation	$65,000
Pond Plumbing	$20,000
Shed Construction	$18,000
Electrical and Blower Installation	$ 9,000
Plastic Trays ($27·50 each)	$ 3,300
Crane	$ 4,000
Spat ($12/1000 x 1,500,000)	$18,000
Pressure Cleaner	$ 4,000
Tools and Sundry	$ 1,500
Ongoing Work Expenses	$20,000
Total	$179,000

Land

Using a 5ha site in NSW, approx.	$250,000

Set Up Total	$429,000

Running Costs Per Year

Wages		
	1, Manager	$35,000
	2, Staff	$32,000
	Total	$67,000
Electricity		$ 5,000
Petrol		$ 1,500
Car/Truck Lease		$16,500
Local Council Fees		$ 5,000
Plus 5% Sundry		$ 5,000
Total		$100,000

Total Investment $529,000

Profit Before Tax

A	$ 9,000
B	$63,000

Return On Investment

A	= 1·7%
B	= 12%

Electricity Consumption

Pumping and Air Blowers at 8kw	= 48 cents/hr/24 hr
	= $8·64/ day
	= $4,193/ year
Normal Operational Consumption	= $ 800
Total	= $5,000

Site General Requirements

1. Salinity 30-35 ppt
2. Average water temperature 18-20° C
3. Deep water inlet and outlet.
4. Oceanic water quality.
5. Access to fresh water.
6. No metal pollution (either present or future)

Algal Feeding And Pond Fertilizing (J Nell)

Oysters can be fattened in trays submerged under pontoons and more recently in ponds fertilised to maintain rich algal blooms.

It is important that good water quality is maintained to prevent mortality. A whole range of chemical parameters could be measured but this would be very labour-intensive. Alternatively recent experiments suggest that young fish such as small yellow bream (Acanthopagrus australis) and tarwhine (Rhabdosargus sarba) that pass through the filter system when filling ponds are good indicators of poor water quality and if they begin to die the pond should be drained immediately.

Algal blooms in fertilized ponds can become extremely dense and then collapse. After a bloom has collapsed ponds need to be drained, flushed, filled and fertilised.

The recommended fertilisation rete for a 0.1 ha or a one megalitre pond is 25kg single superphosphate (9.1% P), 25kg ammonium nitrate (NH_4NO_3) and 5g sodium molybdate ($Na_2MoO_4 . 2H_2O$).

Sodium molybdate must be included because it is lacking in seawater and algae require it for a series of enzyme reactions enabling the utilisation of nitrogen.

Advantages Over A Conventional Culture System

1. A more efficient use of labour and a cut in labour cost.

2. Easy addition of hatchery facilities with a low cost nursery stage. eg 1 raceway stocked with 1 month old spat (2mm) at a density of 1 bag/meter would hold 2000 - 3000 bags of spat.

3. Access to brood stock and easier condition.

4. Efficient sorting and batching of oysters.

5. Raceway culture makes the use of antibiotics feasable and adds a new dimention of disease control.

6. Hopefully the design will increase production turnover.

7. Raceway culture should, with good management skills have the ability to produce out of season fat oysters. This could possibly be achieved by the utilization of pond blankets to increase agal production and oyster growth.

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Personal communications with different bodies concerning the pricing of various aspects of the system.