"Phetch Buri Model

Application of Seaweed & Biological Treatment in *Penaeus vannamei* Culture in Thailand

XIX CONGRESO ECUATORIANO DE ACUICULTURA

Tecnologías para una producción sustentable

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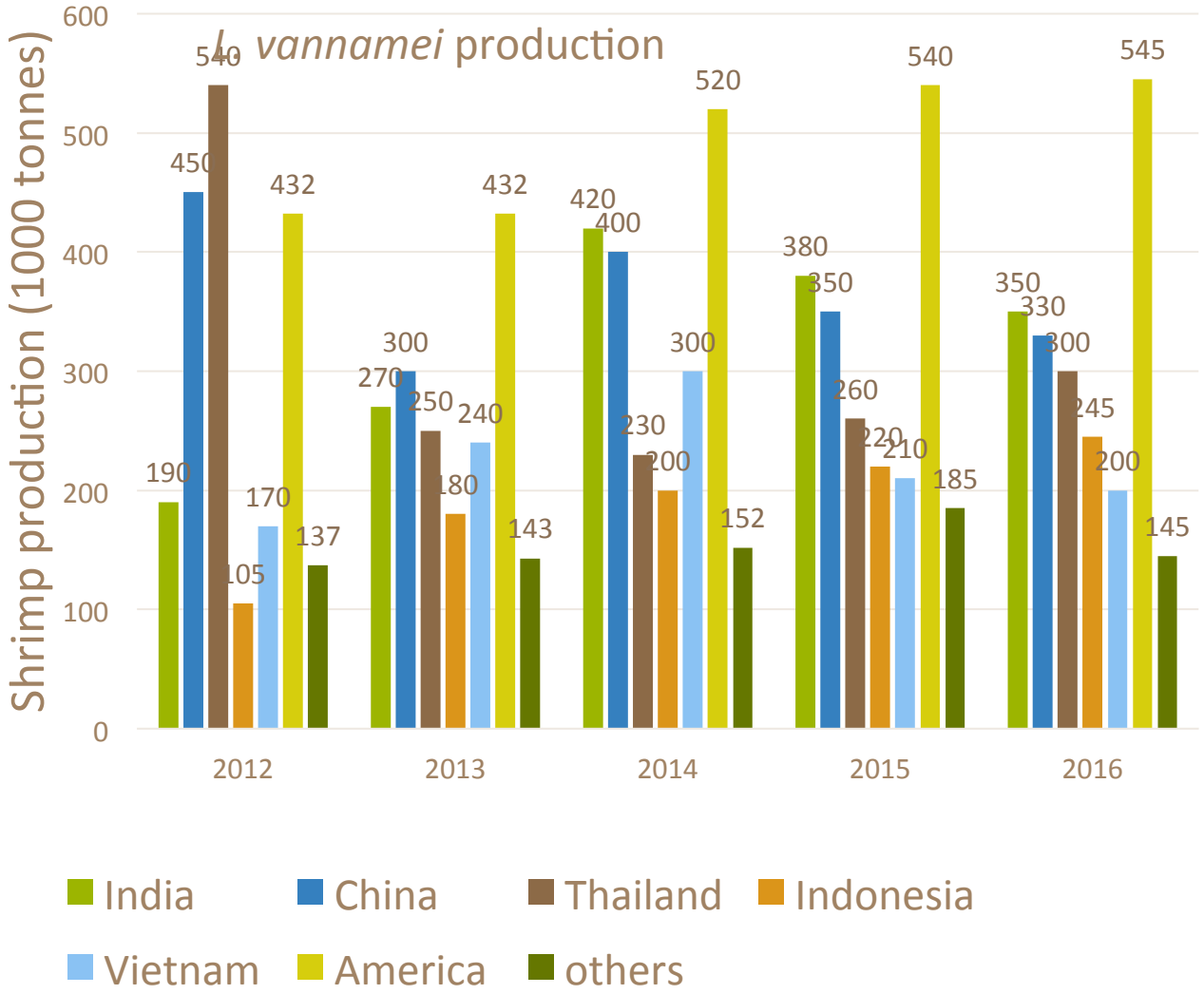
Department of Fisheries, Thailand



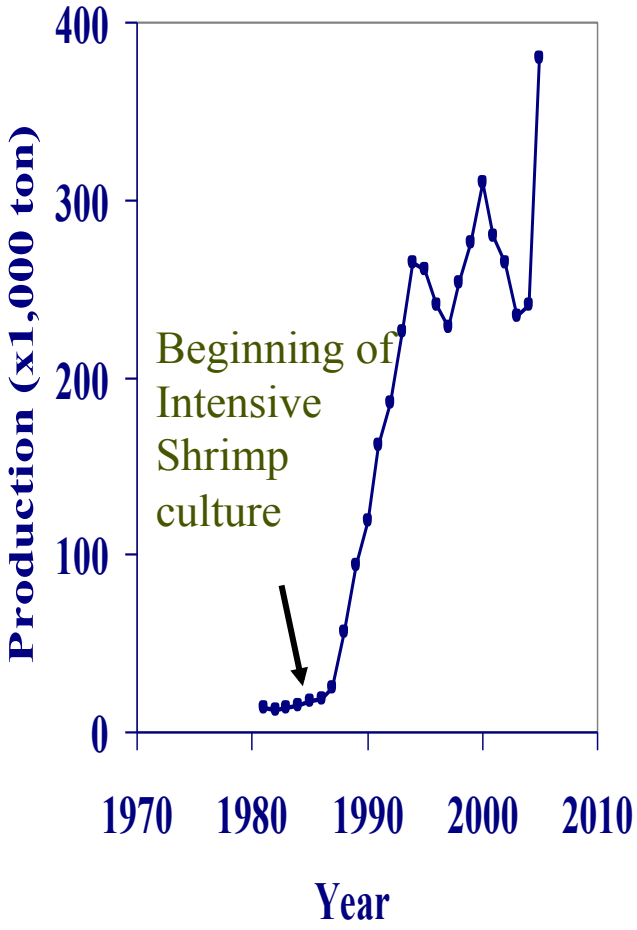
Source:OAE

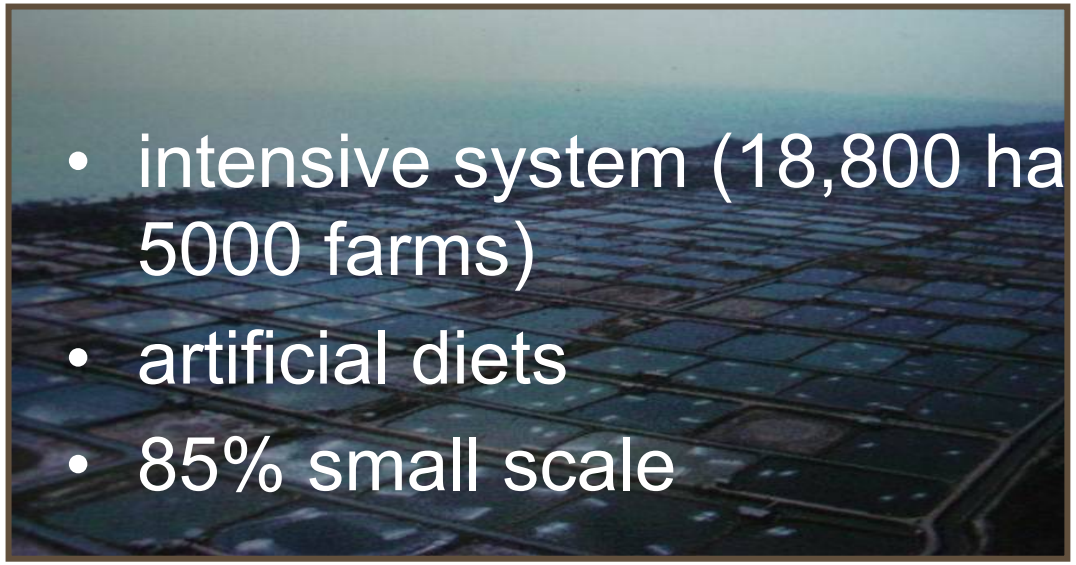
2017 : 300,000 tonnes/>2000 million USD
: 14% of global production

THAILAND

- 2700 km of coastal line
- Located at the tropical climate,
- Ideal for coastal aquaculture
- Appropriate aquaculture technologies

PRODUCTION AREAS





- intensive system (18,800 ha 5000 farms)
- artificial diets
- 85% small scale

Commonly cultured species

- *Penaeus monodon* :Black tiger prawn
- *Litopenaeus vannamei* :Pacific white shrimp
  - *P. monodon* 4% *P. vannamei* 96% (OAE, 2016)

- During 2011-2014, there was a sharp drop of shrimp production
- from 500,000 tonnes to 200,000 tonnes.
- EMS/AHPND from *Vibrio parahaemolyticus*

Measurements from Government

LOW WATER EXCHANGE:

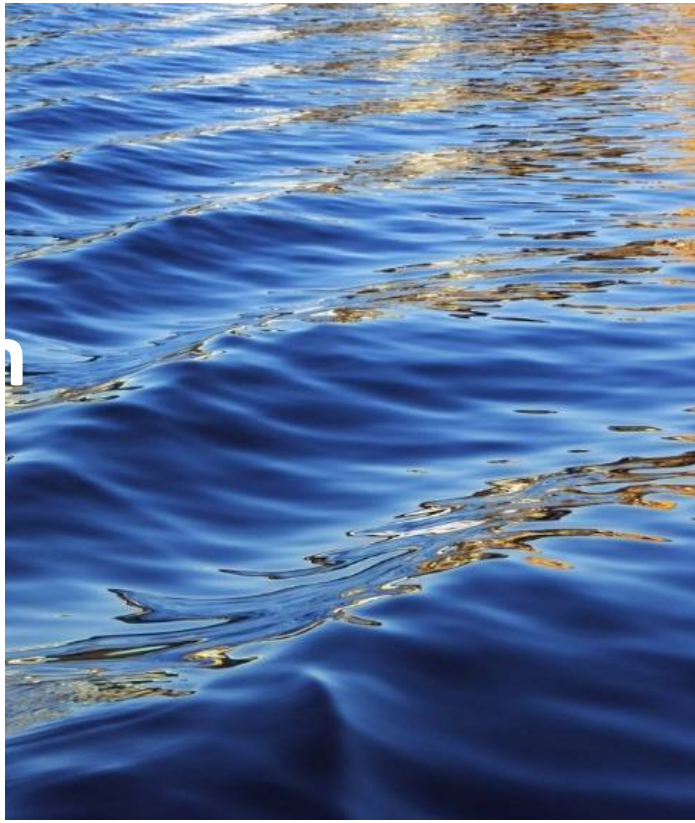
- Reducing water exchange in shrimp culture to minimize discharge of pollutants is for the environmental sustainability .
- Reduction the demand of using water from external sources which may risk in contamination of diseases and introduction of disease carrier or predators.
- Low water exchange must be complemented with aeration to compensate for low levels of oxygen in warm and highly saline water. The reduce of feed remained in the pond during shrimp culture is also a crucial practice.

2014

Phetch buri model

: Shrimp culture technique

using seaweed for bioremediation along with other management strategies.



Principle of Phetch Buri Model

- Healthy and pathogenic free PL

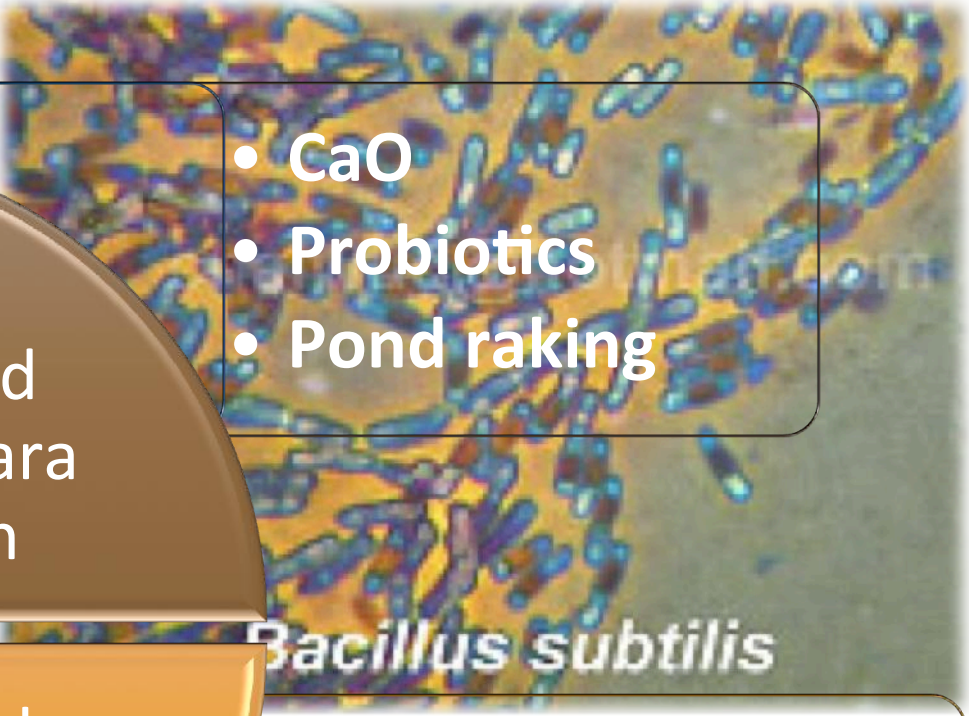
- CaO
- Probiotics
- Pond raking

Good quality shrimp larvae

Pond Prepara tion

Culture manage ments

Feed manage ment



✓ Biological water treatment by seaweed

- Seaweed for bioremediation
- Biocontrol

- Live feed
- Reduce of organic matter loading
- Probiotics&Vitamins /Mineral

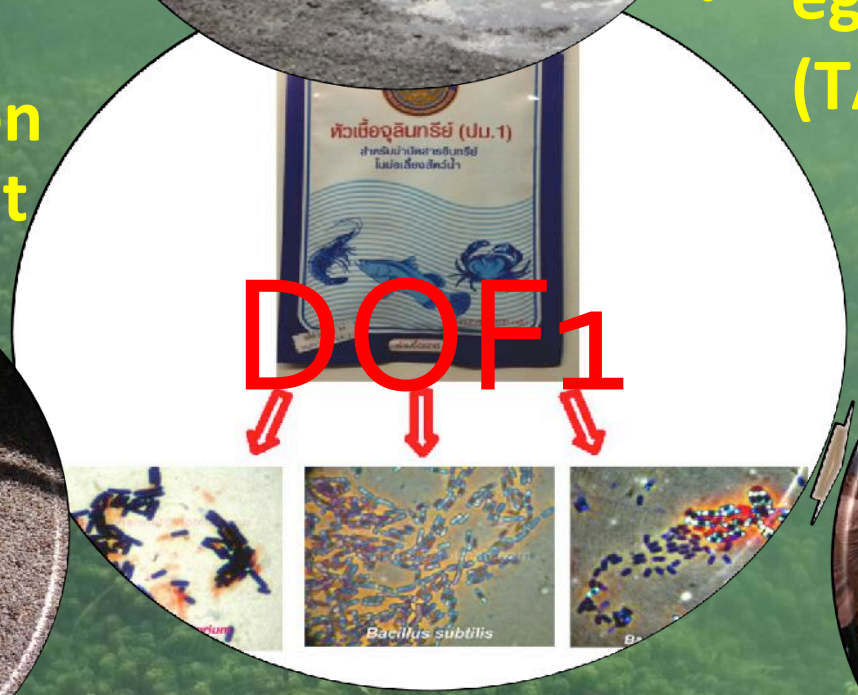
- To reduce impact of OM loading
- To prevent harmful bacteria loading

- Change environment by growing harmless bacteria to “crowd out” pathogens.

- Accelerate decomposition of pond organic sediment

- Optimum pH 7.5-8.5

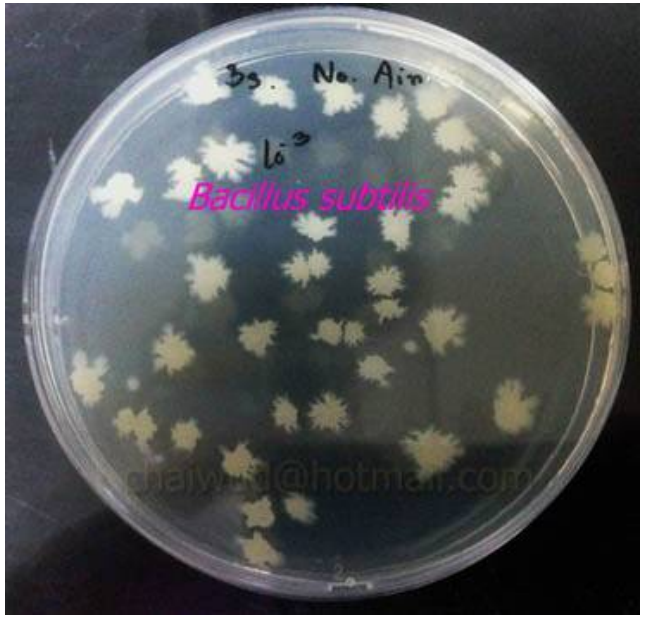
- To obtain inorganic nutrients
- eg. Dissolved Nitrogen (TAN)



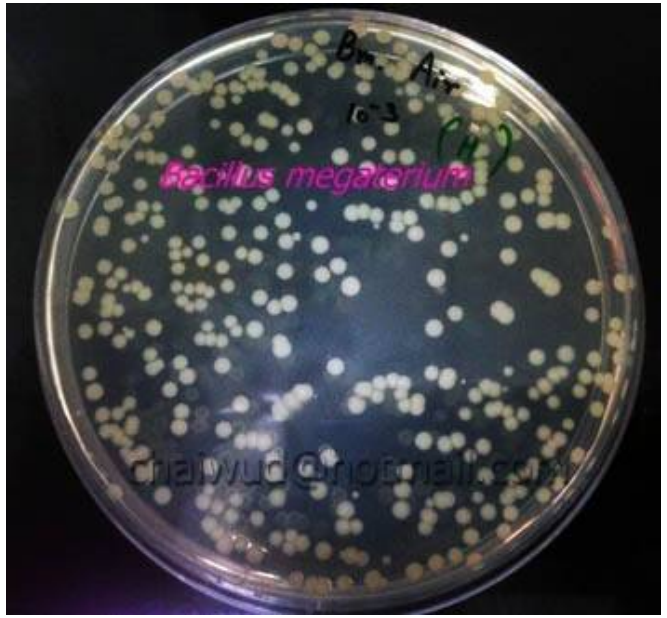
DOFI since 2008

: contain Bacillus spp. More than 10^6 cfu/g

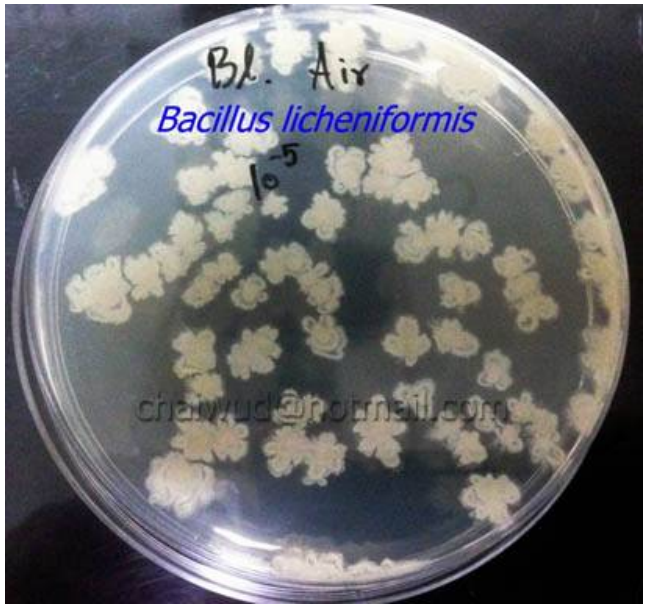
: 200g/sachet



- Degrade protein, lipid, carbohydrate
- Suppress vibrio growth
- Enhance gut colonization by beneficial bacteria



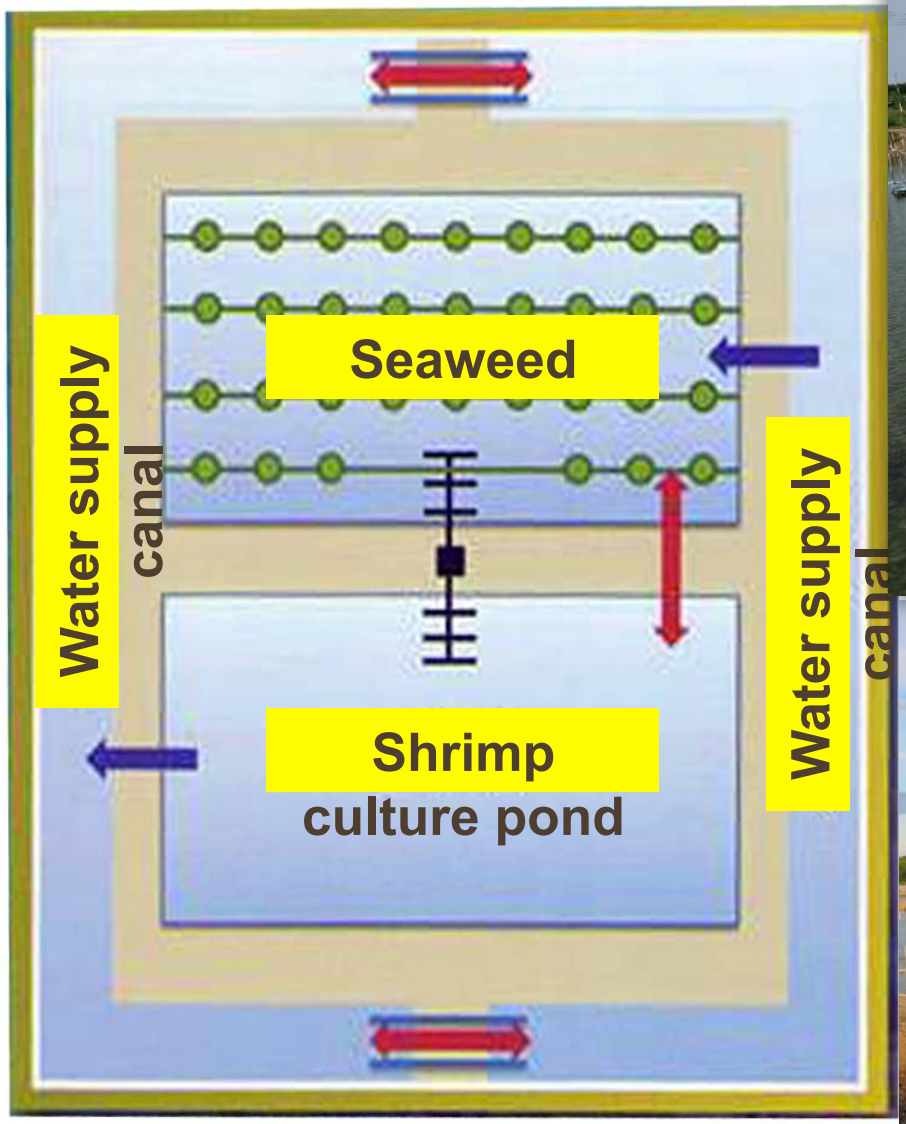
- Degrade phosphate compound into dissolve form
- Degrade soil mineral
- Inhibit bacterial growth
- Produce of B12



- Aerobic&Anareobic condition
- Degrade complex protein eg. Keratin
- Enhance immune system (Ke Li *et al*., 2007)

Samut sakorn CFRDC

Farm Layout

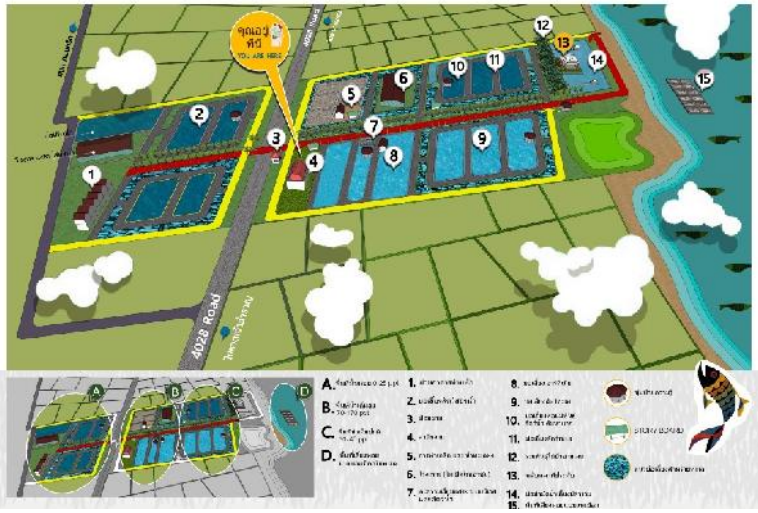


circulation System

- Oxygen generator
- Control bad micro-organism
- Control phyto plankton bloom

Royal demonstration seafarm

Zero waste farm



Pond Preparation

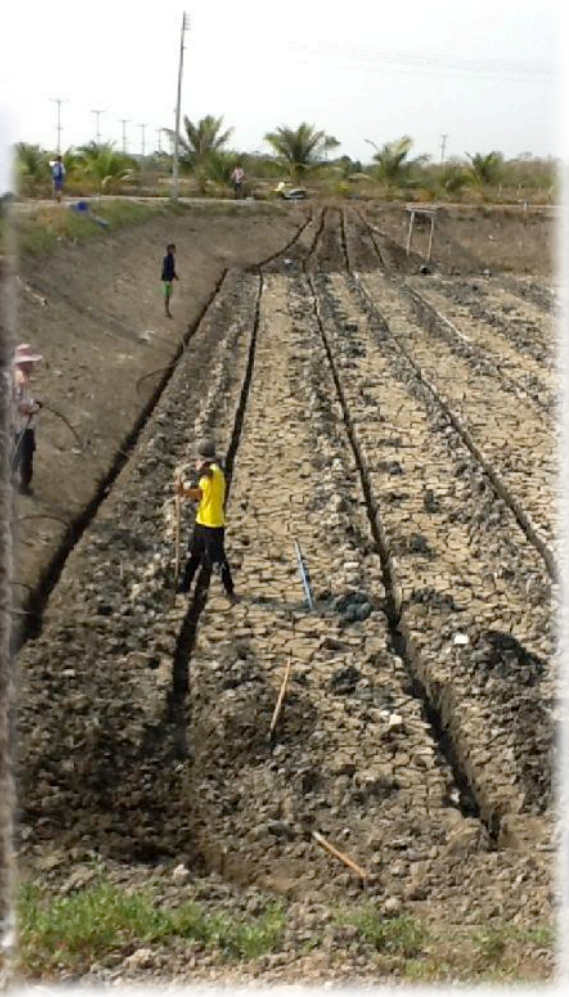
Lime (CaO)

- :To disinfect pathogenic bacteria in pond sediment.
- During 4-7 days, pond bottom pH increase up to 10-11

Pond Raking

- Improving pond bottom by acceleration of soil contact with the air.

Set up of aeration system



Water Preparation

: seaweed pond is used for bioremediation of shrimp culture water :Water will be exchanged from month 2 onward

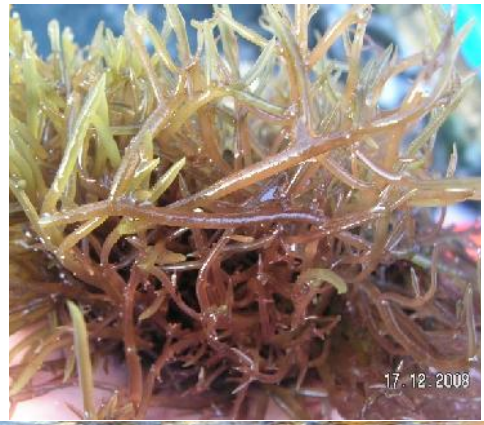
Uptake nutrient from water

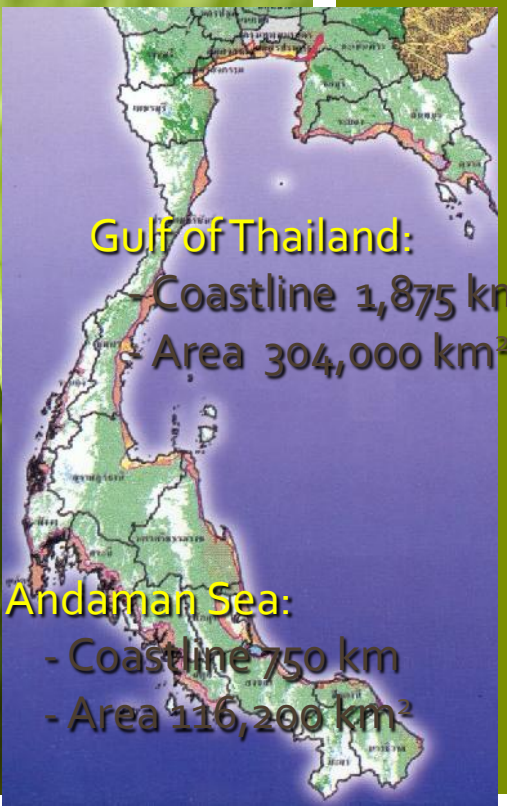
- Reduce of bacteria/ phytoplankton in seawater.

Oxygen generator









Seaweed

3 groups depending on colour

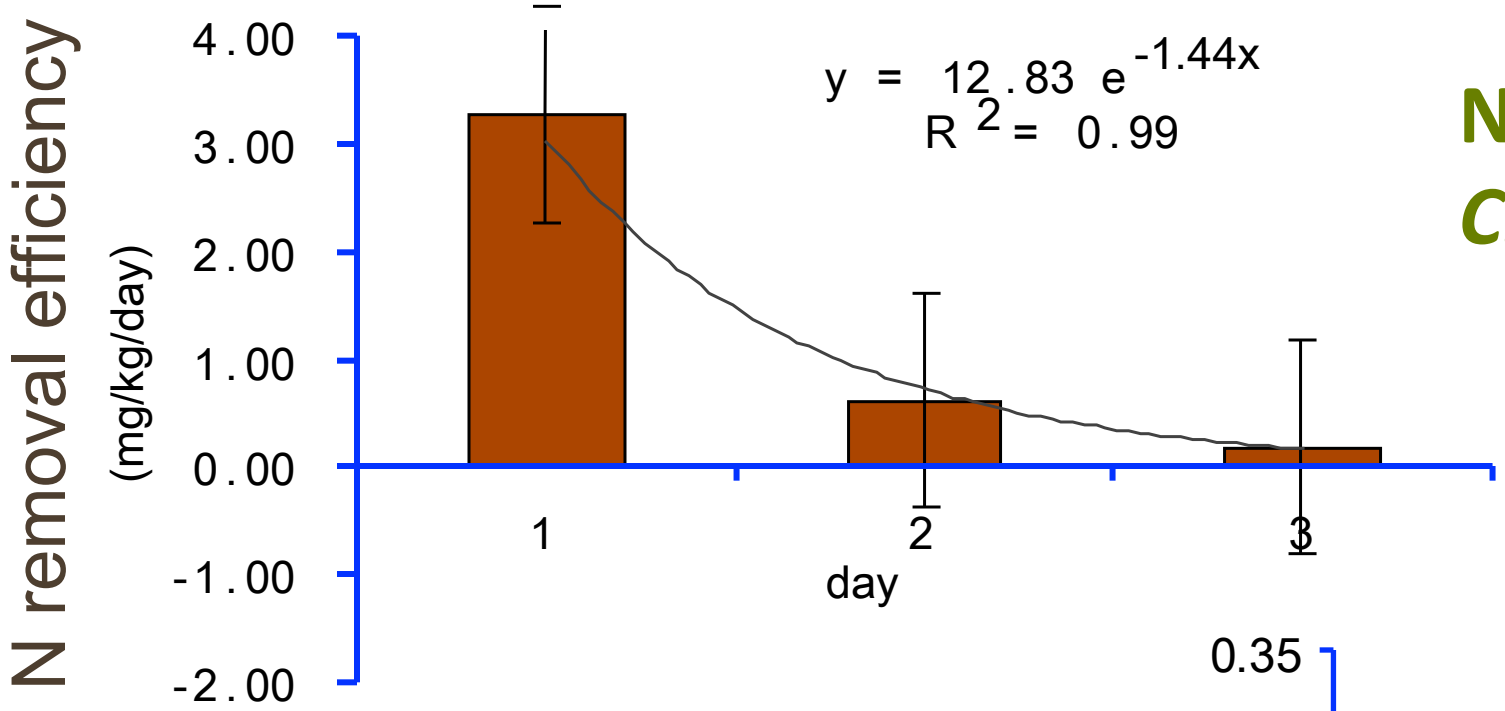
Red :Rhodophyta
Green : Chlorophyta
Brown :Pheophyta

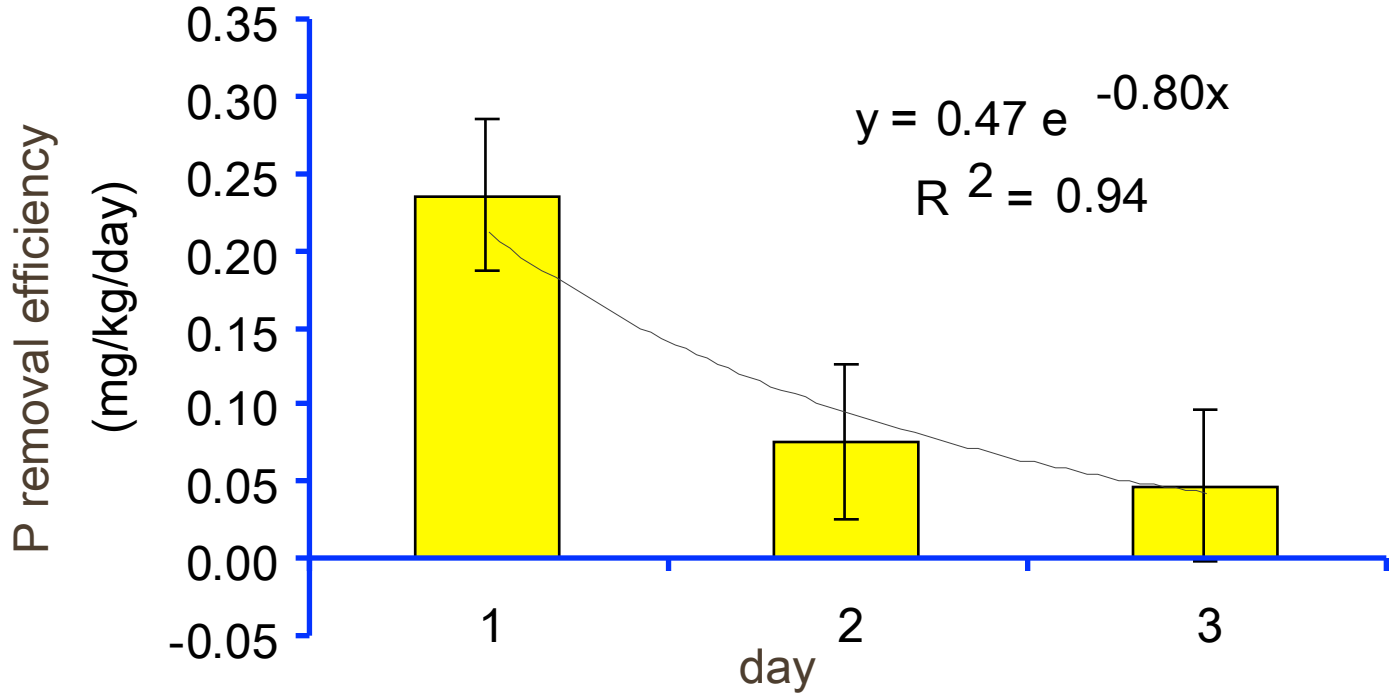
Ulva rigida

Caulerpa lentillifera

Gracilaria fisheri
Gracilaria tenuistipitata

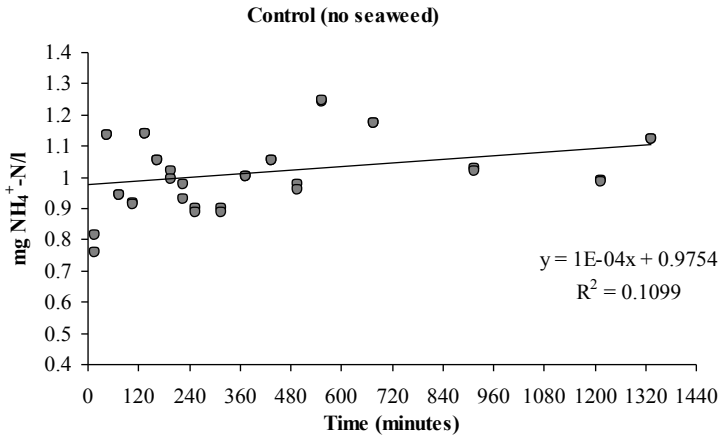
N&P removal efficiency of *C. lentillifera*

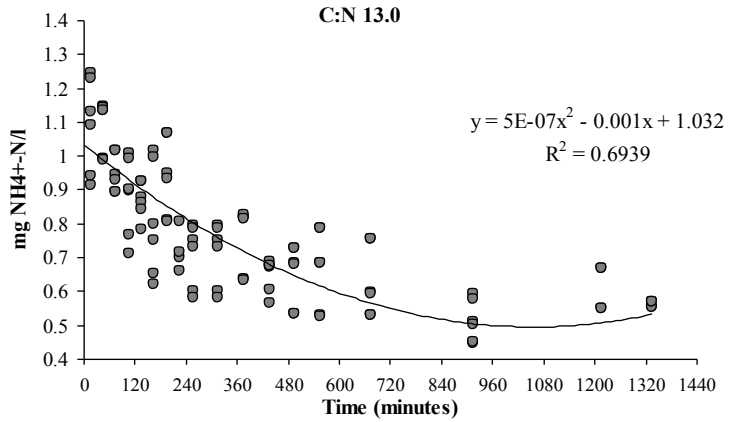


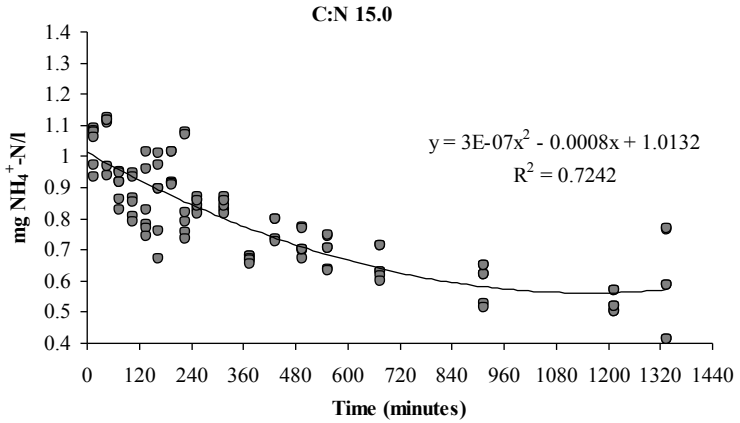


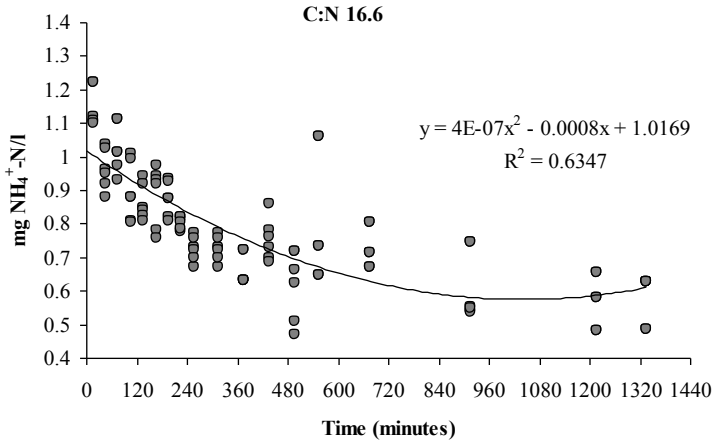
Songsangjinda (2017)

Concentration of NH_4^+-N in water of seaweed (*C. lentillifera*) over the sampling period.





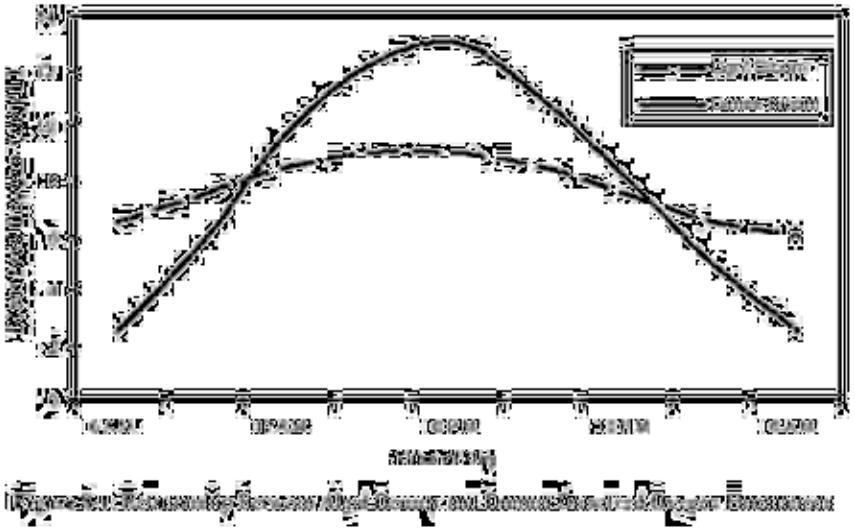




Removal rate 1 mgNH_4^+ppm/kg seaweed/day

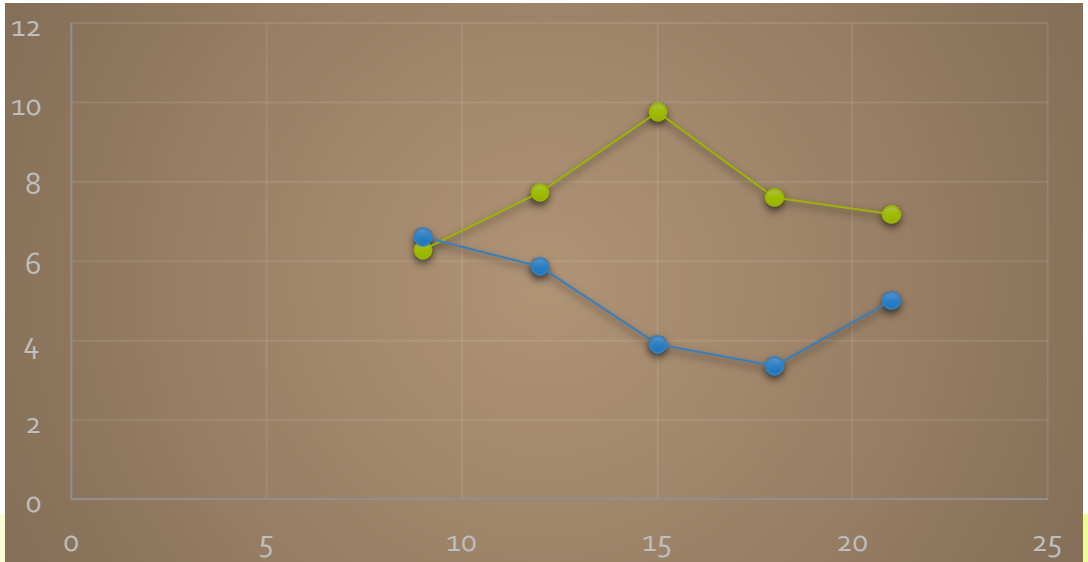
Montakan *et al.* (2017)

DO & Phytoplankton



DO αphotosynthesis

Afternoon :DO maximum /Early morning : DO is the lowest



time	DO seaweed / /shrimp pond	Temp. seaweed/ /shrimp pond (°C)
15:00	9.75 / 3.90	32.5 / 28.4
18:00	7.61 / 3.35	32.5 / 28.6
21:00	7.19 / 5.01	32 / 29.3
6:00	5.48 / 5.66	30.5 / 30.6
9:00	6.28 / 6.62	30.6 / 31.5
12:00	7.73 / 5.87	31.1 / 31.4

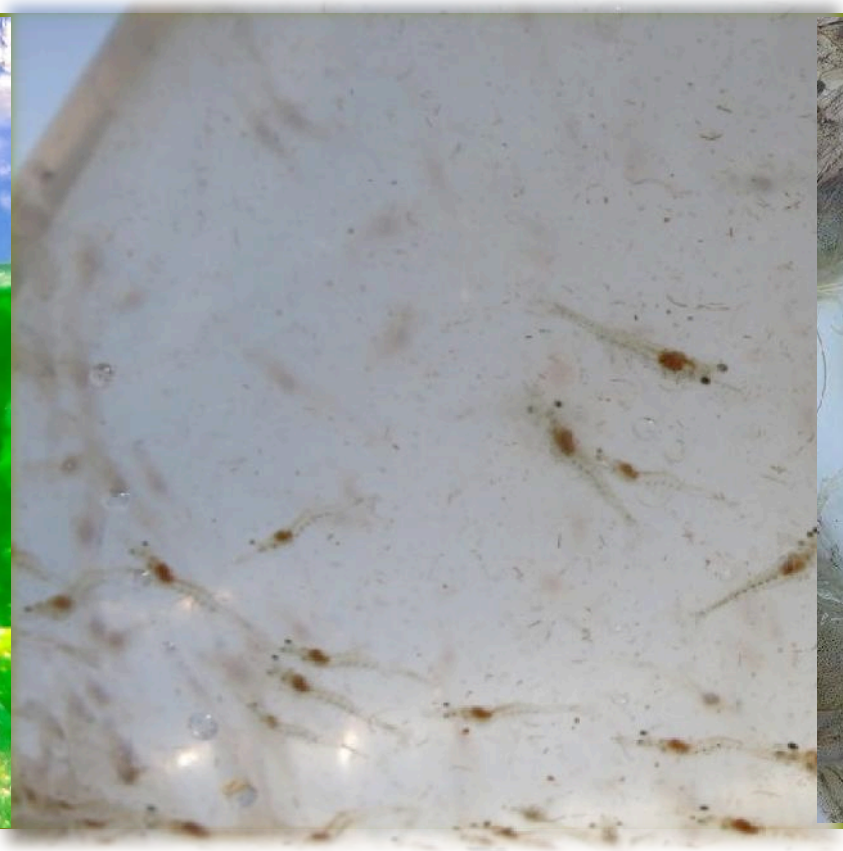
Preparation

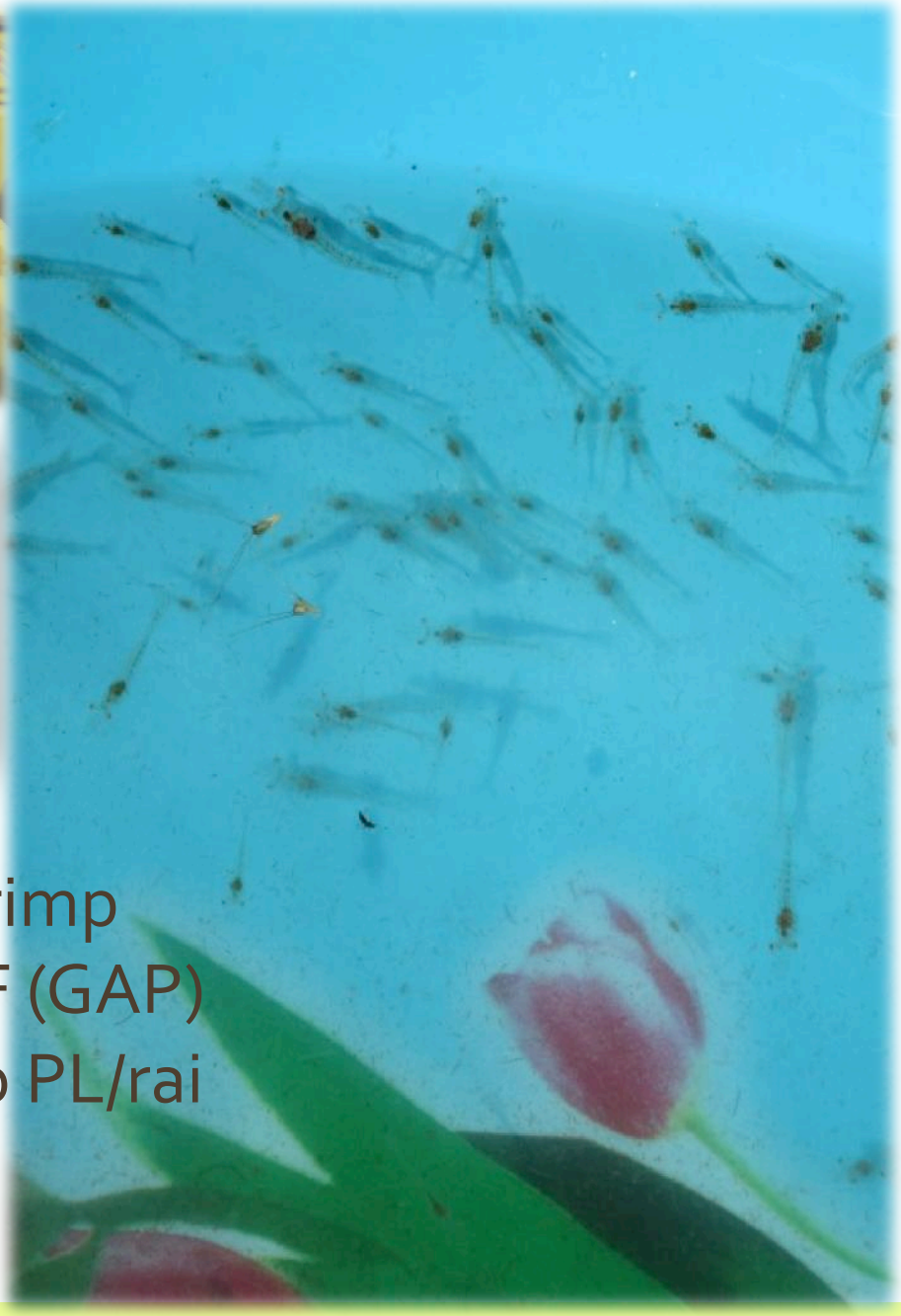
1	**CaO 320 kg/rai is applied into dried pond bottom before 20-30 cm water is added to obtain 10-40% soil moisture**
7	100 L of PM.1 is applied into the pond with pH 7.5-8.5 is maintained
8	Acceleration of organic matter decomposition by pond raking
9	
10	Pond raking
11	
12	Pond raking
13	
14	100 L of PM.1 is applied into the pond with pH 7.5-8.5 is maintained +pond raking
15	
16	Pond raking
17	
18	Pond raking
20	**100 L of PM.1 is applied into the pond with pH 7.5-8.5 is maintained+pond dredging**

Water Preparation

21	Water is pumped into the seaweed canel
22	20-25 ppt culture water is prepared by mixing of 30 ppt seawater from seaweed pond with underground water.
23	
24	
25	Chlorine 30-40 ppm is applied to disinfect of bacteria and reduce heavy metal/POM
26	
27	
28	
29	
30	Fish, jelly fish, insect larvae etc. is eliminated by trawl net.
31-3	20-25 kgs Dolomite /rai is used for water adjustment.

Shrimp



: Good quality shrimp
: Certified by DOF (GAP)
: 100,000-150,000 PL/rai (0.16 ha)

Culture/Feed Management

Feed Management

Feed type:

:Fed shrimp with live food (Artemia) for 7 days.

:Change to pelleted diet from day7 until harvest.

Feeding of good quality shrimp feed

35% protein /3-5% BW/day

Premix: Pelleted diets were supplemented with Vitamin&Mineral

: to accelerate moulting

:to promote of shrimp health

Probiotics: Supplemented of probiotics (DOF1)

into shrimp via : Artemia and Pelleted feed




Feed Preparation

Por Mor 1

3 Bacillus sp
B. subtilis,
B. megaterium &
B. licheniformis

Contain *Bacillus* spp.>10^6cfu/g

Inoculation

: 1 sachet PM1
: 0.5 L mollass
: 0.5 kg shrimp feed
: 250 L water
: 36 hrs

Application

:1L/1kgArtemia/ 15m
:1L/1kgPellet Diet

Premix

:3gVit C
:
3gSeasalt(NaCl)
:3mlEpsom Salt (Mg2SO4)
:1kg pelleted diet

Feeding

:with premix
7.00,11.00 AM,15.00 PM
:with probiotics
19.00,23.00 PM
FCR 1.1

Culture managements

0	100 L PM1/rai (0.16 hectare)	Artemia Biomass 10 kg/100,000 shrimpPL
1	100,000 PL/rai	Artemia Biomass 10 kg (2 kgs/meal), feed left is checked after 3 hrs feeding day 4 artemia biomass 11 AM, 20PM 50-100 g artificial diet/meal 7 AM, 16, 23 PM
7	PM 1 added in the pond weekly	
8		Artificial diet 5 times a day (7, 11, 15, 19, 23) 200 g/meal
14	Addition of PM 1 ,Feed net is applied.	
21	Addition of PM 1	
28	Addition of PM 1	
***	Month 2 onward, PM 1 is added	

Some Factors effect to culture success

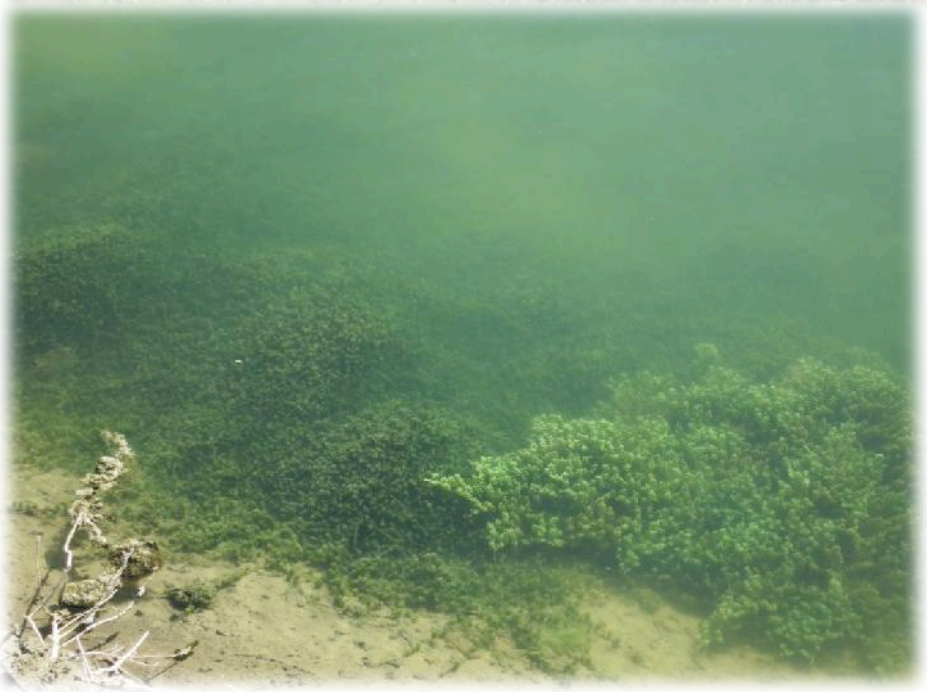
- Labour/staff
- Pond bottom
- Water quality/water supply
  - Salinity
  - DO
  - Dissolve nitrogen/nutrients
  - Organic matter
  - Climate change
  - PL quality
  - Feed management
  - Energy supply

- **Control of organic matter is one of the key success**
- **Organic matter**
  - **: Feed**
  - **: Feaces**
  - **: Dead plankton**
  - **: organic particles**
  - **Toxic gasses**
  - **DO shortage**
  - **Bacteria bloom**
  - **Shrimp stress/low immunity/susceptible to infection/low mortality**

Organic matter management

- High efficiency feed management
- Remove of organic matter
- Input of enough DO and effective micro-orgaism


Effluent from
Shrimp pond
Seaweed
Pond



Bacterial Count of Pond Preparation

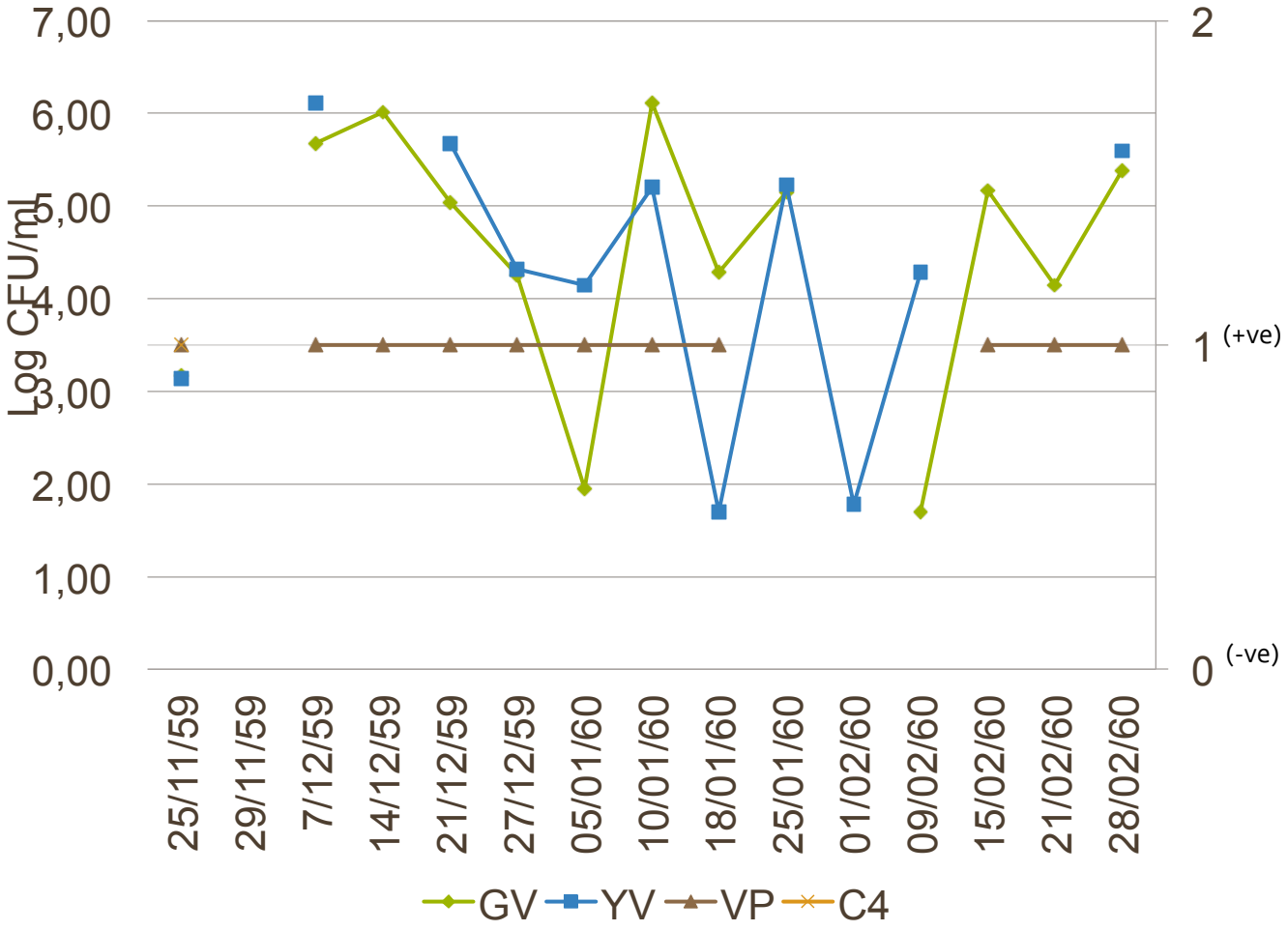
Date	Soil					Water				
	GV	YV	Vp-flae	Tumsat C4	Tumsat Vp3	GV	YV	Vp-flae	Tumsat C4	Tumsat Vp3
20/04/17	40	1.24*10^5	-ve	-ve	-ve	0.00E+00	5.00E+01	-ve	-ve	-ve

Water Quality before stocking Post Larva

Date	pH	Salinity	Alkaline	Ammonia	Nitrite	Nitrate	Phosphate
15/5/17	8.55	11	230	0.3988	0	1.0249	0.094
	8.67	11	222	0.0841	0	0.0537	0.2087

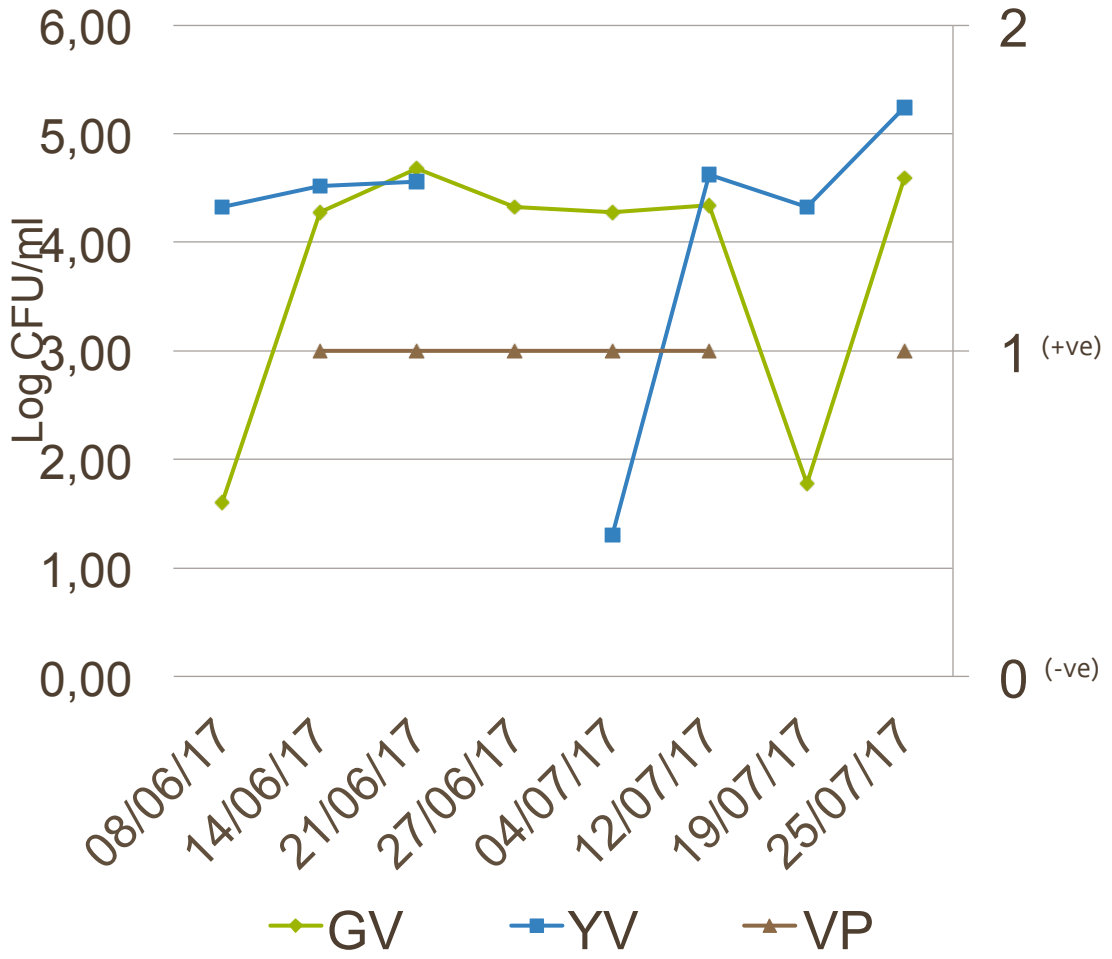
Crop : 6

Vibio Count in Shrimp

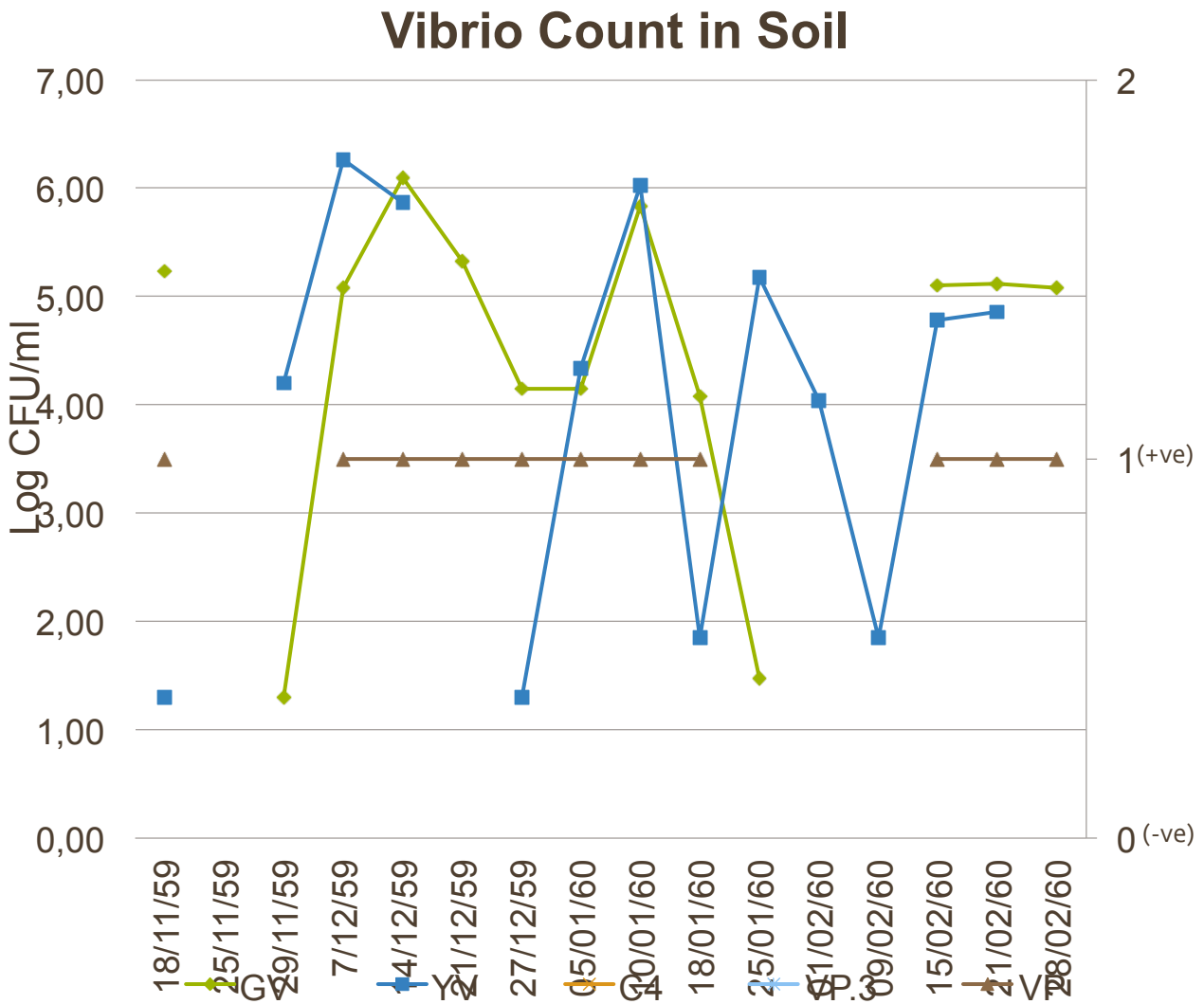


Crop : 7

Vibio Count in Shrimp



Crop : 6


Vibrio Count in Soil
7,00
6,00
5,00
4,00
3,00
2,00
1,00
0,00
Log CFU/ml
2
1 (+ve)
0 (-ve)
18/11/59
25/11/59
29/11/59
7/12/59
14/12/59
21/12/59
27/12/59
05/01/60
10/01/60
18/01/60
25/01/60
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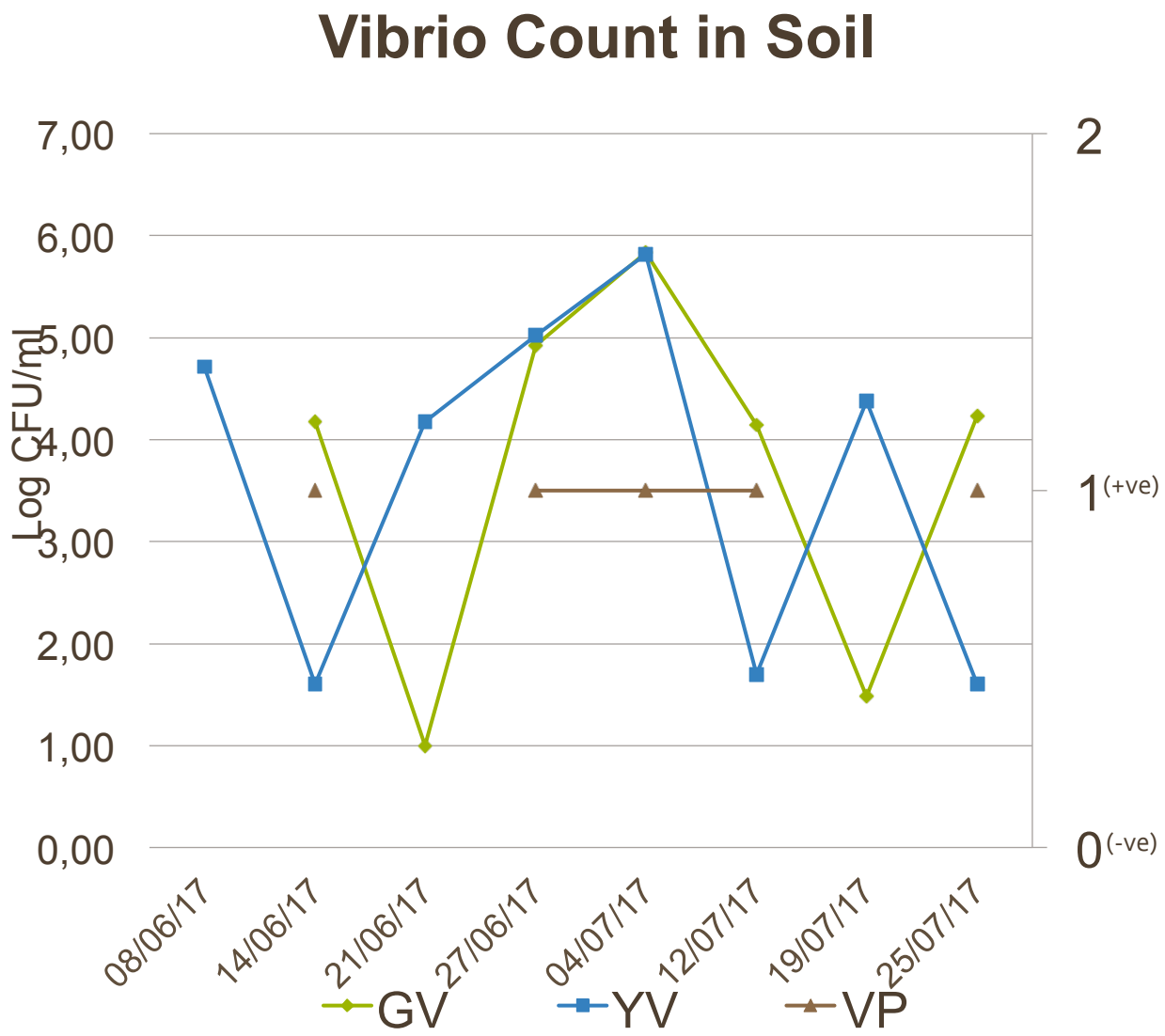
09/02/60
15/02/60
21/02/60
28/02/60
GV
YV
VP

Crop : 7


Vibrio Count in Soil
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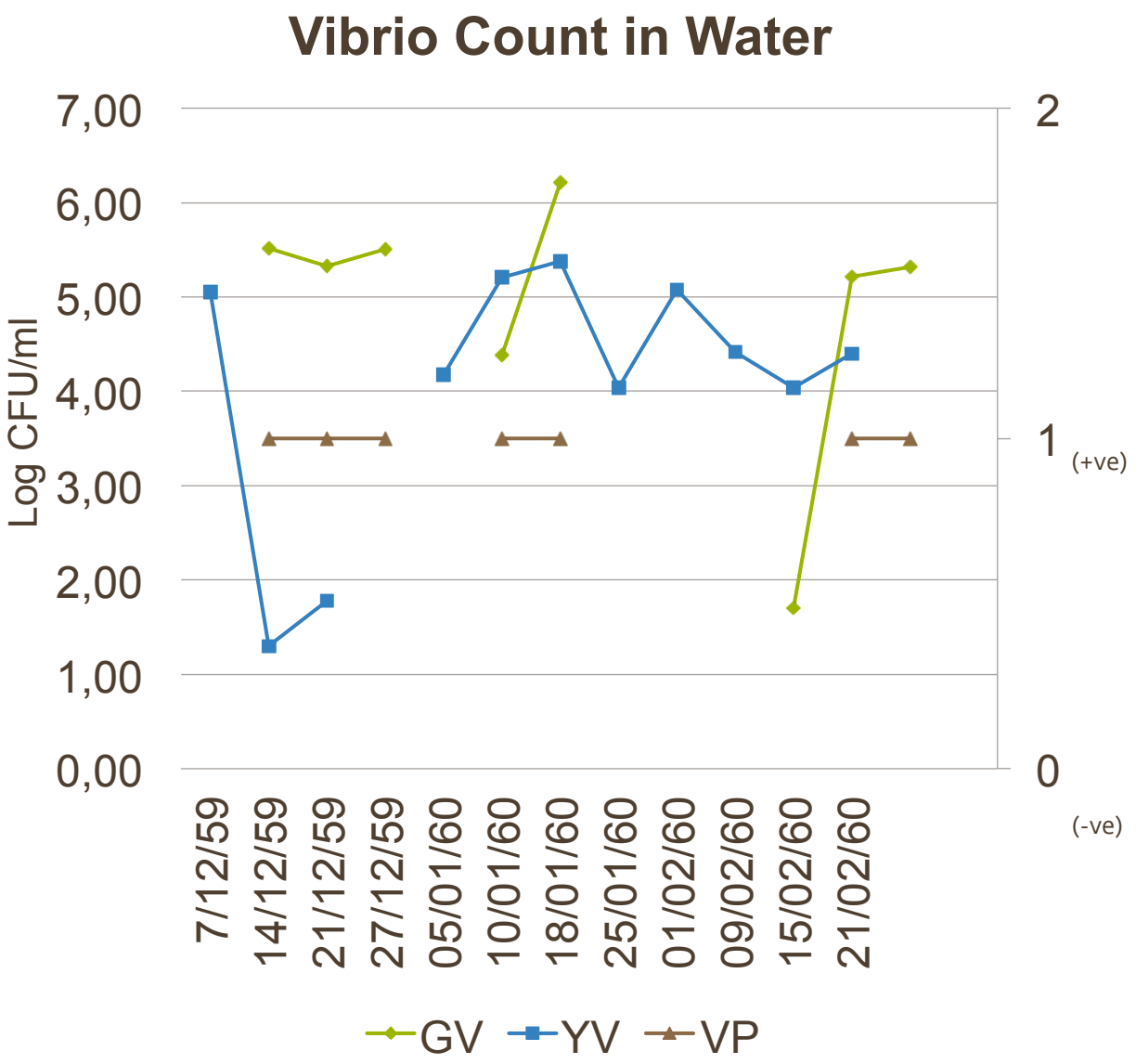
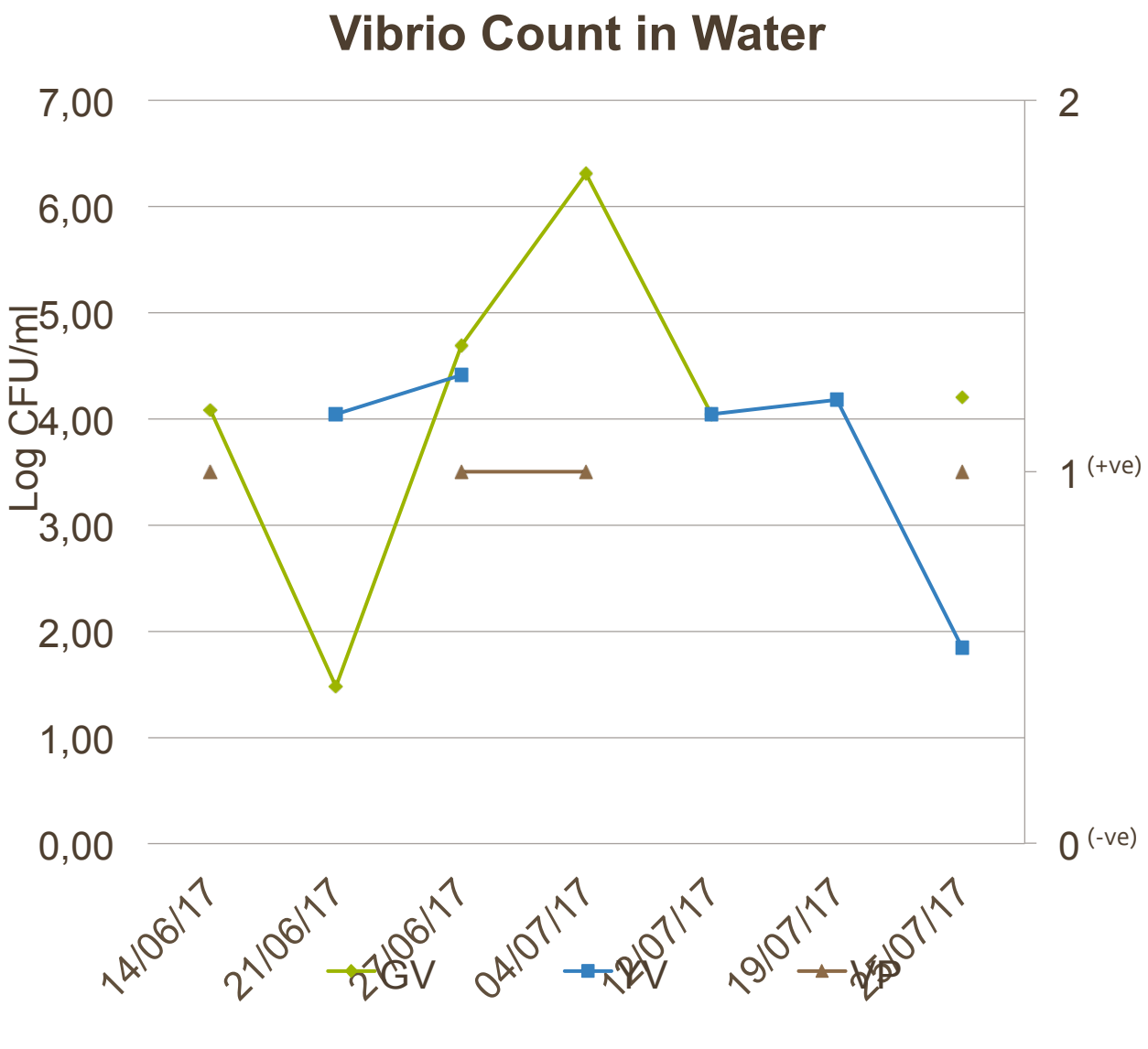
2,00
1,00
0,00
Log CFU/ml
2
1 (+ve)
0 (-ve)
08/06/17
14/06/17
21/06/17
27/06/17
04/07/17
12/07/17
19/07/17
25/07/17
GV
YV
VP

Crop : 6

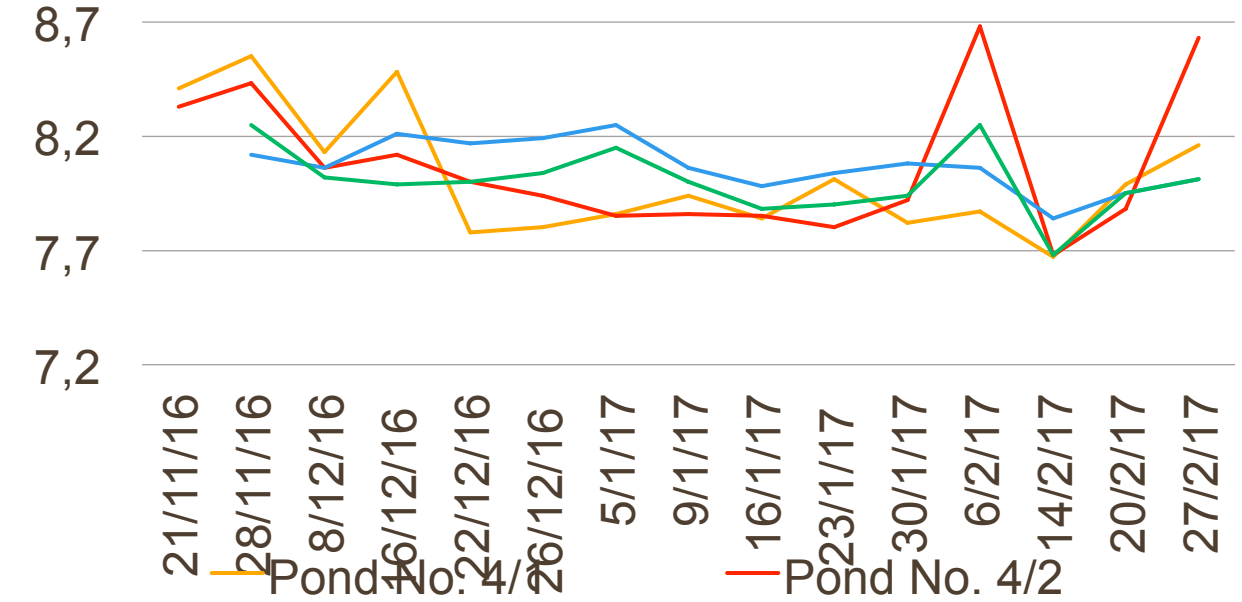

Vibrio Count in Water
Log CFU/ml
7,00
6,00
5,00
4,00
3,00
2,00
1,00
0,00
2
1 (+ve)
0 (-ve)
7/12/59
14/12/59
21/12/59
27/12/59
05/01/60
10/01/60
18/01/60
25/01/60
01/02/60
09/02/60
15/02/60
21/02/60
GV
YV
VP

Crop : 7


Vibrio Count in Water
Log CFU/ml
7,00
6,00
5,00
4,00
3,00
2,00
1,00
0,00
2
1 (+ve)
0 (-ve)
14/06/17
21/06/17
27/06/17
04/07/17
12/07/17
19/07/17
25/07/17
GV
YV
VP

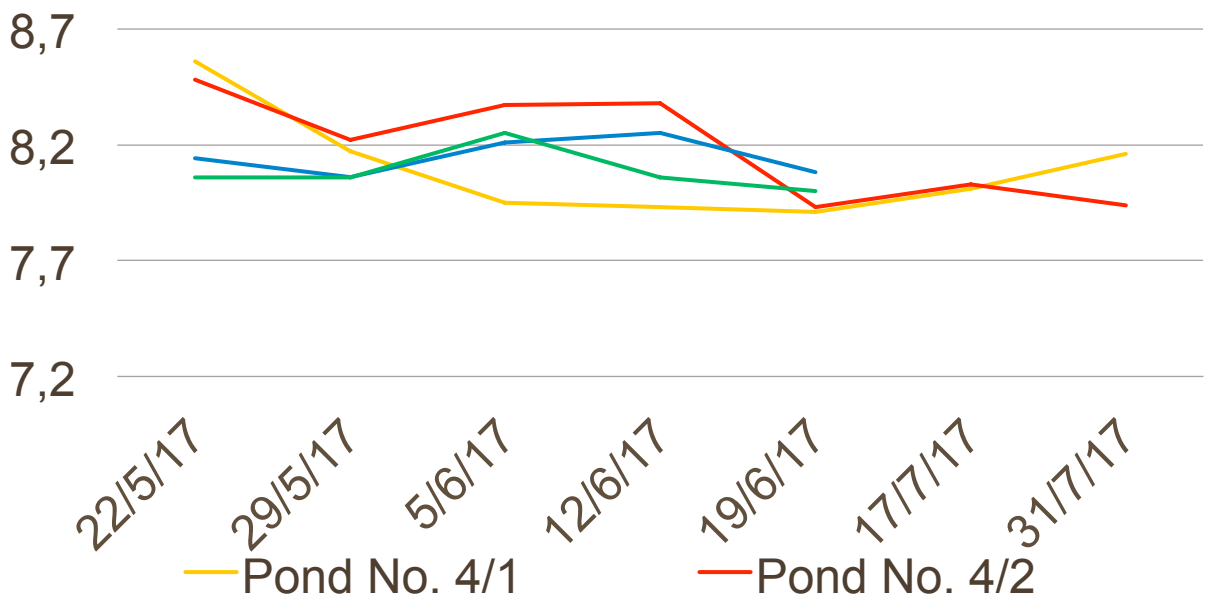
Crop : 6

pH During Grow - Out

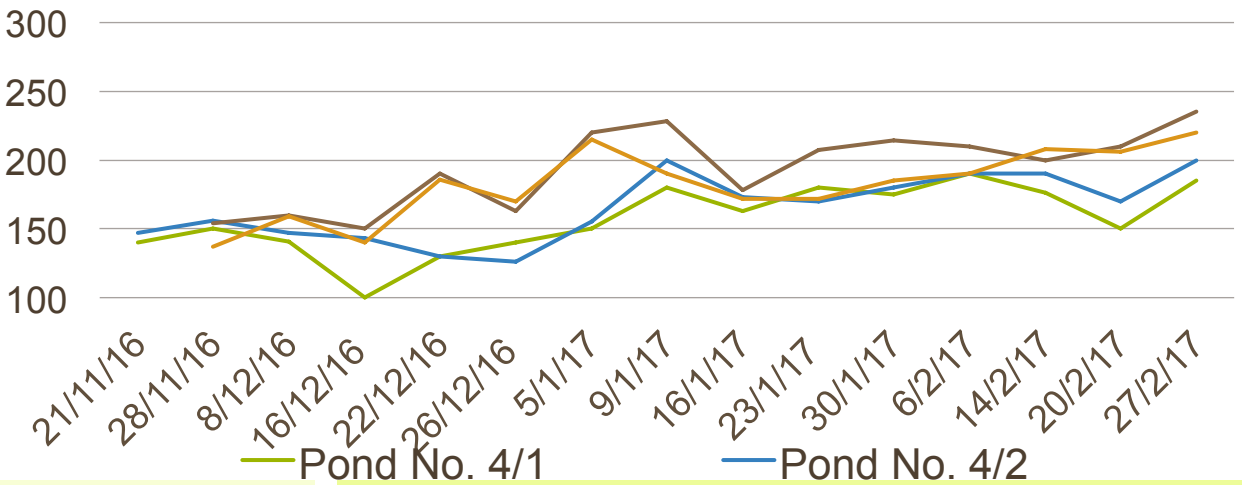


Crop : 7

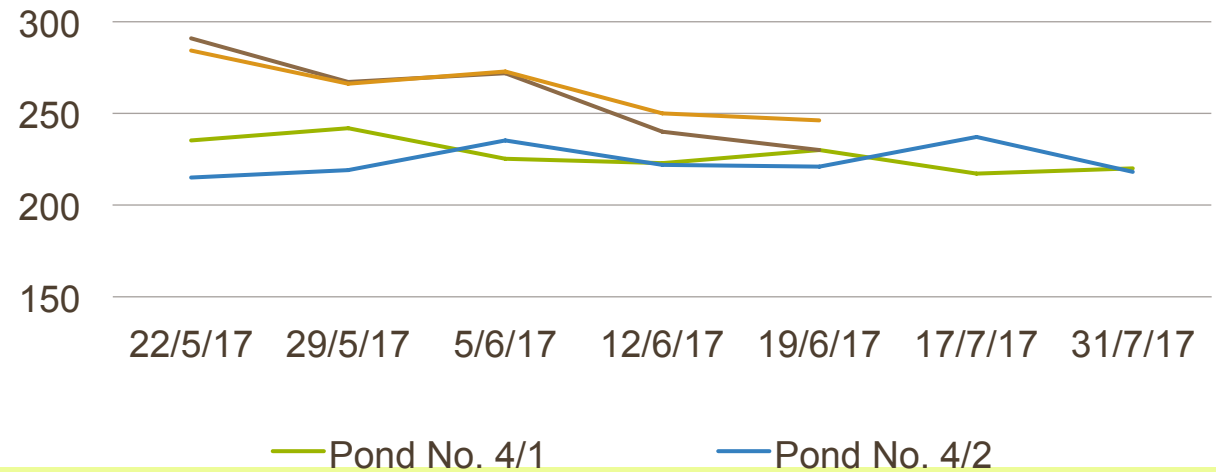
pH During Grow - Out



Alkalinity during grow - out

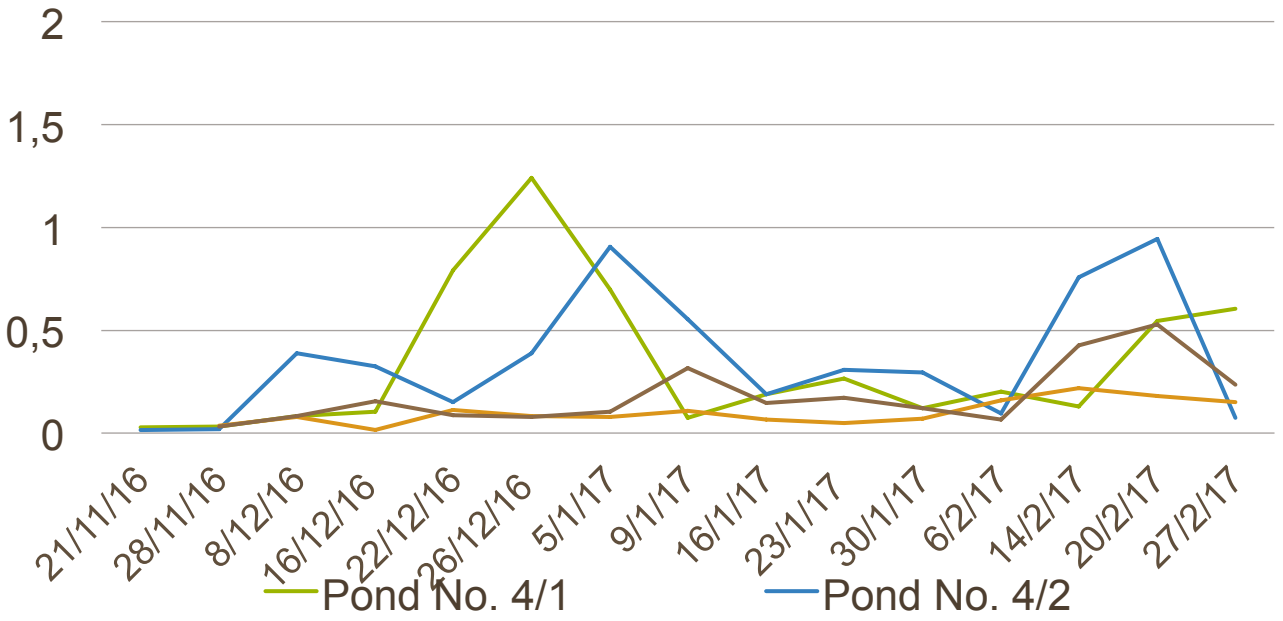


Alkalinity during grow - out

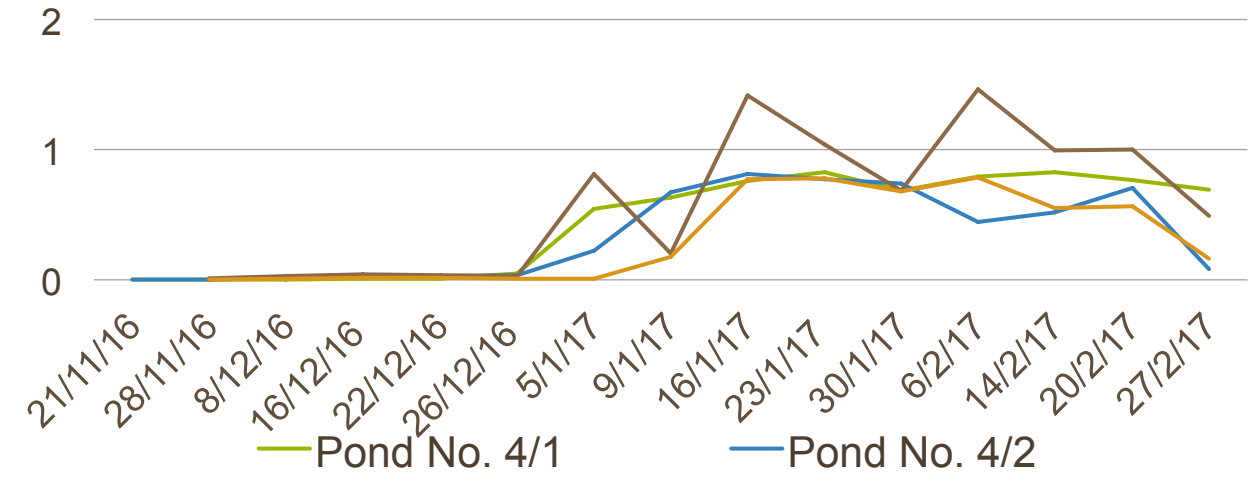


Crop : 6

Total Amnonia (TAN) during grow - out

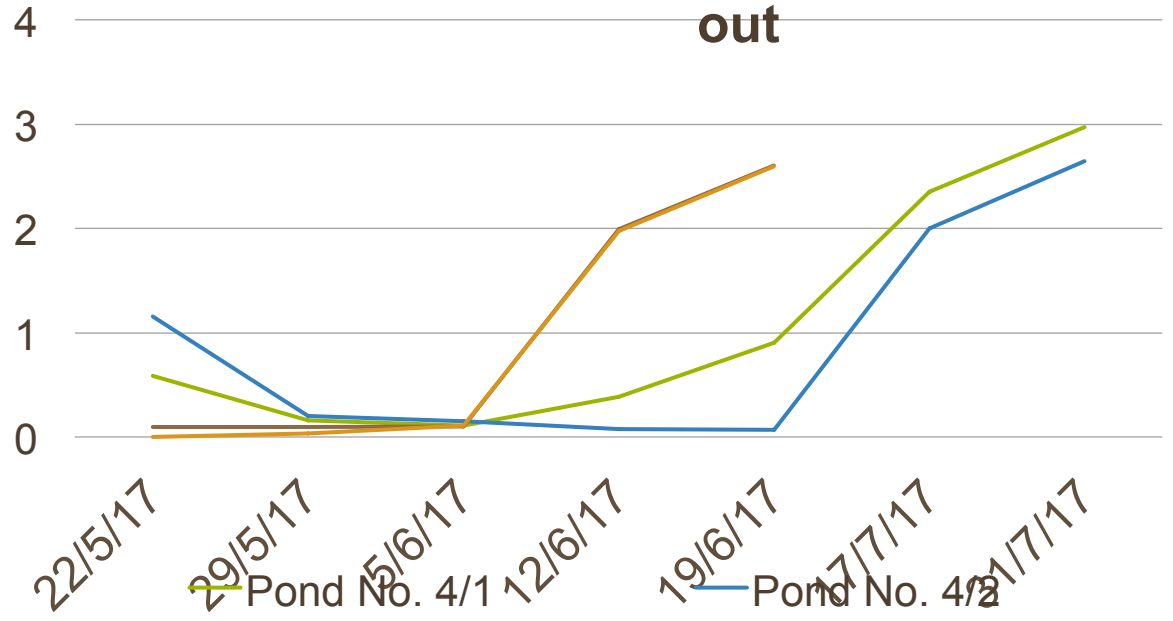


Nitrite during grow - out

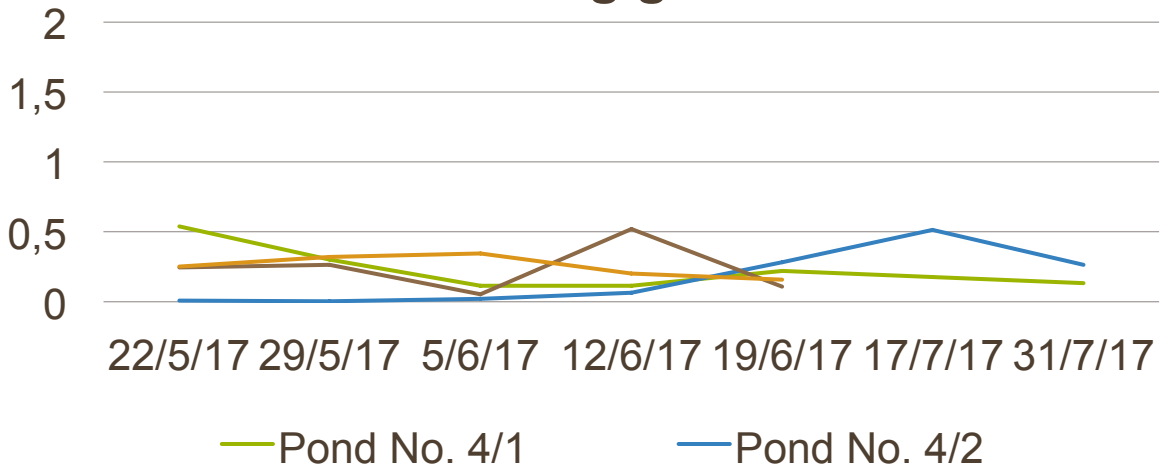


Crop : 7

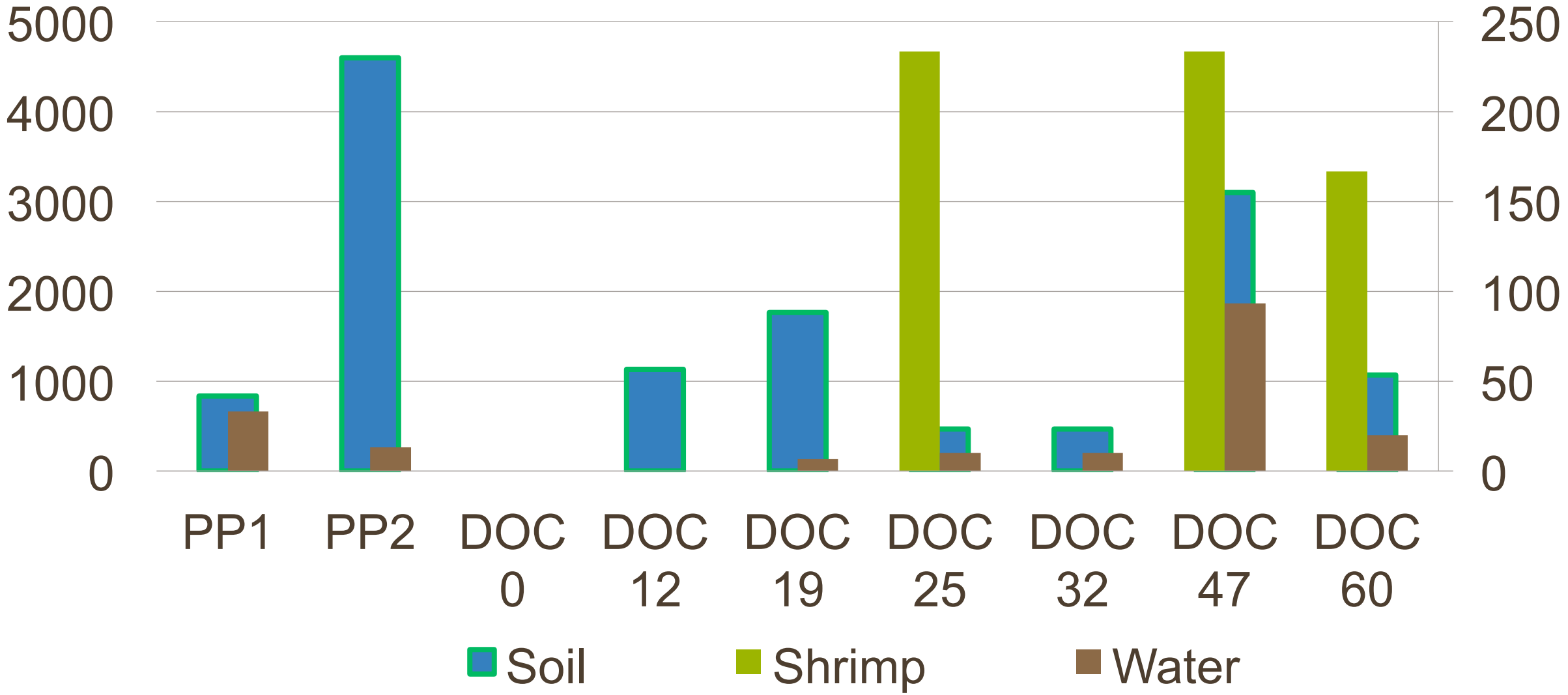
Total Ammonia (TAN) during grow - out



Nitrite during grow - out



Bacillus Counting (CFU/ml)



PP = Pond Preparation , DOC = Date Of Culture

Harvest

- Duration/Size
- Direct market or sell to processor

- **Intensive ponds**
- : Seine nets are dragged around the pond to collect shrimp to the side of the pond then shrimp are removed by perforated buckets.

Begin harvest in the early morning and complete before noon

Harvest preparations

- Tracibility document for sale
- Culture period at 3-3.5 months : 1kg shrimp for antibiotic residue analysis
- Harvest after moulting 10-12 days to prevent soft shell shrimp
- Taking 3 weeks for withdrawn of antibiotics residue
- 3 days prior to harvest, apply of any chemical substances
- Preparation of all official documents
-

Production and Growth rate

Detail	Crop 6		Crop 7	
	4/1	4/2	4/1	4/2
Pond Size (Rai)	1 .44	1.25	1 .44	1.25
Stocking Date	25/11/16	25/11/16	16/05/17	16/05/17
Stocking Quantity (Pcs.)	210,000	140,000	210,000	130,000
Stocking Density (Pcs./ Rai)	145,833	112,000	145,833	104,000
Harvest Date	02/03/17	02/03/17	04/08/17	04/08/17
Culture Period (Day)	91	91	81	81
Production (kg)	2,171.76	1611.57	1,877.00	1,717
Average Day Growth (ADG)	0.17	0.19	0.20	0.23
Feed Consumption Ratio (FCR)	1.63	1.47	1.51	1.3
Survival Rate (%)	66.19	67.92	56.31	70.01
Productivity (Ton/Million PL)	10.34	11.51	8.94	13.21
Productivity (Ton/rai)	1.5	1.8	1.3	1.37

8 USD/kg

2-4 USD/kg

2.85 USD/100g
28 USD/1 kg

Cosmetics


ORGANIC
EXTRACT OF
GREEN CAVIAR ALGA
FOR ANTI-AGING COSMECEUTICAL PRODUCT
MOTIVE FOR CREATIVE INVENTIONS
Dr.Tobi
Fresh green caviar alga (Caulerpa lentillifera)is popular for consumption as a healthy diet because of its nutritious and biological activities. The green caviar alga (GCA) is cultivated and certified organic farming by Department of Fisheries, Thailand. However, the fresh GCA has short shelf-life and need to be consumed with in few days. Therefore,the experiment was developed to value-added as organic GCA extract using non-solvent extraction and tested on pharmacological activity for innovative cosmeceutical product.


SEA FARM
SOAP
Green Caviar


Dr.Tobi
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INNOVATION
APPLICATION
CLINICAL
STUDY IN
HUMAN
INVENTORS

Thank you