Recent Developments in
PRAWN POND CULTURE

F.D. APUD

AQUACULTURE DEPARTMENT
SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER
Tigbauan, Iloilo, Philippines
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RECENT DEVELOPMENTS IN
PRAWN POND CULTURE*

METHODOLOGY AND ECONOMIC ASPECTS OF
DIFFERENT CULTURE SYSTEMS

This document presents the recommended methodology, nominal projections and partial costs and returns, for extensive prawn culture at two production objectives, and semi-intensive culture with costs and returns breakdown for three production targets. Intensive prawn culture procedures are not discussed.

Extensive Prawn Culture System I projects a production yield of about 110 to 160 kg/ha/crop or more in four months and survival rate of from 65 to 70%. The extensive Prawn Culture System II aims for a production rate of about 230 kg/ha/crop in four months at about 70% survival with expected average body weight of about 25 grams. The procedures indicated have been verified and are now widely practised.

Production targets under the Semi-intensive Prawn Culture System I range from 350 to 500 kg/ha in four months at survival rate of about 70 to 75% and expected average size at harvest of about 28 to 30 pcs/kg. This method has been confirmed at different collaborative sites using the modified SEAFDEC diet developed by the Feed Development staff of the SEAFDEC Aquaculture Department.

A. Extensive Prawn Culture System I.

1. Site Specification

   Water Source
   a. Brackishwater: Must be available in sufficient quantity the whole year round.
   b. Freshwater: A fresh water source is essential.

*To be included in the revised edition of EM No. 5: Farming of Prawns and Shrimps.
Environmental Conditions

b. Temperature : Best temperature range is between 25° and 30°C.
c. Dissolved Oxygen : The lowest level should ordinarily be 4 mg/l.

Others

Site must be free from any source of pollution (industrial, agricultural, and domestic) and protected from environmental hazards such as typhoons, flood, erosion, etc. It must be accessible and preferably secured from poachers.

2. Pond Specification

Pond size : Preferably 0.5-1.0 ha water area.
Water depth : 0.8-1.0 m
Water gate : Preferably separate supply and drainage gate; may be single.
Dikes : Must be structurally strong and free from leaks.
Canal/Trench : Single (diagonal or peripheral); 5-10 m wide and 0.50-0.75 m deep.
Bottom : Must be levelled.
Others : Install proper gate screens.

3. Life Support System

Pump : May not be necessary; (10-18 cm centrifugal pump is preferrable).
Manpower : Personnel must have sufficient training or experience in pond culture techniques, preferably prawn culture.

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4. Pond Preparation

Draining : Drain pond water completely and remove miscellaneous fish, other animals and weeds.

Soil Sampling : Collect soil samples for analyses of pH and organic matter.

Pest & Predator Control : Treat undrainable areas of pond with either (a) ammonium Sulfate (21-0-0) and quick lime (CaO) at 1:5 ratio at 0.1-0.5 kg/sq m; or (b) derris root containing 5% rotenone at 0.5-2.0 g/ton pond water (more effective at higher temperature during daytime and at lower pH); or (c) tea-seed cake at 12 g/ton for salinity lower than 15 ppt and 20-30 g/ton for salinity higher than 15 ppt.

Conditioning of Pond Bottom : Dry pond bottom until it cracks, then till the pond soil using a rotavator, plow blade or hoe. Control depth of till about 7.0 cm.

Liming : Apply lime at 1 ton/ha on the pond dikes and pond bottom. The quantity may vary from 200 kg/ha to 3 tons/ha depending on the soil pH.

Fertilization : a) Organic manure: about a week after liming, apply manure at 1 ton/ha.

b) Inorganic fertilizer: also apply synthetic fertilizers Ammonium Phosphate (16-20-0) and Urea (46-0-0) at 50 kg/ha each.

Installing Screens : Install fine mesh net (0.2 mm mesh size) at the gate(s) to prevent entrance of unwanted species and escape of fry stock.
Flooding

Introduce water up to 5-10 cm deep into the pond. After a week, gradually increase water to the desired level. Check double screens to prevent entry of unwanted species.

Installing Substrates/Shelters

Spread coconut fronds throughout the pond bottom except in the trench. About 250-500 pcs/ha is required (1/20 m²).

Planting some Vegetation

You may plant aquatic plants *digman* and *kusay-kusay* in various part of the pond.

5. Acclimation and Stocking

Assessing Plankton

Make preliminary assessment of plankton before stocking prawn fry, that is, about two weeks after fertilization of pond.

Acclimating

Acclimating of fry before stocking is essential. Adjust the salinity and temperature of transport water to pond water before stocking.

Size and Age of Fry and Stocking

(a) PL20 Size Fry: Stock the fry overnight inside hapa nets fixed in grow-out ponds before releasing them into the pond.
(b) PL50 Size Fry: Stock the fry directly into the grow-out pond. Stock fry at least 2 weeks after fertilization and flooding.

Stocking Rate

Try either of the two rates of stocking depending on the availability of fry: (a) 5,000 fry/ha, or (b) 7,500 fry/ha.

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Time of Stocking: Early morning or late afternoon. Do not stock when water temperature is high or beyond 30°C.

Distribution of Fry: Release fry evenly around pond perimeter.

6. Water Management

Tidal: Change 10-30% of the pond water every day for 2 to 4 days during highest tide. Maintain 0.80-1.0 m water level.

Use of Pump: Use a pump to bring in new water when dissolved oxygen level is below 3.7 ppt or when you see the prawns surface and jumpy, or when salinity is higher (over 40 ppt); also, when water temperature is very high and there is abrupt reduction of water level due to leakage. In an emergency situation at spring tides, pump pond water out of the pond.

Post-stocking Fertilization: Apply chicken manure at 100 kg/ha every two weeks after 1 month (total of 5 applications). This may be done after spring tide or water change (use T-bags). Suspend manure in sacks (20 kg/sack) at different sites in the pond.

Others: Routinely check inlet-outlet screen installation; dikes for possible leakage and damage caused by burrowing animals.

7. Stock Sampling

Frequency: Once a month.

Sampling Procedure: Use a cast net (10 throws at different pond locations)

8. Feeding

There is no need to feed.

Prawn Pond Culture
9. Monitoring Scheme

Physico-chemical Conditions: Monitor pH, dissolved oxygen, salinity and water temperature three times a week at 6:00-6:30 AM and 3:00-3:30 PM at two layers: 10 cm below surface and 10 cm from bottom at three pond locations. The best levels are (a) pH (7-8.5), (b) dissolved oxygen (4-8 ppm), (c) salinity (10-25 ppt), and (d) water temperature (25°C-30°C).

Biological Conditions: Assess plankton abundance every 2 weeks.

10. Harvesting

Partial Harvest: Start partial harvesting every spring tide when stock reaches average weight of 25 g and above.

Total Harvest: Total harvest is done after 4 months of culture.

11. Economics

PARTIAL DIRECT COST (PDC)* (per ha basis)

<table>
<thead>
<tr>
<th>Fertilizer</th>
<th>Quantity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liming</td>
<td>1 ton</td>
<td>₱500.00</td>
</tr>
<tr>
<td>Chicken manure</td>
<td>1.5 tons</td>
<td>₱750.00</td>
</tr>
<tr>
<td>Ammonium phosphate</td>
<td>50 kg</td>
<td>225.00</td>
</tr>
<tr>
<td>Urea (46-0-0)</td>
<td>50 kg</td>
<td>250.00</td>
</tr>
<tr>
<td>Ammonium sulfate (21-0-0)</td>
<td>25 kg</td>
<td>70.00</td>
</tr>
</tbody>
</table>

F. D. Apud
MISCELLANEOUS

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Cost (₱)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine mesh screen</td>
<td>(0.2 mm)</td>
<td>40 m</td>
<td>320.00</td>
</tr>
<tr>
<td>Coconut fronds</td>
<td>500 pcs</td>
<td>250.00</td>
<td></td>
</tr>
<tr>
<td>Ice</td>
<td>2 blocks</td>
<td>156.00</td>
<td>726.00</td>
</tr>
</tbody>
</table>

PARTIAL DIRECT COST  ₱2,521.00

*Cost estimates based on 1985 prices

NOMINAL PROJECTIONS AND PARTIAL COSTS AND RETURNS*

<table>
<thead>
<tr>
<th>PARTICULAR/SCHEME</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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</thead>
<tbody>
<tr>
<td>Stocking size</td>
<td>PL 20</td>
<td>PL 20</td>
<td>PL 50</td>
<td>PL 50</td>
</tr>
<tr>
<td>Price</td>
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<td>₱0.30/pc</td>
<td>₱0.70/pc</td>
<td>₱0.70/pc</td>
</tr>
<tr>
<td>Stocking rate/ha</td>
<td>5,000</td>
<td>7,500</td>
<td>5,000</td>
<td>7,500</td>
</tr>
<tr>
<td>Culture period</td>
<td>4 mos.</td>
<td>4 mos.</td>
<td>4 mos.</td>
<td>4 mos.</td>
</tr>
<tr>
<td>Survival rate</td>
<td>65%</td>
<td>65%</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>Harvest size</td>
<td>30 pcs/kg</td>
<td>40 pcs/kg</td>
<td>25 pcs/kg</td>
<td>33 pcs/kg</td>
</tr>
<tr>
<td>Total harvest</td>
<td>108 kg</td>
<td>122 kg</td>
<td>140 kg</td>
<td>159 kg</td>
</tr>
<tr>
<td>Market price</td>
<td>₱140/kg</td>
<td>₱120/kg</td>
<td>₱160/kg</td>
<td>₱140/kg</td>
</tr>
<tr>
<td>Return/ha</td>
<td>₱15,120</td>
<td>₱14,460</td>
<td>₱22,400</td>
<td>₱22,260</td>
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<tr>
<td>Cost/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seed</td>
<td>1,500</td>
<td>2,250</td>
<td>3,500</td>
<td>5,250</td>
</tr>
<tr>
<td>PDC (see detail)</td>
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<td>2,271</td>
<td>2,271</td>
<td>2,271</td>
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<tr>
<td>Profit</td>
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<td>₱10,104</td>
<td>₱16,629</td>
<td>₱14,739</td>
</tr>
</tbody>
</table>

*Cost estimates based on 1985 prices

Prawn Pond Culture
B. Extensive Prawn Culture System II

1. Site Specification

Water Source:

a. Brackishwater: Must be available in sufficient quantity the whole year round.

b. Freshwater: A freshwater source is essential.

Environmental Conditions:


b. Temperature: Best temperature range is between 25°C and 30°C.

c. Dissolved Oxygen: The minimum level should ordinarily be 4 mg/l.

Others:

The site must be free from any source of pollution (industrial, agricultural and domestic) and, as much as possible, protected from environmental hazards such as typhoons, floods, erosion, etc. It must be accessible and preferably secured from poachers.

2. Pond Specification

Pond Size: Preferably 0.5-1.0 ha water area.

Water Depth: 0.8-1.0 m

Water Gate: Separate supply and drainage gate; may be single.

Dikes: Must be structurally strong and free from leaks.

Canals/Trench: Single (diagonal or peripheral), 5-10 m wide and 0.50-0.75 m deep.

Bottom: Must be levelled.

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Others: Installation of proper gate screens is essential.

3. Life Support System

Pump: Necessary (10-18 cm centrifugal pump) for emergency.

Manpower: Personnel must have sufficient training or experience in pond culture, preferably prawn culture.

4. Pond Preparation

Draining: Drain pond water completely and remove miscellaneous fish, other animals, and weeds present.

Soil Sampling: Collect soil samples for analyses of pH and organic matter.

Pest & Predator Control: Treat undrainable areas of pond with either (a) Ammonium Sulfate (21-0-0) and quick lime (CaO) at 1:5 ratio at 0.1-0.5 kg/sq m; or (b) derris root containing 5% rotenone at 0.5-2.0 g/ton pond water – more effective at higher temperature during day time and at lower pH; or (c) teaseed cake at 12 g/ton for salinity lower than 15 ppt and 20-30 g/ton for salinity higher than 15 ppt.

Conditioning of Pond Bottom: Dry pond bottom until it cracks after which tilling is done using a rotavator, plow blade or hoe. Control depth of till to about 7.0 cm.

Liming: Apply lime at 1 ton/ha to the pond dikes and pond bottom. The quantity may vary from 200 kg/ha to 3 tons/ha depending on the soil pH.

Prawn Pond Culture
Fertilization

a) Organic manure: About a week after liming apply chicken manure at 1 ton/ha.

b) Inorganic fertilizer: Apply synthetic fertilizers, Ammonium Phosphate (16-20-0) and Urea (46-0-0) at 50 kg/ha each.

Installation of Screens

Install fine mesh net (0.2 mm mesh size) at the gate(s) to prevent entrance of unwanted species and escape of stocked fry.

Flooding

At first introduce 5-10 cm deep water into the pond and then gradually raise water level to the desired level after a week. Check double screens to prevent entry of unwanted species into the pond.

Installation of Substrates/Shelters

Distribute coconut fronds throughout the pond bottom except in the trench. About 250 to 500 pcs/ha is required (1/20 m^2). Twigs may also be used.

Planting some Vegetation

You may plant aquatic plants digman and kusay-kusay in certain areas of the pond.

5. Acclimation and Stocking

Assessment of Plankton

Make preliminary assessment of plankton before stocking prawn fry, that is, about two weeks after fertilization of pond.

Acclimation

Acclimation of fry prior to stocking is essential. Adjust the salinity and temperature of transport water and pond water before stocking.
Size/Age of Fry and Stocking:

(a) PL20 Size Fry: Stock these fry overnight inside hapa nets fixed in grow-out ponds before releasing into the pond.

(b) PL50 Size Fry: Stock these fry directly into the grow-out pond. Stock fry at least 2 weeks after fertilization and flooding.

Stocking Rate: 10,000/ha

Time of Stocking: Early morning or late afternoon. Avoid stocking when water temperature is high.

Distribution of Fry in the Pond: Release fry evenly around pond perimeter.

6. Water Management

Tidal: Change 10-30% of the pond water every day for 2 to 4 days during highest tide. Maintain 0.80-1.0 m water level.

Use of Pump: Use a pump to introduce new water when dissolved oxygen level is low below 3.7 ppt or when you see prawns surface and jumpy, or salinity is higher (over 40 ppt). Also, when water temperature is very high or there is abrupt reduction of water level due to leakage.

Post-stocking Fertilization: Apply chicken manure at 100 kg/ha every 2 weeks from 1 month (total 5 applications). Application may be made after spring tide or water change (use T-bags). Suspend manure in sacks 20 kg/sack at different sites in ponds.

Others: Routine check of inlet-outlet screen installation; routine check of dikes for possible leakages and damages which may be caused by burrowing animals.
7. Stock Sampling

Frequency : Once a month.

Sampling Procedure : Use cast net (10 throws at different pond locations).

8. Feeding

No feeding is done for the first two months. Feeding is carried out on the third month.

Type of Feed : Formulated pelletized feed with about 40% protein content or chopped trash fish.

Feeding Rate : A sliding scale may be used where an 8, 6, 4, 2% of total body weight feed is carried out every 2 weeks; a 6% total body weight feed computation may also be used (straight up to harvest time).

9. Monitoring Scheme

Physico-Chemical Parameters : Monitor pH, dissolved oxygen, salinity and water temperature three times a week at 6:00-6:30 A.M. and 3:00-3:30 P.M. at two layers, 10 cm below surface, and 10 cm from bottom at three pond locations. Optimum levels are:

a) pH (7-8.5)
b) dissolved oxygen (4-8 ppm)
c) salinity (10-25 ppt)
d) water temperature (25°-30°C)

Biological Parameters : Assess plankton abundance every 2 weeks.

10. Harvesting

Partial harvest : Start partial harvesting every spring tide when stock reaches 25 g and above.

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Total harvest is done after 4 months of culture.

11. Economics

PARTIAL DIRECT COST (PDC)*
(per ha basis)

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Cost per Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIMING</td>
<td>1 ton</td>
<td>P 500.00</td>
<td>P 500.00</td>
</tr>
<tr>
<td>FERTILIZER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicken manure</td>
<td>1 ton</td>
<td>P 750.00</td>
<td>P 750.00</td>
</tr>
<tr>
<td>Ammonium phosphate (16-20-0)</td>
<td>50 kg</td>
<td>225.00</td>
<td>225.00</td>
</tr>
<tr>
<td>Urea (46-0-0)</td>
<td>50 kg</td>
<td>250.00</td>
<td>250.00</td>
</tr>
<tr>
<td>Ammonium sulfate (21-0-0)</td>
<td>25 kg</td>
<td>70.00</td>
<td>70.00</td>
</tr>
<tr>
<td>MISCELLANEOUS</td>
<td></td>
<td></td>
<td>P1,295.00</td>
</tr>
<tr>
<td>Fine mesh screen (0.2 mm)</td>
<td>40 m</td>
<td>P 320.00</td>
<td>P 320.00</td>
</tr>
<tr>
<td>Coconut fronds</td>
<td>500 pcs</td>
<td>250.00</td>
<td>250.00</td>
</tr>
<tr>
<td>Ice</td>
<td>2 blocks</td>
<td>156.00</td>
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</tr>
<tr>
<td><strong>PARTIAL DIRECT COST</strong></td>
<td></td>
<td></td>
<td>P2,521.00</td>
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</table>

*Cost estimates based on 1985 prices.

NOMINAL PROJECTIONS AND PARTIAL COSTS AND RETURNS*

PARTICULARS/Scheme

<table>
<thead>
<tr>
<th>Stocking Size</th>
<th>PL 20</th>
<th>PL 50</th>
<th>PL 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price/piece</td>
<td>P0.30</td>
<td>P0.70</td>
<td>P0.30</td>
</tr>
<tr>
<td>Stocking rate/ha</td>
<td>10,000</td>
<td>10,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Culture Period</td>
<td>4 months</td>
<td>4 months</td>
<td>4 months</td>
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Prawn Pond Culture
<table>
<thead>
<tr>
<th></th>
<th>65%</th>
<th>70%</th>
<th>65%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Survival Rate</strong></td>
<td>65%</td>
<td>70%</td>
<td>65%</td>
</tr>
<tr>
<td><strong>Harvest Size</strong></td>
<td>30 pcs/kg</td>
<td>30 pcs/kg</td>
<td>30 pcs/kg</td>
</tr>
<tr>
<td><strong>Total Harvest</strong></td>
<td>217 kg</td>
<td>233 kg</td>
<td>273 kg</td>
</tr>
<tr>
<td><strong>Feed (FCR = 2)</strong>**</td>
<td>174 kg</td>
<td>116 kg</td>
<td>261 kg</td>
</tr>
<tr>
<td><strong>Market Price</strong></td>
<td>P120/kg</td>
<td>P140/kg</td>
<td>P120/kg</td>
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<tr>
<td><strong>Revenues/ha</strong></td>
<td>P26,040</td>
<td>P32,620</td>
<td>P32,760</td>
</tr>
<tr>
<td><strong>Cost/ha</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seed</td>
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<td>P 7,000</td>
<td>P 4,500</td>
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<tr>
<td>Feeds (at P20/kg)</td>
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<td></td>
<td>P 9,001</td>
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<td><strong>Profit</strong></td>
<td>P17,039</td>
<td>P20,779</td>
<td>P20,519</td>
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*Cost estimates based on 1985 prices.

**Based on the amount of supplementary feed given.

C. Semi-intensive Prawn Culture System

1. Site Specification

   Water Source

   a. Brackishwater : Must be sufficient the whole year round.

   b. Freshwater : Freshwater source is also essential.
Optimum Environmental Conditions:

b. Temperature: Optimum temperature range is between 25°C-30°C.
c. Dissolved oxygen: The minimum level should ordinarily be 4 mg/l.

Others: The site must be free from any source of pollution (industrial agricultural and domestic) and, as much as possible, protected from environmental hazards such as typhoons, floods, erosion, etc. It must be accessible and preferably secured from poachers.

2. Pond Specification

Pond Size: Preferably 0.5-1.0 ha water area.
Water Depth: 0.8-1.0 m
Water Gate: Separate supply and drainage gate.
Dikes: Must be structurally strong and free from leaks.
Canal/Trench: Single (diagonal or peripheral), 5-10 m wide and 0.50-0.75 m deep.
Bottom: Must be levelled.
Others: Installation of proper gate screens is essential.

3. Life Support System

Pump: Necessary (10-18 cm centrifugal pump).
Manpower: Personnel must have sufficient training or experience in pond culture, preferably prawn culture.

Prawn Pond Culture
4. Pond Preparation

**Draining**
Drain pond water completely and remove miscellaneous fish, other animals and weeds present.

**Soil Sampling**
Collect soil samples for analyses of pH and organic matter.

**Pest & Predator Control**
Treat undrainable areas of pond with either a) ammonium sulfate (21-0-0) and quick lime (CaC) at 1:5 ratio at 0.1-0.5 kg/sq m or b) derris root containing 5% rotenone at 0.5-2.0 g/ton pond water – more effective at higher temperature during day time and at lower pH; or c) teaseed cake at 12 g/ton for salinity lower than 15 ppt and 20-30 g/ton for salinity higher than 15 ppt.

**Conditioning of Pond Bottom**
Dry pond bottom until it cracks after which tilling is done using a rotavator, plow blade or hoe. Control depth of till to about 7.0 cm.

**Liming**
Apply lime at 1 ton/ha to the pond dikes and pond bottom. The quantity may vary from 200 kg/ha to 3 tons/ha depending on the soil pH.

**Fertilization**
a) *Organic manure*: About a week after liming apply chicken manure at 1 ton/ha.

b) *Inorganic fertilizer*: Apply synthetic fertilizers, Ammonium phosphate (16-20-0) and Urea (46-0-0) at 75 and 25 kg/ha respectively.

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Installation of Screens: Install fine mesh net (0.2 mm mesh size) at the gate to prevent entrance of unwanted species and escape of stocked fry.

Flooding: At first introduce 5-10 cm deep water into the pond and then gradually raise water level to the desired level after a week. Check double screens to prevent entry of unwanted species into the pond.

Installation of Substrates/Shelters: Distribute coconut fronds throughout the pond bottom except in the trench. About 250 to 500 pcs/ha is required (1/20 m²). Twigs may also be used.

Plantation of Some Vegetation: You may plant aquatic plants like digman and kusay-kusay in certain areas of the pond.

5. Acclimation and Stocking

Assessment of Plankton: Make preliminary assessment of plankton before stocking prawn fry, that is, about two weeks after fertilization of pond.

Acclimation: Acclimation of fry prior to stocking is essential. Adjust the salinity and temperature of transport water and pond water before stocking.

Size/Age of Fry and Stocking: PL20 Size Fry: Stock these fry overnight inside hapa nets fixed in grow-out ponds before releasing into the pond.
PL25-30 Size Fry: (If available) stock these fry directly into the grow-out pond. Stock fry at least 2 weeks after fertilization and flooding.

Stocking Rate : 15,000-25,000/ha.
Time of Stocking : Early morning or late afternoon. Avoid stocking when water temperature is high.
Distribution of Fry in the Pond : Release fry evenly around pond perimeter.

6. Water Management

Tidal : Change 10-30% of the pond water every day for 2 to 4 days during highest tide. Maintain 0.8-1.0 m water level.

Use of Pump : Use a pump for introduction of new water when dissolved oxygen level is below 3.7 ppt or salinity is higher (over 25 ppt). Also when water temperature is very high and there is abrupt reduction of water level due to leakages. When pond water is about to overflow during spring tide, pump water out.

Post-stocking Fertilization : Apply chicken manure at 100 kg/ha every 2 weeks from one month (total 5 applications). Application may be made after spring tide or water change (use T-bags).

Others : Routine check of inlet-outlet screen installation; routine check of dikes for possible leakages and damages which may be caused by burrowing animals.
7. **Stock Sampling**

   **Frequency** : Twice a month or every 15 days.

   **Sampling Procedure** : Use cast net (10 throws at different pond locations) henceforth.

8. **Feeding**

   No feeding is done for the first 30 to 45 days depending on natural productivity of the pond. Feeding is carried out from the 46th day after stocking until harvest.

   **Type of Feed** : Mainly formulated pelletized feed (about 75% of total requirement) with about 30-40% protein content and about 25% of chopped trash fish.

   **Feeding Rate** : A sliding scale may be used where 6, 5, 4, 3% of total body weight feed is carried out every month; a 4.5 total body weight feed computation may also be used (straight up to harvest time).

9. **Monitoring Scheme**

   **Physico-chemical Parameters** : Monitor pH, dissolved oxygen, salinity, transparency and water temperature three times a week at 6:00-6:30 AM and 3:00-3:40 PM at two layers, 10 cm below surface, and 10 cm from bottom at three pond locations. Optimum levels are:

   a. pH (7-8.5)
   b. dissolved oxygen (4-8 pp)
   c. salinity (10-15 ppt)
   d. transparency (25-50 cm)
   e. water temperature (25°-30°C)

   **Biological Parameters** : Assess plankton abundance every 2 weeks. Excess or decayed plankton should be scooped out.
10. **Harvesting**

**Partial Harvest**
Start partial harvesting every spring tide when stock reaches 25 g and above.

**Total Harvest**
Total harvest is done after 4 months of culture.

11. **Economics**

**PARTIAL DIRECT COST (PDC)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Per ha Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pond Conditioning</strong></td>
<td></td>
<td>P 570.00</td>
</tr>
<tr>
<td>Liming</td>
<td>1 ton</td>
<td>500.00</td>
</tr>
<tr>
<td>Ammonium sulfate</td>
<td>25 kg</td>
<td>70.00</td>
</tr>
<tr>
<td><strong>Fertilizer</strong></td>
<td></td>
<td>P 1,212.50</td>
</tr>
<tr>
<td>Chicken manure</td>
<td>1.5 ton</td>
<td>750.00</td>
</tr>
<tr>
<td>Ammonium phosphate (16-20-0)</td>
<td>75 kg</td>
<td>337.50</td>
</tr>
<tr>
<td>Urea (46-0-0)</td>
<td>25 kg</td>
<td>125.00</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td></td>
<td>P 804.00</td>
</tr>
<tr>
<td>Fine mesh screen (0.2 mm)</td>
<td>70 m</td>
<td>320.00</td>
</tr>
<tr>
<td>Coconut fronds</td>
<td>500 pcs</td>
<td>250.00</td>
</tr>
<tr>
<td>Ice</td>
<td>3 blks.</td>
<td>234.00</td>
</tr>
<tr>
<td><strong>Partial Direct Cost</strong></td>
<td></td>
<td>P 2,586.50</td>
</tr>
</tbody>
</table>

*Cost Estimates based on 1986 prices.*
NOMINAL PROJECTIONS AND PARTIAL COSTS AND RETURNS
AT STOCKING DENSITY OF 15,000/ha AND CULTURE PERIOD OF 120 DAYS

<table>
<thead>
<tr>
<th>Scheme</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking density/size</td>
<td>15,000 (PL20)</td>
<td>15,000 (PL25)</td>
<td>15,000 (PL30)</td>
</tr>
<tr>
<td>Survival rate (%)</td>
<td>70</td>
<td>73</td>
<td>75</td>
</tr>
<tr>
<td>Pcs. harvested</td>
<td>10,500</td>
<td>10,950</td>
<td>11,250</td>
</tr>
<tr>
<td>No. of pcs/kg</td>
<td>32</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>Total harvest (kg)</td>
<td>330</td>
<td>365</td>
<td>400</td>
</tr>
<tr>
<td>Market price/kg</td>
<td>P115</td>
<td>P130</td>
<td>P130</td>
</tr>
<tr>
<td>Revenue/ha</td>
<td>P37,950</td>
<td>P47,450</td>
<td>P52,000</td>
</tr>
<tr>
<td>Cost/ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Seed Cost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pcs/stage</td>
<td>15,000 (PL20)</td>
<td>15,000 (PL25)</td>
<td>15,000 (PL30)</td>
</tr>
<tr>
<td>Price/pc</td>
<td>P0.30</td>
<td>P0.35</td>
<td>P0.40</td>
</tr>
<tr>
<td>Cost</td>
<td>P4,500</td>
<td>P5,250</td>
<td>P6,000</td>
</tr>
<tr>
<td>B. Feed Cost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Total Feed Requirement (kg)</td>
<td>653</td>
<td>740</td>
<td>828</td>
</tr>
<tr>
<td>Price/kg</td>
<td>P20</td>
<td>P20</td>
<td>P20</td>
</tr>
<tr>
<td>Cost</td>
<td>P3,060</td>
<td>P14,800</td>
<td>P16,560</td>
</tr>
<tr>
<td>C. PDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost/ha</td>
<td>P20,146.50</td>
<td>P22,636.50</td>
<td>P25,146.50</td>
</tr>
<tr>
<td>Gross income</td>
<td>P17,803.50</td>
<td>P24,813.50</td>
<td>P26,853.50</td>
</tr>
</tbody>
</table>

*Total Est. Feed Requirement (TEFR) = FCR x Est. wt. gained
Where: Est. wt. gained = Tot. harvest wt. — Est. wt. at day 45
FCR = 2.5
Est. wt. at day 45 = 69 kgs
### NOMINAL PROJECTIONS AND PARTIAL COSTS AND RETURNS
### AT STOCKING DENSITY OF 20,000/ha AND CULTURE PERIOD OF 120 DAYS

**Scheme**

<table>
<thead>
<tr>
<th>Stocking density/size</th>
<th>20,000 (PL 20)</th>
<th>20,000 (PL 25)</th>
<th>20,000 (PL 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survival rate (%)</td>
<td>70</td>
<td>73</td>
<td>75</td>
</tr>
<tr>
<td>Pieces harvested</td>
<td>14,000</td>
<td>14,600</td>
<td>15,000</td>
</tr>
<tr>
<td>Harvest size: Pcs/kg</td>
<td>34</td>
<td>32</td>
<td>30</td>
</tr>
<tr>
<td>Total harvest wt. (kg)</td>
<td>412</td>
<td>456</td>
<td>500</td>
</tr>
<tr>
<td>Market Price/kg</td>
<td>P115</td>
<td>P115</td>
<td>P130</td>
</tr>
<tr>
<td>Revenue/ha</td>
<td>P47,380</td>
<td>P52,440</td>
<td>P65,000</td>
</tr>
</tbody>
</table>

**Cost/ha**

A. **Seed Cost**

<table>
<thead>
<tr>
<th>Pieces (stage)</th>
<th>20,000 (PL 20)</th>
<th>20,000 (PL 25)</th>
<th>20,000 (PL 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price/pc</td>
<td>P0.30</td>
<td>P0.35</td>
<td>P0.40</td>
</tr>
<tr>
<td>Cost</td>
<td>P5,000</td>
<td>P7,000</td>
<td>P8,000</td>
</tr>
</tbody>
</table>

B. **Feed Cost**

<table>
<thead>
<tr>
<th>Total Est. Feed Requirement (kg)</th>
<th>800</th>
<th>910</th>
<th>1,020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price/kg</td>
<td>P20</td>
<td>P20</td>
<td>P20</td>
</tr>
<tr>
<td>Cost</td>
<td>P16,000</td>
<td>P18,200</td>
<td>P20,400</td>
</tr>
</tbody>
</table>

C. **PDC**

<table>
<thead>
<tr>
<th>Cost/ha</th>
<th>P24,586.50</th>
<th>P24,786.50</th>
<th>P30,986.50</th>
</tr>
</thead>
</table>

**Gross income**

<table>
<thead>
<tr>
<th></th>
<th>P22,793.50</th>
<th>P24,653.50</th>
<th>P34,013.50</th>
</tr>
</thead>
</table>

---

*Total Est. Feed Requirement (TEFR) = FCR x Est. wt. gained
Where: Est. wt. gained = Tot. harvest wt. - Est. wt. at day 45
FCR = 2.5
Est. wt. at day 45 = 92 kgs.

---

F. D. Apud
## NOMINAL PROJECTIONS AND PARTIAL COSTS AND RETURNS
### AT STOCKING DENSITY OF 25,000/ha AND CULTURE PERIOD OF 120 DAYS

<table>
<thead>
<tr>
<th>Scheme</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking density/size</td>
<td>25,000 (PL20)</td>
<td>25,000 (PL25)</td>
<td>25,000 (PL30)</td>
</tr>
<tr>
<td>Survival rate (%)</td>
<td>70</td>
<td>73</td>
<td>75</td>
</tr>
<tr>
<td>Pieces harvested</td>
<td>17,500</td>
<td>18,250</td>
<td>18,750</td>
</tr>
<tr>
<td>Harvest size (pcs/kg)</td>
<td>36</td>
<td>34</td>
<td>32</td>
</tr>
<tr>
<td>Total harvest wt. (kg)</td>
<td>486</td>
<td>537</td>
<td>586</td>
</tr>
<tr>
<td>Market (Price/kg)</td>
<td>₱115</td>
<td>₱115</td>
<td>₱115</td>
</tr>
<tr>
<td>Revenue/ha</td>
<td>₱55,890</td>
<td>₱61,755</td>
<td>₱67,390</td>
</tr>
</tbody>
</table>

### Cost/ha

**A. Seed Cost**

- Pieces (stage): 25,000 (PL20) 25,000 (PL25) 25,000 (PL30)
- Price/pc: ₱0.30 ₱0.35 ₱0.40
- Cost: ₱7,500 ₱8,750 ₱10,000

**B. Feed Cost**

*Total Est. Feed Requirement (TEFR) = FCR x Est. wt. gained*

- Est. wt. at day 45 = 115 kgs
- FCR = 2.5

- Price/kg: ₱20 ₱20 ₱20
- Cost: ₱18,560 ₱21,100 ₱23,560

**C. PDC**

- Cost/ha: ₱28,647 ₱32,437 ₱36,147
- Gross Income: ₱27,243 ₱29,318 ₱31,243

---

Total Est. Feed Requirement (TEFR) = FCR x Est. wt. gained
Where: Est. wt. gained = Total harvest wt - Est. wt. at day 45
FCR = 2.5
Est. wt. at day 45 = 115 kgs

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