DESCRIPTION OF THE PROJECT ACTIVITY AND OUTCOME LOCAL BUSINESS DEVELOPMENT: TRIAL PRODUCTION OF BABYLONIA SHELL

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I. BACKGROUND

The project has exerted efforts in promotion of prospective local business among fishers and women's groups in the project area since inception of the project. The implication in this attempt lies in not only increasing supplemental income sources among fishers' families but also looking for alternative job opportunities to avert over-capitalization in fishing efforts.

Babylonia shells have been widely consumed in Thailand at relatively high price. Moreover, the demand for this shell has been boosted recently after the export market to Taiwan was exploited. Some substantial amounts of this shell must have been exported to the foreign markets although no precise statistic data is available. With such a marketing trend, the culturing Babylonia shell has commenced in the central part of Thailand especially in the Chonburi Province in order to offset the expanding domestic demand. Under this trend of increasing market demand, the project considered it worthwhile and promising to introduce this new venture among those who were interested.

Consonant with this implication, the experimental babylonia shell culture was conducted for 7 months from August 2005 to February 2006. However, the result was rather pessimistic with mal-growth of the shells, especially after 3 months' culturing. The suspected cause for this may be attributed to the unfavourable sea conditions after November when the monsoon season set in. Also, some other reasons were suspected as discussed in the report: Experimental Babylonia Shell Culturing (Etoh 2006). The experiment was not satisfactorily conducted as such, and in order to ensure commercial feasibility in this venture the 2nd experiment was conducted for 6 months from March to September 2006 during calm seasons in the improved way incorporating lessons learned through the first experiment.

II. MODE OF EXPERIMENT / DEMONSTRATION

1. Operational mode

The project provided all materials and equipment necessary for this experiment to the Aquaculture Sub-group of the Pakklong Aquaculturists Group (PAG) and the experiment was continued for 6 months under close supervision by the SEAFDEC/TD Field Extension / Liaison Officer. The intermittent technical supervision was provided by the research officers from the Chumphon Marine Aquaculture Station (CMAS).

2. Construction of cages and rafts

The old 10 cages used in the previous experiment were brought in the mechanical workshop of SEAFDEC/ TD for necessary repair and modification, particularly shortening the height of each cage and replacing plastic trays in the bottom basin. The raft with the bamboo frame was also reinforced and installed near the crab bank cage so that close monitoring to protect from likely theft became possible. Another advantage in this location lay in its calm sea protected by the island.

3. Experiment

The 2nd experiment was commenced on 21 March 2006. In each cage, 700 pcs of shell seed hatched in the Chumphon Coastal Aquaculture Center (CCAS) were released totaling 7,000 pcs in all. The average weight of a seed was 0.33g which was comparatively smaller than the one in the previous experiment, 0.48g. The price was 0.75 Baht per piece compared with 0.60 Baht in the previous experiment.

Daily taking care for maintenance of cages and feeding was exerted by the locally assigned SEAFDEC/TD extension officer with assistance of local fishing community. Small fish mainly caught by squid cast-netters as by-catch were purchased daily at around 12 to 15 Baht per Kg and fed to the cages after splitting. The daily feeding quantity were initiated 0.5Kg for 10 cages and increased to 2-3Kg judging from the remaining of unfed fish. The amount of feed given every day was recorded by the extension officer. Remaining residues were removed every day and the cages were cleaned once a week.

The growth in weight was measured and recorded by the extension officer every fortnight in a way that 100 pcs of shell were picked up at random from the cages No.1 and 10 to measure the growth of shells and the total numbers survived were countered in both the cages.

As such, the experiment was continued up to 22nd September 2006 with 185 operational days.

III. Observation

Toward the end of experiment, it was observed that some shells were tainted with black colour. The taste, texture and floavour were not different from normal ones. The consultation was made with the researcher in the CMAC was made to find a cause and seek a solution. As a result, it was found that the black colouring was attributed to the contact with the mud at most times. This black colouring was seen especially in shells in cage No. 4 and 9 most and 5 to some extent. This is something to do with the wave direction. When the tide is low, the bottom mud is swelled up with the current and dredged at the bottom of cages. However, the black colour would turn to normal after placing them in the clean sand for a while before delivery, the researcher from the CMAC suggested.

During the course of experiment, it was observed that there was noticeable unevenness in growth rate depending on the cages. As seen in the table 1 below, the largest group in the cage No. 4 (8.6g in mean) exceeds the smallest group (4.8g in mean) in sizes by as much as 44.2%. These were fed in the exactly same condition and volume. In reference to the figure 1 below, the cause could be reasonably attributed to exposure to the strong current; the groups in No.1 and 6 which are most exposed to the strong current are smallest one, while the groups No1 and 9 which are protected from exposure to the direct current are largest. This assumption was supported by the researcher of CMAC. This can be a valuable instruction in practical application in babylonia shell culturing.

At the last stage of experiment, it was found that two cages got damaged and some shell escaped. Given that this is the experiment in the calm season, the further reinforcement on the frame is necessary in case of commercial production which is bound to undertake even during the monsoon seasons.

On 22nd September 2006 after culturing for 185 days, the experiment was terminated as it had passed the targeted culturing period of 6 months and the shells were taken out of the cages and measured. The total weight is recorded at 35.45Kg. The weight, appearance and quality are described in the following Table 2.

Table 1: Average weight of shell in each cage

Cage No.	Number of sample (Pc)	Weight of sample (gr)	Mean weight (gr / pc)	Order in size
1	100	500	5.0	9
2	50	290	5.8	6
3	50	360	7.2	3
4	50	430	8.6	1
5	50	360	7.2	3
6	50	240	4.8	10
7	50	270	5.4	8
8	50	280	5.6	7
9	50	390	7.8	2
10	100	650	6.5	5
Average	-	-	6.4	

Fig. 1. Layout of each cage and shell sizes

No. 6 (10) 4.8g	No.7 (8) 5.4g	No.8 (7) 5.6g	No.9 (2) 7.8g	No.10 (5) 6.5g
No.1 (9) 5.0g	No.2 (6) 5.8g	No.3 (3) 7.2g	No.4 (1) 8.6g	No.5 (3) 7.2g

Note: ( ) – order of size

IV. RESULT

The results of periodical measurement every fortnight in weigh and also the amount of feed given are tabulated in the table 4 of Annex 1. As seen in the table, the growth rate of shells in the cage No.10 has been increased soundly until the end of experiment, while for the one in cage No.1 the pace of growth has been dwindled slightly after 105 days. The average sizes of shells in the cage No.1 and No.10 after 185 days culturing are 5.20g and 6.87g respectively, which can lead the mean size of all shells to 6.04g. The total feed given is calculated at 469.9Kg (the last period of data for feed given was lost and it was calculated based on the previous figure.)

Table 2: Production record of Babylonia shell culturing

Cage No.	Initial stock (pc)	Final stock (6 months)			Survival rate (%)	Remarks
		(pc)	Total wt.(gr)	Wt. per shell (gr)		
1	700	543	2,825	5.20	77.6	Many lost in the last month
2	700	535	2,975	5.56	76.4	
3	700	687	5,350	7.79	98.1	Good colour and sizes
4	700	601	5,400	8.99	85.9	Tainted with black colour
5	700	637	4,700	7.38	91.0	Tainted with black colour
6	700	262	1,300	4.96	37.4	Cage damaged, small sizes remained
7	700	186	1,000	5.38	26.6	Cage damaged, small sizes remained
8	700	484	2,600	5.37	69.1	Cage damaged, small sizes remained
9	700	560	4,700	8.39	80.0	Tainted with black colour
10	700	670	4,600	6.87	95.7	Tainted with black colour
Total	7,000	5,165	35,450	6.59	73.8	

Table 3: Quantity and expected prices by size and quality

Grade	Size / quality standard	Quantity (kg)	Expected beach price (Baht) / Kg	Expected gross sales (Baht)	Remarks
A	Over 7.8g (130 pcs. per Kg)	4.2	350	1,470	
B	Between 7.8 – 5.0g in average (130 – 200 pcs. per Kg)	11.2	250	2,800	
C	Under 5.0g	12.8	Immature	-	To be further cultured
D	Black tainted shell	7.2	No marketable	-	Mostly 8.3 – 10.0g size
Total		35.4		4,270	

V. Discussion

As seen in the Table 4 and Fig 2 of Annex 1, it is obvious that the shell growth in the cage No. 10 shows satisfactorily while for the ones in the cage No.1 the pace of growth becomes slightly retarded after passing around 105 days stocking. This difference in growth is certainly caused by the position of cages as dealt in 3. Observation. This exactly demonstrates the resultant observation in the first experiment that the wave and current tend to impede the growth of shell due to less feeding. It is striking when compared with the data of experiment conducted by Dr. Ninnard Chaithavisut, Chulalongkorn University in 2002 (Ref. Fig. 2). The trend of growth in the cage No.10 is closely consistent with the one in the laboratory experiment result. (In this laboratory experiment, it seems to be a bit unrealistic that the growth rate after 150 days increases abruptly. It could be stabilized or slightly decreased toward reaching the matured size.) In addition, judging from the fact that the growth rate of cage No. 10 is not highest but just in the middle (ref. in Fig 1), shells in some cages are much bigger than those in the laboratory experiment, e.g. shells in Cage No.4 which are almost 32% larger.

As for feeding practices, some irregularity is witnessed especially around 30 and 110 days. In these periods, growth rates were unreasonable decreased, although this slow growth may not be attributed to only the feed practices but something else as well.

The average feed conversion rate (FCR) is 13.7% which is reasonable and was improved compared with 9.0% in the previous experiment. Also, as shown in Annex 3, it is obvious that the growth rates in the 2nd experiment are improved by far compared with the one in the 1st experiment. This demonstrates the diagnosis given by the researcher of CMAC that the feeding habit of shell gets deteriorated in the shaking environment by monsoon is persuadable.

VI. Economic Feasibility

As for possible marketing outlet, it was consulted with the CMAC. A few middlemen visit Chumphon to purchase the babylonia shell whenever products are ready to deliver in quantity. The prevailing beach prices are Baht 350 and 250 per Kg for grade A and B respectively, although no transaction was realized in this experiment as the quantity was too small for a middleman to attract.

The cost and profit analysis in this experiment is shown in Annex 4, which ends up with deficit. The cost and profit analysis made by Dr. Ninnard in the Chulalongkon University explained that an expected expenditure of Babylonia shell per kg would be as little as Baht 199.50 based on his laboratory experimental result, which is by far low compared with the experiment result carried out by the project with PFG; i.e. 799.15 per kg shell.

Also, the cost and profit analysis is made in case of commercial operation with the expanded capacity of 50 and 100 cages as seen in the Annex 5. Even in this calculation, no possible profit can be foreseen in this venture. The expenditure is estimated at Baht 391.11 per kg shell in case of culturing 100,000 shells, which would be still too high to expect some profit as the best beach price is Baht 350 per kg. The major expenses are the cost of seeds and labour.

VII. Conclusion

In the wake of the first experiment conducted in August 2005 to February 2006, the 2nd experiment was initiated in March 2006 in the favourable environment as more positive outcomes were expected as suggested in the laboratory test result by the Chulalongkorn University and also some encouraging lessons were learnt through the 1st experiment. However, the result was again negative as seen in the economic calculation and it is not convincing for the PFG to envisage entering this venture in future under the present marketing trend. The reasons are;

- the expected economic return is negative or too marginal even if it turns to lucrative,
- the maintenance of cages requires laborious work in cleaning and repairing and can not be managed within part-time work,
- the cost of seed is still relatively high,
- the growth rate is largely affected by the environmental condition like wind, current, tide etc. therefore it is very fragile and difficult to cope with the weather changes,
- as having been commercially established, the culturing with the concrete tanks or in the ponds may be feasible but such attempts entail huge amount of initial investment.

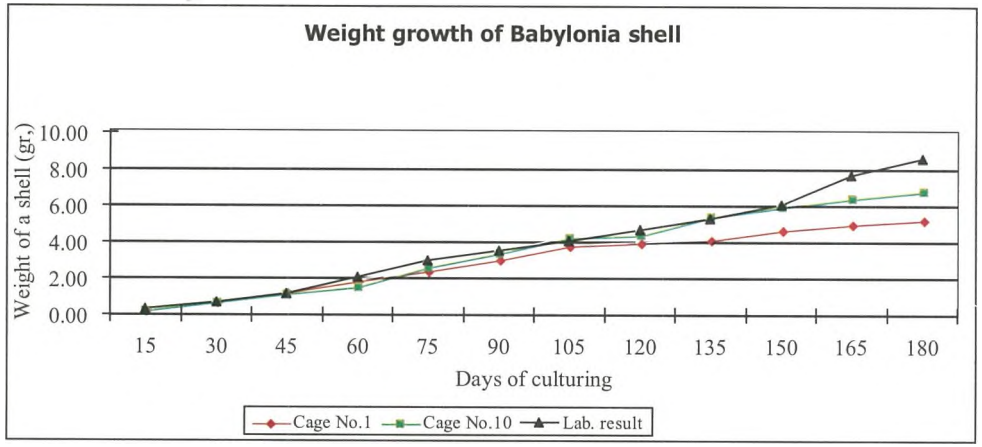
VIII. Reference

Ninnard C., Manual of Babylonia Shell Culture (Theory and Practice) 2002, 92P.

Annex 1 Table4: Growth of Babylonia Shell in the Experiment

Measuring date	Accum'ed culturing days	Cage No.1					Cage No.10					Total feed given		Lab. experiment
		Weight measurement		Number of shells (Pcs)			Weight measurement		Number of shells (Pcs)					
		Wt per 100 pcs (gr)	Mean per pc. (gr)	Survived	Dead	Escaped	Wt per 100 pcs (gr)	Mean per pc. (gr)	Survived	Dead	Escaped	(Kg)	(Baht)	Wt. per pc. (g)
21.03.2006	0	33.8	0.34	700	0	0	32.1	0.32	700	0	0	-	-	0.30
05.04.2006	15	80.0	0.80	700	0	0	78.6	0.79	700	0	0	7.3	108	0.73
24.04.2006	34	132.5	1.33	697	3	0	120.0	1.20	689	11	0	23.6	353	1.16
09.05.2006	49	196.1	1.96	697	0	0	163.9	1.64	689	0	0	23.0	230	2.07
24.05.2006	64	250.0	2.50	680	14	3	266.7	2.67	675	10	4	23.7	230	2.98
07.06.2006	78	308.8	3.09	680	0	0	348.2	3.48	675	0	0	25.4	253	3.52
24.06.2006	95	383.6	3.84	670	4	6	434.1	4.34	673	2	0	41.8	418	4.06
10.07.2006	111	400.0	4.00	670	0	0	450.0	4.50	673	0	0	80.7	968	4.70
24.07.2006	124	418.0	4.18	670	0	0	549.0	5.49	673	0	0	50.0	600	5.34
12.08.2006	144	470.0	4.70	670	0	0	600.0	6.00	673	0	0	60.0	720	6.08
02.09.2006	165	500.0	5.00	670	0	0	650.0	6.50	673	0	0			7.73
22.09.2006	185	520.0	5.20	543	5	122	687.0	6.87	670	3	0	*		8.63
Total				543	26	131			670	26	4	335.4	3,880	

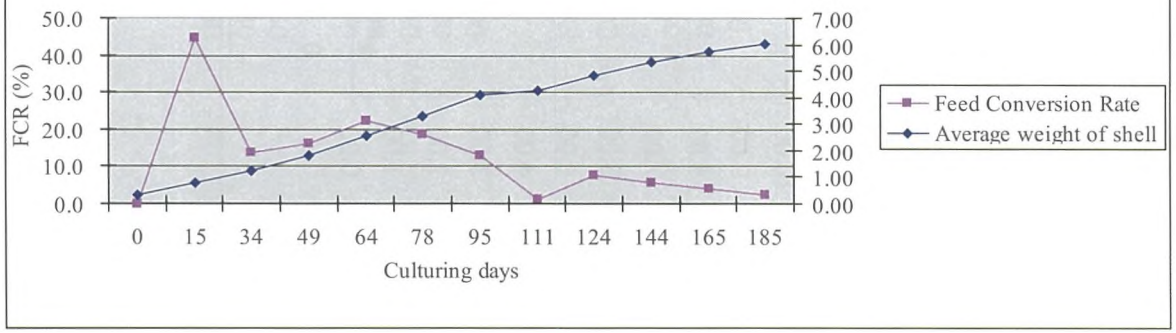
* Note: The total feed given (335.4Kg) is the total amount up to 144 days.



Annex 2 Table 5: Changes of Feed Conversion Rate of Babylonia Shell

Measuring date	Accum'ed culturing days	Duration of culturing (days)	Mean wt.per pc (g)				Survived shell				Calculated number of shells in all (pc)	Increased wt. of shells in all during the period (Kg)	Feeds given during the period (Kg)	Calculated Feed Conversion Rate (%)
			Cage No.1	Cage No.10	Average	Increased wt. during the period	Cage No. 1	Cage No.10	Average	Survival rate(%)				
21.03.2006	0	0	0.34	0.32	0.33	-	700	700	700	100	7,000	-	-	-
05.04.2006	15	15	0.80	0.79	0.80	0.47	700	700	700	100	7,000	3.3	7.3	44.8
24.04.2006	34	19	1.33	1.20	1.27	0.47	697	689	693	99	6,930	3.3	23.6	13.8
09.05.2006	49	15	1.96	1.64	1.80	0.54	697	689	693	99	6,930	3.7	23.0	16.1
24.05.2006	64	15	2.50	2.67	2.59	0.79	680	675	678	97	6,775	5.3	23.7	22.5
07.06.2006	78	14	3.09	3.48	3.29	0.70	680	675	678	97	6,775	4.7	25.4	18.7
24.06.2006	95	17	3.84	4.34	4.09	0.81	670	673	672	96	6,715	5.4	41.8	12.9
10.07.2006	111	16	4.00	4.50	4.25	0.16	670	673	672	96	6,715	1.1	80.7	1.3
24.07.2006	124	13	4.18	5.49	4.84	0.59	670	673	672	96	6,715	3.9	50.0	7.9
12.08.2006	144	20	4.70	6.00	5.35	0.52	670	673	672	96	6,715	3.5	60.0	5.8
02.09.2006	165	21	5.00	6.50	5.75	0.40	670	673	672	96	6,715	2.7	65.4	4.1
22.09.2006	185	20	5.20	6.87	6.04	0.29	543	670	607	87	6,065	1.7	69.1	2.5
Total													469.9	13.7

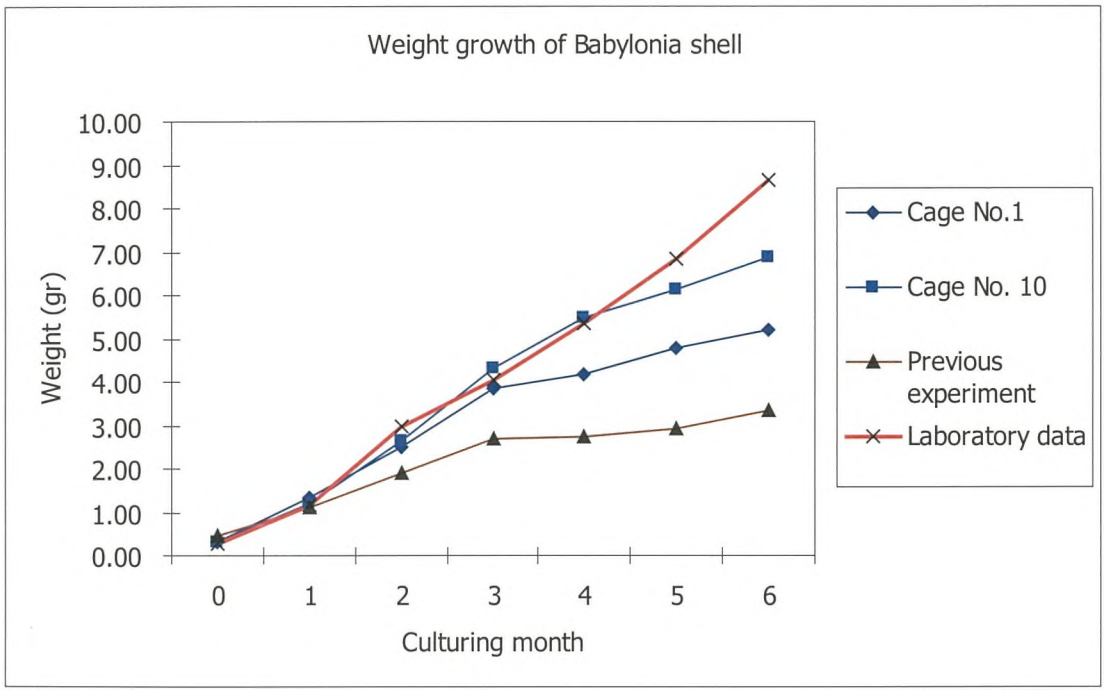
Fig 3: FCR and growth of shell



Annex 3 Comparative weight growth in experiment 1 and 2

Culturing month	Cultured shell (gr)			Laboratory data (gr)
	Cage No.1	Cage No. 10	Previous experiment	
0	0.34	0.32	0.48	0.30
1	1.33	1.20	1.13	1.16
2	2.50	2.67	1.93	2.98
3	3.84	4.34	2.70	4.06
4	4.18	5.49	2.76	5.34
5	4.78	6.14	2.94	6.82
6	5.20	6.87	3.33	8.63

* By Dr. Ninnard Chaithavisut, 2002



Annex 4

Cost & profit calculation (Experiment)

1. Base of calculation — Remarks
   - Cost of 10 cages; B aht 3,200 x 10 = 32,000
   - Depreciation term of cages: 5 years
   - Cage maintenance co st per season: 5 %
   - Cost of seed: Baht 0.75 per pc.
   - Cost of feed: Baht 3,880 per 7,000 pc
   - Cost of labour: Baht 1,500 per month
   - Fuel and lubrication : Baht 900 per month
   - Price of shell: A grade - Baht 350/Kg (over 8.0g)
     B grade - Baht 250 /Kg (over 5.0g)
     C grade - Baht 200/Kg (under 5.0g) — To be further cultured

2. Expenses	Baht	
Fixed cost		
- Depreciation cost for 6 months(Baht 32,000/10)	3,200	
- Cage maintenance cost (Baht 32,000 x 5%)	1,600	
- Labour cost (Baht 1,500 x 6m)	9,000	
- Fuel & lubrication (Baht900 x 6m)	5,400	
Sub- total:	19,200	
Variable cost		
- Cost of seeds (Bah t 0.75 x 7,000pc)	5,250	
- Cost of feed	3,880	
Sub- total:	9,130	
Total Expenses:	28,330	Baht 799.15/Kg shell

Income	Baht	
3. a. Sales		
- A grade: Baht 350 x 4.2kg	3,990	
- B grade: Baht 250 x 11.2kg	2,800	
- C grade: Baht 200 x 12.8kg	2,560	With assumption
Sales total:	9,350	
b. Income		
- Sales total	9,350	
- Expenditure total	28,330	
Net income:	- 18,980	

Annex5

Cost & profit calculation (in commercial scale)

	In case of 50 cages	In case of 100 cages	Remarks
1. Base of calculation			
- Number of cages:	50	100	
- Number of shell in a cage	1,000	1,000	
- Total number of shell to be cultured	50,000	100,000	
- Cost of cages; Baht 3,200 each	160,000	320,000	
- Depreciation term of cages:	5 years	5 years	
- Cage maintenance cost per season:	5%	5%	
- Cost of a seed:	Baht 0.75	Baht 0.75	
- Cost of feed per shell for 6 months:	Baht 0.55	Baht 0.55	
- Cost of labour per month:	Baht 5,625	Baht 11,250	
- Fuel and lubrication per month:	Baht 900	Baht 900	
- Price of shell: A grade(over 8.0g, average 10.0g)	Baht 350/Kg	Baht 350/Kg	
B grade (over 5.0 to 8.0g, average 6.5g)	B aht 250/Kg	Baht 250/Kg	
C grade (under 5.0g, average 4g)	Baht 200/ Kg	Baht 200/kg	Further cultured
- Mortality rate of shell:	5%	5%	
- Number of product in pc.: A grade (32%)	15,200	30,400	
B grade (32%)	15,200	30,400	
C grade (36%)	17,100	34,200	
Sub-total:	47,500	95,000	
- Quantity of product in kg: A grade (32%)	152	304	
B grade (32%)	99	198	
C grade (36%)	68	137	
Sub-total:	319	638	

2. Expenses	Baht	Baht	
Fixed cost			
- Depreciation cost of cages for 6 months	16,000	32,000	12.8%
- Cage maintenance cost (5% of initial investment)	8,000	16,000	6.4%
- Labour cost	33,750	67,500	27.1%
- Fuel & lubrication	5,400	5,400	2.2%
Sub-total:	63,150	120,900	48.5%
Variable cost			
- Cost of seeds (Baht 0.75 per a seed)	37,500	75,000	30.1%
- Cost of feed (Baht 0.55 per a shell)	26,813	53,625	21.5%
Sub-total:	64,313	128,625	51.5%
Total Expenses:	127,463	249,525	Baht 391.11/Kg

3. Income	Baht	Baht
a. Sales		
- A grade: Baht 350 per Kg	53,200	106,400
- B grade: Baht 250 per Kg	24,700	49,400
- C grade: Baht 200 per Kg	13,680	27,360
Sales total:	91,580	183,160