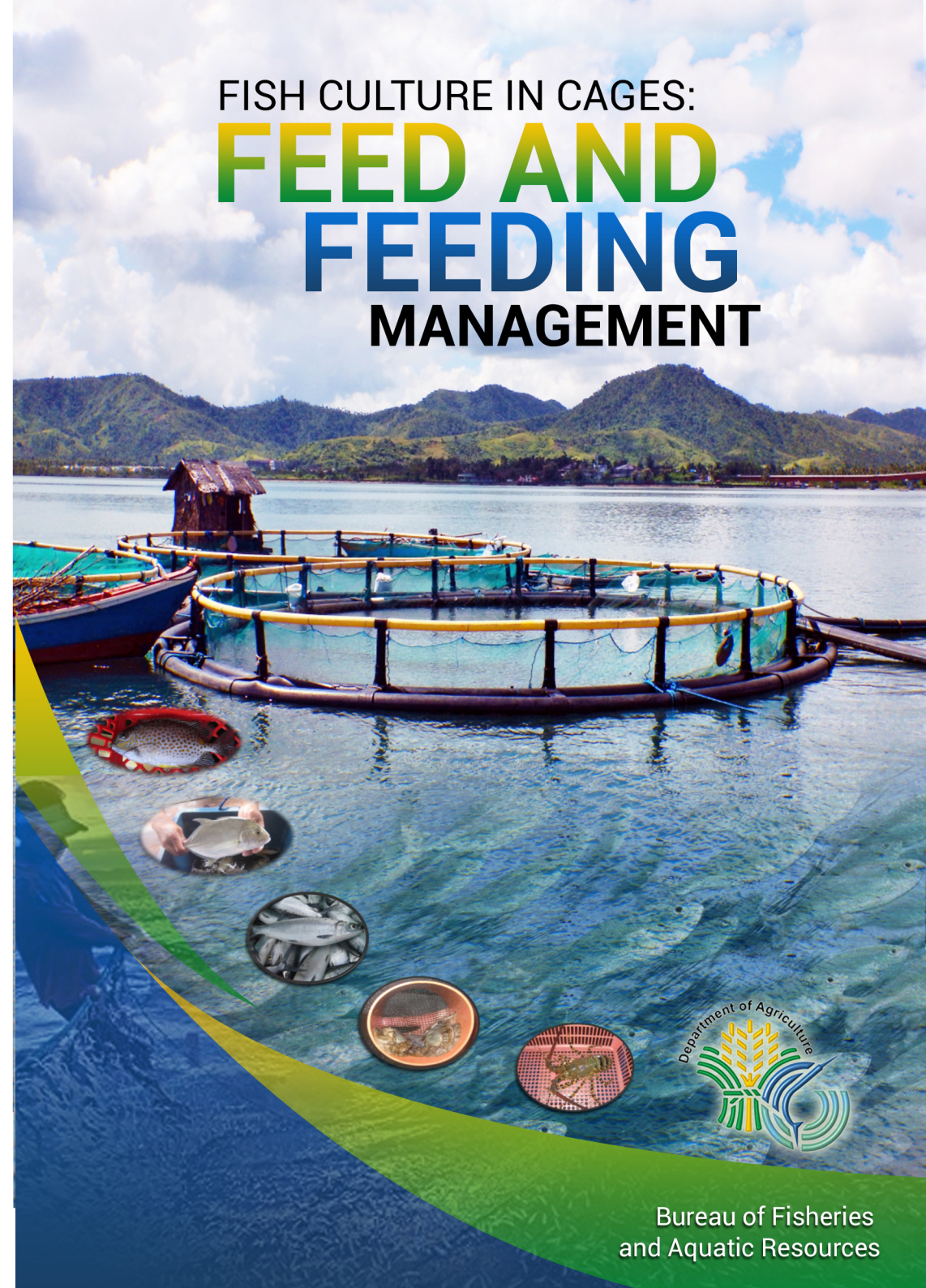


# FISH CULTURE IN CAGES: **FEED AND** **FEEDING** MANAGEMENT



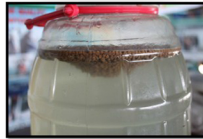
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Bureau of Fisheries  
and Aquatic Resources

## Good Qualities of Feeds for Fish

- ◆ Must be palatable.
- ◆ Must be stable in water. Pellets that break down quickly in water will lose nutrients.
- ◆ Must have high protein content (CP 25%-40%).
- ◆ Must not be expensive.
- ◆ Must be accessible or available in the local market or area.



## Feed Type and its Advantages

- ◆ **Sinker** - for bottom feeder fish (shrimp and crab).
- ◆ **Slow sinker** - water column feeder bangus from surface, middle & net bottom (taking the feed as it slowly sinks through the water (bangus in cage).
- ◆ **Floater** - for surface feeder fish (tilapia, catfish, bangus), in open sea cage, floater feed easily carried away by water current (need retainer net).

## Type of Sinker Feeds (based on ABW & Days of Culture)

- ◆ **Starter Crumble** – small size bangus fingerling upon stocking (15 days).
- ◆ **Starter Pellets** – 1 month
- ◆ **Grower Pellets** – 2 to 3 months
- ◆ **Finisher Pellets** – 4<sup>th</sup> month until harvest



## Materials Used in Sampling

Weighing Scale (digital)



Calculator



Record book & pen  
(Fish Sampling Report)



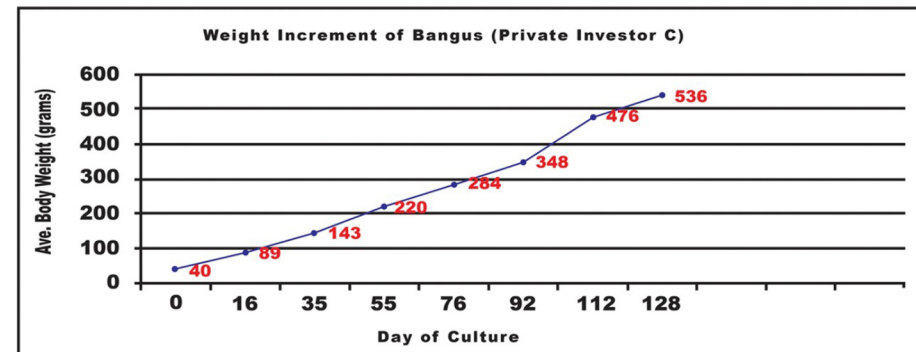
Sampling Net (Pamo)



Scoop net

## GROWTH PERFORMANCE OF BANGUS IN MARINE FISH CAGE AT PANABO CITY MARICULTURE PARK

**NORMAL GROWTH** - moderate increase in the growth rate of bangus showing normal growth over a given period of time



**Stocking Density** : 15,000 pieces  
**Target Production** : 6,500 kilos  
**Ave. Weight Gain** : 3.9 grams/day (Ideal weight gain - 50 grams every 15 days; weight increment 3.0 grams/day)  
**Ave. FCR** : 2.0 (2.0 kilos feeds : 1 kilo bangus) proper feeding management system was implemented (Ideal FCR level - not more than 2.0);  
**Date of Harvest** : After 128 days/4 months  
**DOC** : 136 days



## How to Maintain Low FCR level (2.0 – 2.0) ?

### Efficient Feeding Practices:

- ◆ Follow Proper Feeding Guide
- ◆ Feeding Frequency (6-7 times a day)
- ◆ Quality Feeds
- ◆ Avoid Overfeeding or ad-libitum
- ◆ Positive Attitude of Caretakers
- ◆ Follow Good Aquaculture Practice

### Fish Sampling

- ◆ Sampling is done early in the morning or before the first feeding schedule.
- ◆ Sample stocks every 15 days or twice a month to determine Average Body Weight (ABW).
- ◆ Collect at least 30 samples of milkfish/Bangus (use random sampling method).
- ◆ Monitoring of the growth performance of the stocks or Average Body Weight – ABW), target daily weight gain: 2-3 g per day.
- ◆ Compute the weight increment per day, feed requirements and feed conversion ratio (ideal FCR level – not more than 2.0).
- ◆ Prepare daily ration based on the average body weight of the stocks.



## Cost and Benefit (per kilo)

Feeds: 28 per kilo  
Fingerlings : 6.50 per pc.  
Farm Gate Price : 90 Php. per kilo  
Average Body weight : 500 grams or 2 pcs. per kilo  
FCR: 2.0

$2 \times 28 = 56$  Php.  
 $6.5 \times 2 = 13$  Php.  
Miscellaneous expenses. 20 Php.  
Total expenses = 89 php

Farm gate Price per kilo – Total Expenses  
 $90 \text{ Php.} - 89 \text{ Php.} = 1 \text{ Php.}$  Net Income

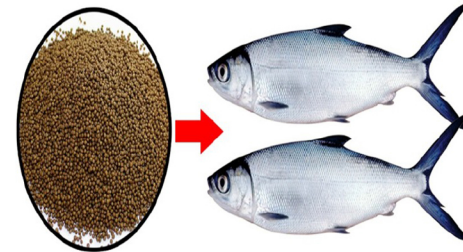


## Feed Brand

- ◆ TATEH
- ◆ VITARICH
- ◆ BMEG
- ◆ FEEDMIX
- ◆ PURINA
- ◆ JULU
- ◆ Others



# FCR: 2.5



2.5 kilos of feeds = 1 kilo of fish (bangus)  
 2.5 x 28/kg = 70.00    6.5/pc x 2 = 13.00

## Production cost/kg fish

Amount of Feeds = 70.00  
 Amount of fish (2 pcs.) = 13.00  
 Labor/Miscellaneous expenses = 15.00  
**Total Cost/kg = 98.00**  
 Feed Cost (more than 77% of production cost)

**Profit/kg**  
 Farm Gate Price = 92.00/kg - 98.00/kg  
 Net Income = (P 6.00/kg)

## How to Maintain a Good Quality of Feeds



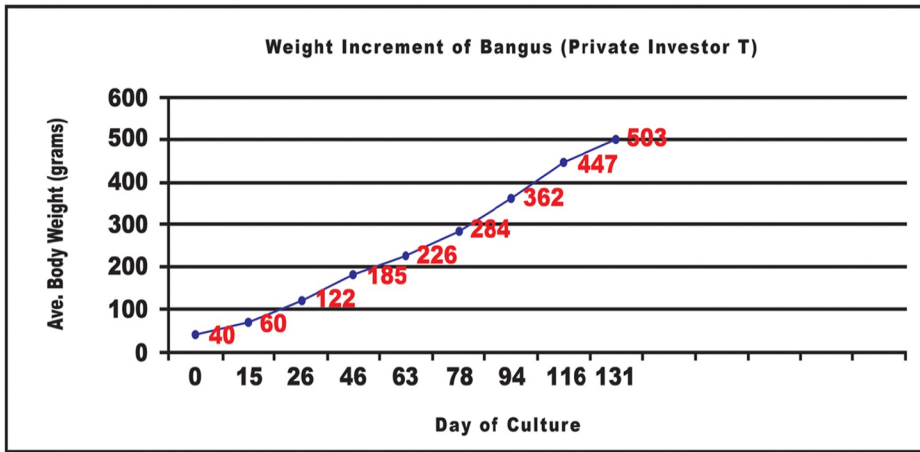
- ◆ Store feeds properly (must have good ventilation to prevent growth of molds).
- ◆ Do not expose feeds to sunlight



## Important Factors Affecting Feeding and Growth of Bangus

Water Quality Parameters	Growth of Bangus	Recommended Management Measures
Low Dissolved Oxygen (DO) below 3 ppm	Low Feed Consumption Slow Growth	Change net – improve DO ((ideal level is 3-5 ppm) Reduce feeding (avoid wastage)
Low-cold Temperature (below 25 degrees Celsius)	Low Feed Consumption Slow Growth	Reduce feeding (number of bags daily) avoid wastage
Bad Weather condition (typhoons, LPA, strong water current)	Low Feed Consumption Slow Growth	Reduce feeding (number of bags daily) avoid wastage
Others: stress condition of bangus	Slow growth, mortality	Reduce feeding
Limited supply of feeds	Slow growth of bangus	Adjust feeding

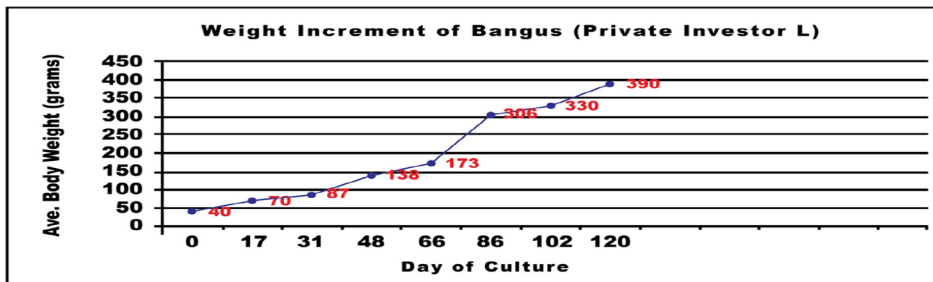




**Stocking Density** : 15,000 pieces  
**Target Production** : 6,500 kilos  
**Ave. Weight Gain** : 3.5 grams/day (Ideal weight gain - 50 grams every 15 days; weight increment 3.0 grams/day)  
**Ave. FCR** : 2.1 (2.1 kilos feeds : 1 kilo bangus) feeding management system has to improve by the caretaker (Ideal FCR level - not more than 2.0);  
**Date of Harvest** : After 131 days/4 months  
**DOC** : 135 days

**GROWTH PERFORMANCE OF BANGUS IN MARINE FISH CAGE AT PANABO CITY MARICULTURE PARK**

**SLOW GROWTH**



**Stocking Density** : 15,000 pieces  
**Target Production** : 6,500 kilos  
**Ave. Weight Gain** : 2.9 grams/day (Ideal weight gain - 50 grams every 15 days; weight increment 3.0 grams/day)  
**Ave. FCR** : 2.2 (2.1 kilos feeds : 1 kilo bangus) feeding management system has to improve by the caretaker (Ideal FCR level - not more than 2.0)  
**Date of Harvest** : After 120 days/4 months  
**DOC** : 123 days

**Formula (Guide)**

$$\text{Biomass} = \frac{\text{ABW} \times \text{Stocking Density}}{1000}$$

$$\frac{90 \text{ grams} \times 15,000 \text{ pcs.}}{1000 \text{ grams}}$$

Biomass = 1,350 Kilograms

**Formula (Guide)**

DAILY FEED RATION (DFR)

$$\text{DFR} = \text{Biomass} \times \text{Feeding Rate}$$

$$= 1350 \times 6\%$$

$$\text{DFR} = 81 \text{ kilos}$$

$$\text{FEED CONSUMED} = \text{Previous DFR} \times \text{DOC}$$

$$= 81 \times 15$$

$$\text{FEED CONSUMED} = 1215 \text{ kilos}$$

*Feeding Guide (Based on stocking density  
(SD) = 5,000 pcs Bangus Fingerling*

Days of Culture (DOC)	Feeding Rate (FR)	Feed Type (# of bags)			
		Starter Pellets	Grower Pellets	Finisher Pellets	Total
1 - 30 (1 <sup>st</sup> month)	6%	30			30
31-60 (2 <sup>nd</sup> month)	5%		45		45
61-90 (3 <sup>rd</sup> month)	4%		59		59
91-120 (4 <sup>th</sup> month)	3%			66	66
<b>Total</b>		<b>30</b>	<b>104</b>	<b>66</b>	<b>200</b>

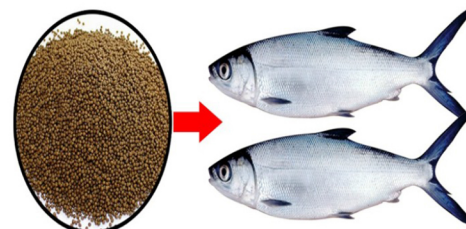
*Frequency & Daily Feeding Schedule (6-7*

Morning		Afternoon	
7:00 - 8:00	feeding	1:00 - 2:00	feeding
8:00 - 8:30	rest	2:00 - 2:30	rest
8:30 - 9:30	feeding	2:30 - 3:30	feeding
9:30 - 10:00	rest	3:30 - 4:00	rest
10:00 - 10:30	feeding	4:00 - 5:00	feeding
10:30 - 11:00	rest		
11:00 - 12:00	feeding		

## FEED CONVERSION RATIO ANALYSIS (FCR)

(Quantity of Feeds to produce 1 kilo of Bangus; Ideal FCR Level 2.0 to 2.2)

### FCR: 2.0



2 kilos of feeds = 1 kilo of fish (bangus)  
2 x 28/kg = 56.00    6.5/pc x 2 = 13.00

### Production cost/kg fish

Amount of Feeds = 56.00  
Amount of fish (2 pcs.) = 13.00  
Labor/Miscellaneous expenses = 15.00

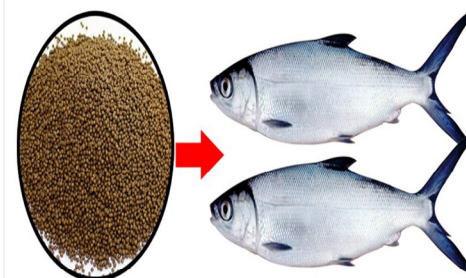
**Total Cost/kg = 84.00**

Feed Cost (more than 70% of production cost)

### Profit/kg

Farm Gate Price = 92.00/kg - 84.00/kg  
**Net Income = 8.00/kilo**

### FCR: 2.2



2.2 kilos of feeds = 1 kilo of fish (bangus)  
2.2 x 28/kg = 61.60    6.5/pc x 2 = 13.00

### Production cost/kg fish

Amount of Feeds = 61.60  
Amount of fish (2 pcs.) = 13.00  
Labor/Miscellaneous expenses = 15.00

**Total Cost/kg = 89.60**

Feed Cost (more than 75% of production cost)

### Profit/kg

Farm Gate Price = 92.00/kg - 89.60/kg  
**Net Income = 2.40/kilo**



## How to feed the Stocks?



- ◆ Daily feeding frequency (6-7 times a day)
- ◆ Broadcasting-Hand Feeding method with small quantity of feeds being spread out to feed all stocks (avoid wastage, over feeding, high FCR).
- ◆ Consider the water flow or current during feeding as well as the wind direction.
- ◆ Using of big containers is not advisable resulting to over-feeding and high FCR.

## Practice Cost-Efficient and Improved Feeding Management System ideal FCR level: 2.0 -2.2

2.0 kg of feed =1 kg Bangus (450g-500g)



Feed Cost represents more than **70% - 80%** of the total production cost of Bangus production in marine fish cage.

## Feeding Guide. Feed Allocation (15,000 pcs SD)

Weekly and Monthly Feed Allocation

		Feed Type (# of bags)			Total	Amount
		Starter Pellets	Grower Pellets	Finisher Pellets		
1st Month	1st week	18			18	10,791.00
	2nd week	18			18	10,791.00
	3rd week	26			26	15,587.00
	4th week	28			28	16,786.00
<b>Sub-total</b>		<b>90</b>	<b>0</b>	<b>0</b>	<b>90</b>	<b>53,955.00</b>
2nd month	1st week		32		32	22,816.00
	2nd week		32		32	22,816.00
	3rd week		34		34	24,242.00
	4th week		34		34	24,242.00
<b>Sub-total</b>		<b>0</b>	<b>132</b>	<b>0</b>	<b>132</b>	<b>94,116.00</b>
3rd month	1st week		40		40	28,520.00
	2nd week		40		40	28,520.00
	3rd week		44		44	31,372.00
	4th week		44		44	31,372.00
<b>Sub-total</b>		<b>0</b>	<b>168</b>	<b>0</b>	<b>168</b>	<b>119,784.00</b>
4th month	1st week			49	49	33,834.50
	2nd week			49	49	33,834.50
	3rd week			56	56	38,668.00
	4th week			56	56	38,668.00
<b>Sub-total</b>		<b>0</b>	<b>0</b>	<b>210</b>	<b>210</b>	<b>145,005.00</b>
<b>TOTAL</b>		<b>90</b>	<b>300</b>	<b>210</b>	<b>600</b>	<b>412,860.00</b>

## Feeding Guide. Feed Allocation (10,000 pcs SD)

Weekly and Monthly Feed Allocation

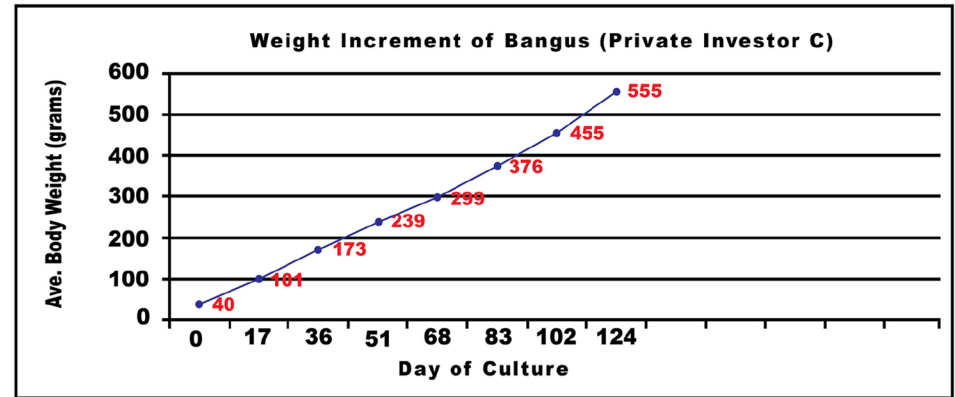
		Feed Type (# of bags)			Total	
		Starter Pellets	Grower Pellets	Finisher Pellets		
1st Month	1st week	11			11	6,550.50
	2nd week	11			11	6,550.50
	3rd week	14			14	8,337.00
	4th week	14			14	8,337.00
<b>Sub-total</b>		<b>50</b>	<b>0</b>	<b>0</b>	<b>50</b>	<b>29,775.00</b>
2nd month	1st week		18		18	12,834.00
	2nd week		21		21	14,973.00
	3rd week		21		21	14,973.00
	4th week		25		25	17,825.00
<b>Sub-total</b>		<b>0</b>	<b>85</b>	<b>0</b>	<b>85</b>	<b>60,605.00</b>
3rd month	1st week		25		25	17,825.00
	2nd week		28		28	19,964.00
	3rd week		28		28	19,964.00
	4th week		35		35	24,955.00
<b>Sub-total</b>		<b>0</b>	<b>116</b>	<b>0</b>	<b>116</b>	<b>82,708.00</b>
4th month	1st week			34	34	23,477.00
	2nd week			37	37	25,548.50
	3rd week			39	39	26,929.50
	4th week			39	39	26,929.50
<b>Sub-total</b>		<b>0</b>	<b>0</b>	<b>149</b>	<b>149</b>	<b>102,884.50</b>
<b>TOTAL</b>		<b>50</b>	<b>201</b>	<b>149</b>	<b>400</b>	<b>275,972.50</b>

Total wt. of samples	=	2700.0 grams
Total # of samples	=	30 pcs.
Ave. Body Weight	=	90 grams
Total Stocks	=	15000 pcs.
Mortality to date	=	pcs.
Present Stocks	=	15000 pcs.
Biomass	=	1350 kgs.
Feeding Rate	=	6%
Daily Feed Ration	=	81 kgs.
Feed Consumption	=	540 kgs.
Previous biomass	=	600 kgs.
Total Wt. gained	=	750 kgs
Feed Conversion Ratio	=	0.7

### Formula (Guide)

$$\text{Average Body weight (ABW)} = \frac{\text{Total Weight of samples}}{\text{Number of samples}}$$

$$\text{ABW} = \frac{2700}{30} \quad \text{ABW} = 90 \text{ grams}$$



**Stocking Density** : 15,000 pieces  
**Target Production** : 6,500 kilos  
**Ave. Weight Gain** : 4.2 grams/day (Ideal weight gain - 50 grams every 15 days; weight increment 3.0 grams/day)  
**Ave. FCR** : 2.0 (2.0 kilos feeds : 1 kilo bangus) proper feeding management system was implemented (Ideal FCR level - not more than 2.0);  
**Date of Harvest** : After 120 days/4 months  
**DOC** : 126 days

### Sampling Results and Computations

#### Sampling Report

Date: 7-Apr-09  
 Cage:  
 DOC: 16  
 Cropping Period: 1st

Initial ABW = 40 grams  
 Initial DFR = 36 Kgs.

No.	Weight (grams)	No.	Weight (grams)	No.	Weight (grams)
1	100.0	11	70.0	21	60.0
2	80.0	12	60.0	22	80.0
3	75.0	13	80.0	23	70.0
4	75.0	14	50.0	24	70.0
5	110.0	15	60.0	25	60.0
6	75.0	16	70.0	26	70.0
7	90.0	17	70.0	27	70.0
8	100.0	18	80.0	28	60.0
9	80.0	19	90.0	29	60.0
10	100.0	20	60.0	30	70.0
	885.0		690.0		1125.0