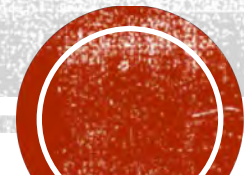




# FEED MANAGEMENT FOR PRODUCTION AND COST EFFICIENCY IN INDIAN SHRIMP FARMING



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**United Research | Growel Feeds**





# FEED

Accounts for about 50% of production cost



Every 0.1 reduction in FCR can increase profitability by INR 7500/ton of shrimp production



Every 0.1 increase in FCR will produce 90 kg more organic waste/ton of shrimp production

**HARVEST**

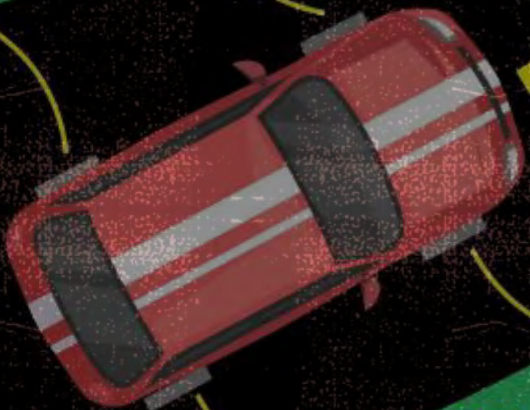
**SEED**

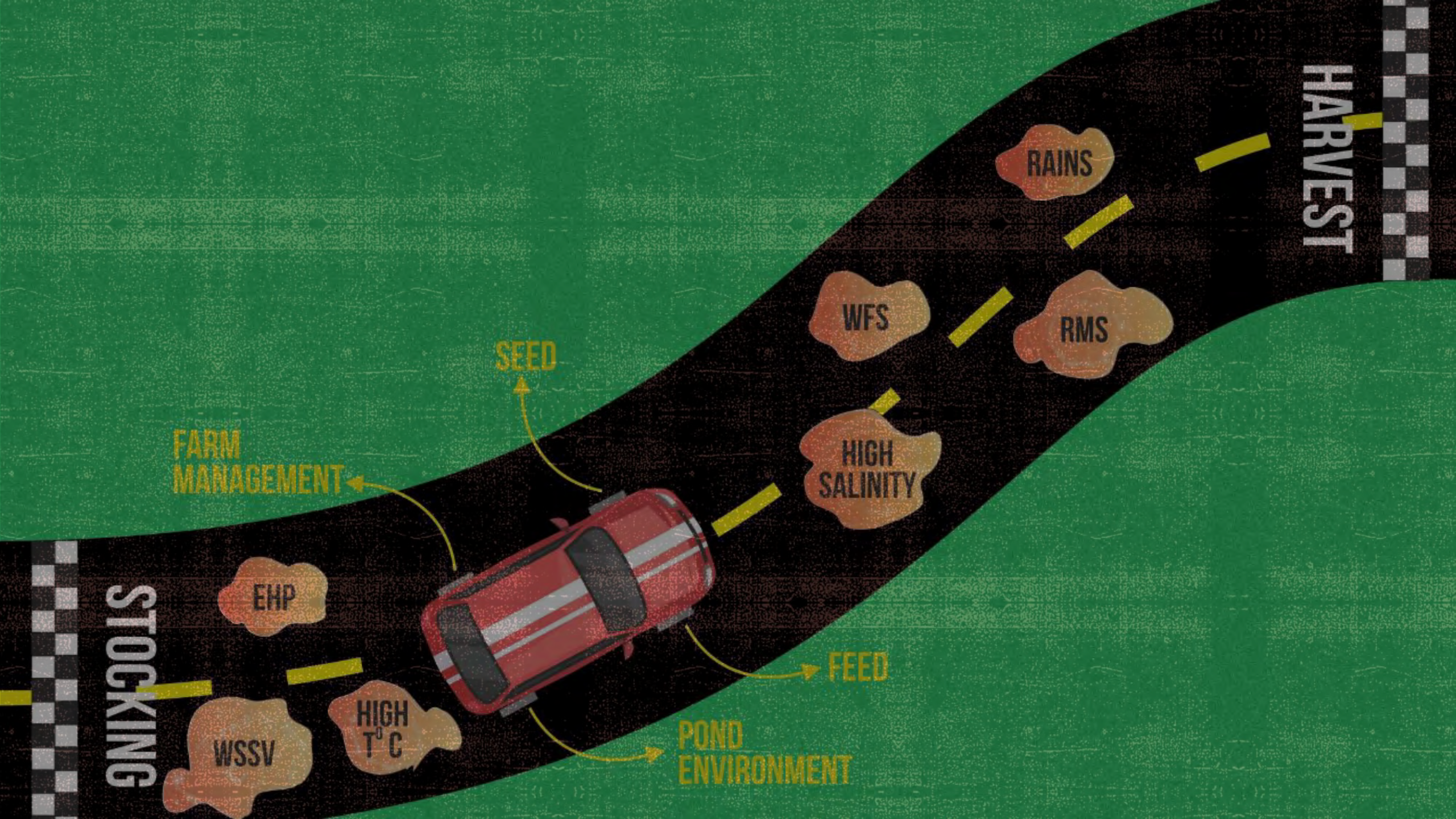
**FARM  
MANAGEMENT**

**FEED**

**POND  
ENVIRONMENT**

**STOCKING**





HARVEST

RAINS

RMS

WFS

HIGH SALINITY

SEED

FARM MANAGEMENT

FEED

POND ENVIRONMENT

EHP

WSSV

HIGH T°C

STOCKING



# PRIME FACTORS DRIVING FEED EFFICIENCY

- Feed quality
- Animal genetics & PL quality
- Pond environment: Soil & Water Quality, Climatic Factors, Algae, Bacteria
- Farm Management:
  - Survival rate & ability to estimate surviving biomass
  - Feeding rate

# BEST PRACTICES FOR FEED EFFICIENCY START AT STOCKING

## Know

As accurately as possible how many PL are being packed

## Minimize

Transport stress and acclimatize properly during stocking

## Estimate

Post-stocking survival by stocking a small sample of PL in a hapa in the pond and measure survival after 24 and 48 h and adjust feed quantity

## Estimate

Survival rate at the first sampling (typically 30 DOC)

## Undertake

On-farm nursery rearing before grow-out

A good start increases the chances of a successful culture. Especially when risks due to pathogens like EHP are high. Provide high quality balanced feed from DOC 1.



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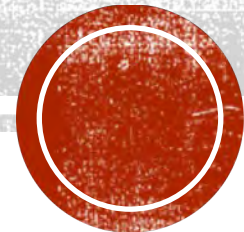
Blind Feeding for 100,000 PL

| DOC     | Feed Code | Feed increment (g) |
|---------|-----------|--------------------|
| 1       | 1         | Start with 1.5 kg* |
| 2 - 7   | 1         | 300                |
| 8 - 13  | 2         | 400                |
| 14 - 21 | 2         | 500                |
| 22 - 28 | 3C/3SP    | 500                |

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\* In many SE Asian Countries, DOC 1 feeding is 2-3 kg per 100,000 PL. Some farmers use up to 4 kg to drive early growth and minimize EHP infection risk.

**EARLY  
FEEDING  
RATE**





# ESTIMATING SURVIVAL AT FIRST SAMPLING

- DOC 1-30 Blind Feeding: Start with 1.5-3 kg per 100,000 PL on DOC 1; add 0.3 - 0.5 kg per day
- At the first sampling (DOC 30), Assume survival at 90% (or lower depending on previous experience at the farm)
- $\text{Feed/Day} = (\text{Feeding Rate at MBW}) \times (\text{Stocked Population}) \times (\text{Survival Assumption})$
- 1-1.5% of feed in 3-4 feed trays. Check at 1-1.5 hour.
  - Feed runs out quickly = Increased Survival
  - Feed does not run out = Decreased Survival
- Calculate Feed/Day for subsequent days by adding 0.4-0.8 kg per 100,000 PL depending on MBW target, feed tray observations & shrimp condition.





# USING CHECK TRAYS

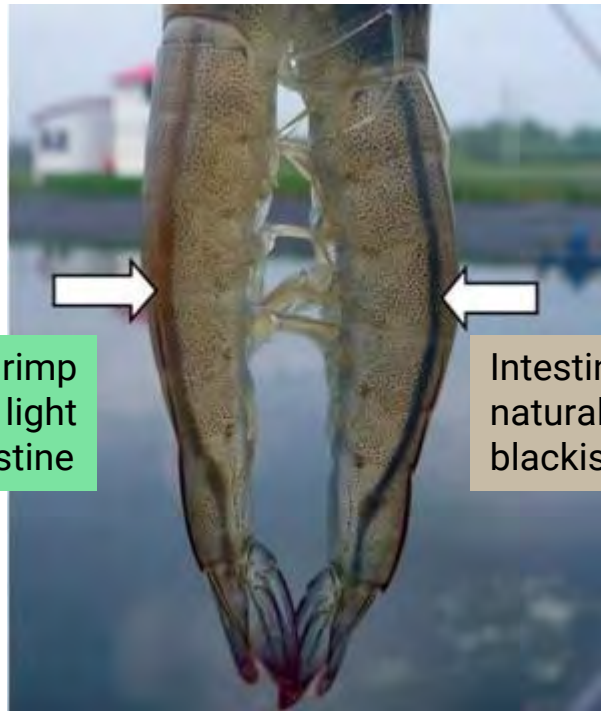
- Use for observation
  - Feed consumption
  - Animal health
- Do not use as the only tool to adjust feeding rate
  - High variability based on size, shape, number and location of trays used

# Feeding Rate Adjustment based on Feeding Tray Observation



| Check Tray Observation                    |                  |                           |
|---|------------------|---------------------------|
| No feed remaining                         | No shrimp        | Increase feed by 10-20%   |
| Small amount of feed remaining            | Many shrimp      | Increase feed by 5%       |
| Moderate amount of feed remaining         | Many shrimp      | Maintain the feeding rate |
| Lot of feed remaining                     | Few or no shrimp | Reduce the feed           |
| Plenty of long fecal strands              |                  | Maintain the feeding rate |
| Reduced amount of and short fecal strands |                  | Increase the feeding rate |

# OBSERVING THE GUT



Feed consumed by shrimp is evident by the light brown color in the intestine

Intestine filled with natural food appears blackish

Source: Ching, 2011

| Suspected Problem | Sample                       | Confirmation                                   | Action           |
|-------------------|------------------------------|--|------------------|
| Overfeeding       | 1 hour <u>before</u> feeding | > 10% of shrimp having feed in the gut         | Reduce feeding   |
| Underfeeding      | 1 hour <u>after</u> feeding  | > 40% of shrimp having natural food in the gut | Increase feeding |

# ADJUSTING FEEDING RATES BASED ON ENVIRONMENTAL CONDITIONS



| Temperature | Feed                      |
|-------------|---------------------------|
| < 26°C      | Reduce 25% of Normal Feed |
| 28°C - 32°C | Normal Feed               |
| > 34°C      | Reduce 20% of Normal Feed |

- Do not feed when DO levels drop below 4 ppm



# FEEDING RATE REQUIRES ADJUSTMENT BASED ON NUTRIENT DENSITY TOO

- Shrimp need less of feeds that are more nutrient dense (higher in protein and energy) when compared to feeds of lower protein and energy
- Reduce feeding rate when feeds with higher nutrient density are used
- Dietary protein from 1 kg of a 33% protein feed can be provided by 0.87 kg of a 38% protein feed

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# FEEDING TABLE



| Shrimp ABW(g) | Feed Code | Standard  | New       |
|---------------|-----------|-----------|-----------|
|               |           | % bw/d    | % bw/d    |
| 3.0 - 5.0     | 3C/3SP    | 5.5 - 5.0 | 5.5 - 5.0 |
| 5.0 - 7.5     | 3SP       | 5.0 - 4.0 | 5.0 - 4.0 |
| 7.5 - 10.0    | 3SP/3P    | 4.0 - 3.5 | 4.0 - 3.5 |
| 10.0 - 12.5   |           | 3.5 - 3.1 | 3.5 - 3.1 |
| 12.5 - 15.0   | 3P        | 3.1 - 2.9 | 3.1 - 2.9 |
| 15.0 - 17.5   |           | 2.9 - 2.6 | 2.9 - 2.4 |
| 17.5 - 20.0   |           | 2.6 - 2.4 | 2.4 - 2.2 |
| 20.0 - 22.5   |           | 2.4 - 2.3 | 2.2 - 2.0 |
| 22.5 - 25.0   | 3P/4S     | 2.3 - 2.2 | 2.0 - 1.9 |
| 25.0 - 27.5   |           | 2.2 - 2.1 | 1.8       |
| 27.5 - 30.0   |           | 2.1 - 2.0 | 1.75      |
| > 30.0        |           | 2         | 1.6       |

\* Some progressive farmers advocate limiting feed to 1.8-2.4% bw/d once animals reach 10 g and to never exceed 2% bw/d during periods of very high water temperature

# ARRIVING AT DAILY RATIONS

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Farm-specific



Based on observations and data



Use check tray AND feeding table



Be willing to adjust daily



Stay within lower and upper limits based on pond biomass and carrying capacity

# DAILY RATION CALCULATION

## Method 1: FCR & Weight Gain Driven

- Average Weekly Feed = Estimated Population x Expected FCR x Expected Weekly Growth

Example:

- Estimated Population = 100000
- Expected FCR = 0.8
- Expected Weekly Growth = 2.00g
- AWF =  $100000 \times 0.8 \times 2 = 160 \text{ kg}$
- ADF =  $160/7 = 22.85 \text{ kg}$

## Method 2: Size & Feeding Rate Driven

- Average Weekly Feed = Estimated Population x Expected ABW x Suggested Feeding Rate/Day for the Expected ABW x 7

Example:

- Estimated Population = 100000
- Expected ABW = 14.28 g
- Suggested Feeding Rate = 2.95%
- AWF =  $100000 \times 14.28 \times (2.95/100) \times 7 = 294.88 \text{ kg}$
- ADF =  $294.88/7 = 42.12 \text{ kg}$

\* Some progressive farmers advocate limiting feed to 1.8-2.4% bw/d once animals reach 10 g and to never exceed 2% bw/d during periods of very high water temperature



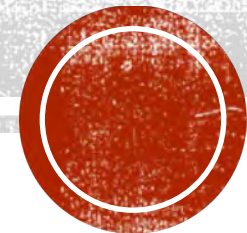
# MANUAL FEEDING VS AUTOMATIC FEEDING

- Increasing feeding frequency improves feed efficiency
- Manual feeding by labor requires close supervision
- Automatic feeding is preferred over manual feeding by large and more organized farms
- Two main types of automatic feeders:
  - Ration is set by the farmer and delivered using a timer
  - Acoustic Feeder: Ration is driven by the shrimp's feeding activity which is transmitted to the feeder as signals of sound
- Studies demonstrate vast improvements in feed efficiency when acoustic feeders are used



| S.No. | Pond No. | Density/M <sup>2</sup> | Nursery Feed | Nursery Grow out Nursery |     |      |        | Biomass Survival |     |      |
|-------|----------|------------------------|--------------|--------------------------|-----|------|--------|------------------|-----|------|
|       |          |                        |              | DOC                      | DOC | ABW  | ABW(g) | (Kgs)            | (%) | FCR  |
| 1     | G1       | 19                     | F15          | 27                       | 37  | 1.33 | 12.82  | 1130             | 66  | 0.96 |
| 2     | G2       | 19                     | F15          | 27                       | 43  | 1.33 | 11.90  | 1437             | 78  | 1.00 |
| 3     | G3       | 25                     | F15          | 47                       | 59  | 3.00 | 18.86  | 3028             | 90  | 0.95 |
| 4     | G4       | 19                     | F15          | 40                       | 36  | 2.00 | 17.54  | 1710             | 65  | 0.90 |
| 5     | G7       | 17                     | F15          | 24                       | 82  | 0.77 | 24.40  | 3606             | 87  | 1.00 |
| 6     | F2       | 23                     | F15          | 40                       | 34  | 2.00 | 14.29  | 1526             | 59  | 1.09 |
| 7     | F3       | 21                     | F15          | 24                       | 67  | 0.95 | 20.83  | 4861             | 80  | 0.92 |
| 8     | F4       | 25                     | F15          | 24                       | 70  | 0.83 | 21.73  | 4437             | 81  | 0.87 |

**RESULTS FROM  
GROWEL DEMO  
FARM IN  
NANDAMURU USING  
NURSERY REARING,  
FUNCTIONAL FEEDS,  
AUTOFEEDER &  
SYNBIOTICS**





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