

Aquaculture Extension Pamphlet No. 2
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Feeding prawns for grow-out culture

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FEEDING PRAWNS FOR GROW-OUT CULTURE

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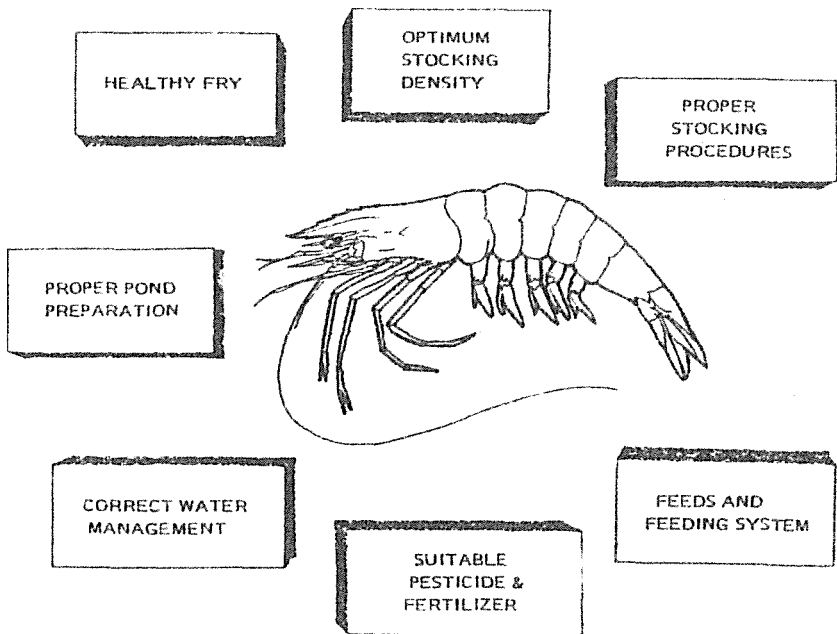
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FEEDING PRAWNS FOR GROW-OUT CULTURE

Sugpo (*Penaeus monodon*) is a delicacy and a highly priced export product. It is an important aquatic crop farmed in South-east Asia particularly in Taiwan, Thailand, and the Philippines.

FACTORS TO CONSIDER IN FARMING PRAWN

Successful farming of sugpo to marketable size depends on a number of factors as illustrated:



There are three pond culture systems for sugpo in the Philippines. These are the (1) *extensive*, (2) *semi-intensive*, and (3) *intensive* methods which were brought about by improved maturation and broodstock development techniques and by the availability of hatchery-bred fry and formulated feeds. The following table describes the three pond culture systems and their expected production harvests.

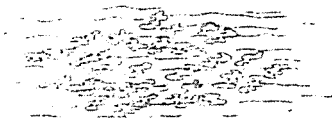
Culture systems of prawn (*P. monodon*) in grow-out ponds.

	<i>Extensive</i>	<i>Semi-intensive</i>	<i>Intensive</i>
Feed	Natural food	Natural food & supplementary feeds	Formulated feeds (pellets)
Water management	Tidal	Tidal & pump	Pump & aeration
Stocking density	1,000-10,000 fry/ha	10,000-90,000 fry/ha (variable)	100,000-400,000 fry/ha (variable)
Pond size	2-20 ha	1-5 ha	1,000 sq m-1 ha
Pond development cost	Existing milkfish pond	P25,000/ha + existing pond	P500,000/ha + existing pond
Production	100-500 kg/ha/yr	500-4,000 kg/ha/yr	5,000-15,000 kg/ha/yr

When you use the extensive method, you make your prawns subsist mainly on the natural food growing in the pond. In the semi-intensive and intensive methods, you make the prawns depend mainly on the feed you give and on more frequent water change. Traditionally, fish farmers supplement the natural food in their ponds by feeding their prawns with chicken entrails, trash fish, small shrimps, mussel meat, frog meat, chopped carabao hide, and others. Feeding with artificial or formulated feeds produces high yields.

PROPER FEEDING IS NEEDED

With supplementary feed and aeration, you can stock fry up to nine times more than with natural food alone. When fed with supplementary and formulated diets twice a day, your prawns will reach marketable size in around 4 months. You will then harvest two or more crops in one year and get bigger, healthier, and more attractive prawns that would command a better price.



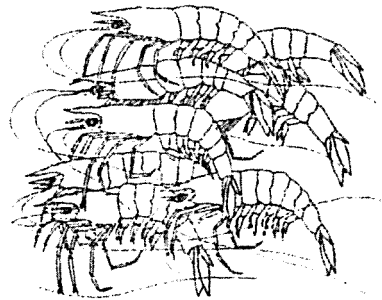
Natural Food +



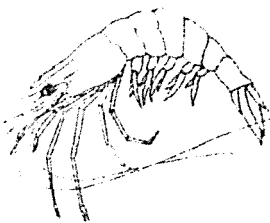
Supplementary or diet



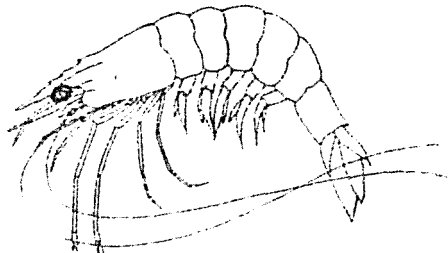
Formulated feed



Bigger, healthier prawns



3-month old prawn (about 15 g) fed with natural food



3-month old prawn (about 20 g) fed twice a day with supplementary formulated feeds

Since feed represents a big amount of total production cost, a nutritious and economical diet is a worthwhile investment.

PRAWNS NEED NUTRIENTS

Like any other living organism, prawns need essential nutrients or substances that will make them grow, regulate their body functions, and increase resistance to disease.

The five major nutrients needed by prawns are (1) protein, (2) fats, (3) carbohydrates, (4) vitamins, and (5) minerals.

5 Major nutrients needed by the prawn

- **35~45% Protein**
- **25% Carbohydrates**
- **10% Fats**
- **Vitamins**
- **Minerals**

Protein and Amino Acids

Protein is necessary primarily for growth. It also contributes heat and energy. About 35 to 45% protein is needed by prawns in their diets.

Amino acids are building blocks for protein formation. There are around 18 amino acids needed to form protein, but only 10 are considered essential in the prawn diet. When one amino acid is lacking or insufficient in the diet, protein formation can be delayed or decreased resulting in a lower efficiency of the diet.

Some protein sources from animals and plants are:

Animal sources

- fish meal, both white and brown
- shrimp meal
- shrimp head meal
- earthworm meal
- squid meal
- chicken entrails
- mussel meat
- meat & bone meal
- toads
- snails

Vegetable sources

- yeast
- soybean meal, defatted or full fat
- peanut meal

Carbohydrates

Carbohydrates like sugars and starches are useful for their energy value. These also act as binders in the diet because of their “stickiness.” Cornstarch, potato starch, *sago* palm starch, wheat flour, agar or *gulaman*, and carrageenan are good binders.

Rice bran, corn meal, etc., aside from helping as binders, contain other nutrients needed by the prawn.

When used as ingredients, carbohydrate sources must be fresh and dry, not rancid and moldy.

Some carbohydrate sources are:

- | | |
|-----------------------------|--|
| – wheat flour (bread flour) | – <i>sago</i> palm (<i>Metroxylon sagu</i>) starch |
| – rice flour | – rice bran |
| – cassava flour | – corn meal |
| – potato starch | – copra meal |

Fats or Lipids

Fats or lipids are necessary not only for their energy value but also for the presence of fatty acids that are essential to the growth and survival of prawns.

Prawns need from 5 to 10% lipid, 0.5 to 1% cholesterol, and 3% to 4% lecithin.

Some fat or lipid sources are:

- cod liver oil and other fish liver oils
- squid oil
- beef tallow
- purified soybean oil
- crude, degummed soybean oil
- peanut oil
- corn oil
- sunflower oil
- oil palm oil

Vitamins and Minerals

Vitamins and minerals are important regulators of body processes. Although the exact amounts of vitamins and minerals required by prawns are not yet known, certain levels must be included in the diet.

So far, there are around 16 vitamins and 13 minerals included in the premix. Their functions are interrelated and each one meets a definite need, as shown in the examples below.

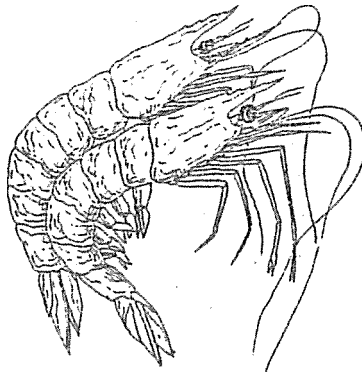
General Types

- Water-soluble vitamins such as C, B₁, B₂, B₁₂, biotin, choline chloride, inositol, p-amino-benzoic acid, niacin, folic acid.

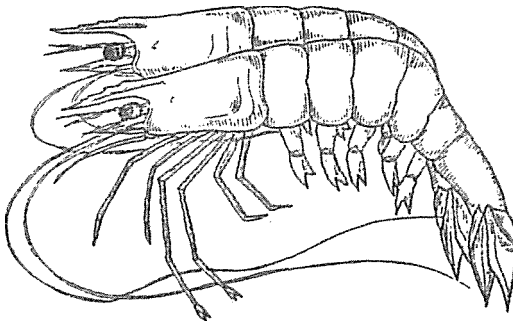
General Functions

- For proper utilization of protein, carbohydrates, fats

- Fat-soluble vitamins such as A, D, E, K.
- The minerals calcium and phosphorus
- For building resistance to infection
- For the formation of prawn exoskeleton or shell and prevention of "soft-shelling"



Soft-shelled prawns due to lack or insufficiency of calcium and phosphorus.



Healthier and bigger prawns with hard shells

HOW TO PREPARE PRAWN FEEDS

Researchers at SEAFDEC Aquaculture Department have formulated and developed prawn diets for grow-out culture. The formulated feeds come in pelletized forms, have been tested and found to increase production under various pond conditions using the semi-intensive culture method.

Although several diets have been formulated, none can be considered as "best." There is much to be done for further improvement. An innovative prawn farmer can formulate a diet to suit the nutritional needs of the prawns he is culturing. A good formula is one that yields healthier, bigger, and more prawns, and gives more profit to the prawn farmer.

Anyone interested in preparing feeds can utilize the feed ingredients available in his locality. While some ingredients may have to be bought, feeds are a wise investment. Nothing can substitute for good prawn nutrition which is essential if you want to increase your profits from prawn farming.

The prawn diet included in this module is recommended for semi-intensive culture with a stocking density of 25,000-50,000 fry/ha.

Here's how to prepare the prawn diet:

Equipment Needed

- | | |
|-----------------------------|---|
| – weighing scale or balance | – steamer (like in cooking <i>puto</i> or <i>siopao</i>) |
| – sieve, No. 40 | – saucepan for gelatinizing cornstarch |
| – meat grinder | – drier or oven |
| – rice or coffee grinder | – wooden ladle |
| – mixer | – plastic containers with covers |
| – screen trays | |
| – stove | |

Ingredients

Prepare the following ingredients to produce at least 10 kilograms of pellets:

- 3.0 kg fish meal (from clean, dried, small trash fishes like tilapia, etc.), finely ground
- 1.5 kg shrimp head meal, dried, finely ground
- 1.5 kg soybean meal, defatted, finely ground
- 1.3 kg rice bran, clean, dry, very fine
- 1.4 kg bread flour
- 0.5 kg cornstarch
- 0.2 kg lecithin
- 0.3 kg cod liver oil
- 0.15 kg vitamin mix*
- 0.15 kg mineral mix*
- 2000 ml water (about 8 cups)

*You may use any vitamin-mineral pre-mix available in poultry stores. Add about 0.5 to 1% Vitamin C if pre-mix does not contain it.

Composition of mineral mixture (After Deshmaru, 1981)

<i>Mineral</i>	<i>Percent</i>
K_2HPO_4	10.0
$NaH_2PO_4 \cdot 2H_2O$	21.5
$Ca(H_2PO_4)_2 \cdot H_2O$	26.5
$CaCO_3$	10.5
Ca-lactate	16.5
KCl	2.8
$MgSO_4 \cdot 7H_2O$	10.0
Fe-citrate	1.2
Trace metals [†]	1.0

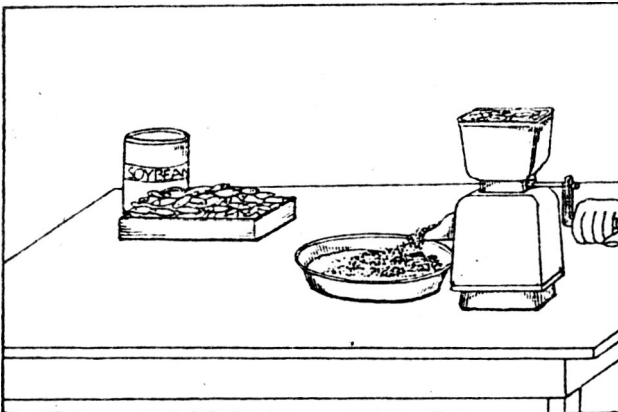
[†] $AlCl_3 \cdot 6H_2O$, 0.024; $ZnSO_4 \cdot 7H_2O$, 0.476; $MnSO_4 \cdot 4-6H_2O$, 0.107; CuCl, 0.015; KI, 0.023; $CoCl_2 \cdot 6H_2O$, 0.140; and cellulose, 0.125g/g.

Composition of vitamin mixture
(After Deshimaru, 1981)

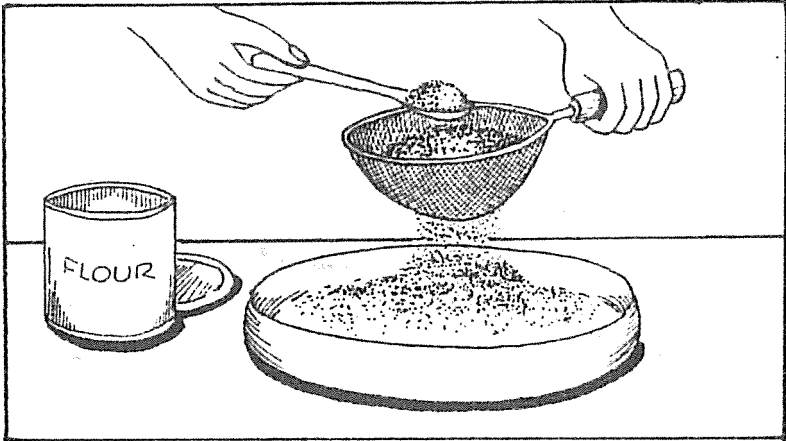
<i>Vitamin</i>	<i>mg/100g</i>
Thiamine-HC1	150
Riboflavin	500
Pyridoxine-HC1	150
Nicotinic acid	2000
Ca-Pantothenate	750
Inositol	10000
Biotin	15
Folic acid	37.5
p-Aminobenzoic acid	1000
Choline chloride	20000
Ascorbic acid	25000
alpha-Tocopherol	1000
Menadione	100
beta-Carotene	100
Calciferol	15
Cyanocobalamine	1
Cellulose	39181.5

Procedure

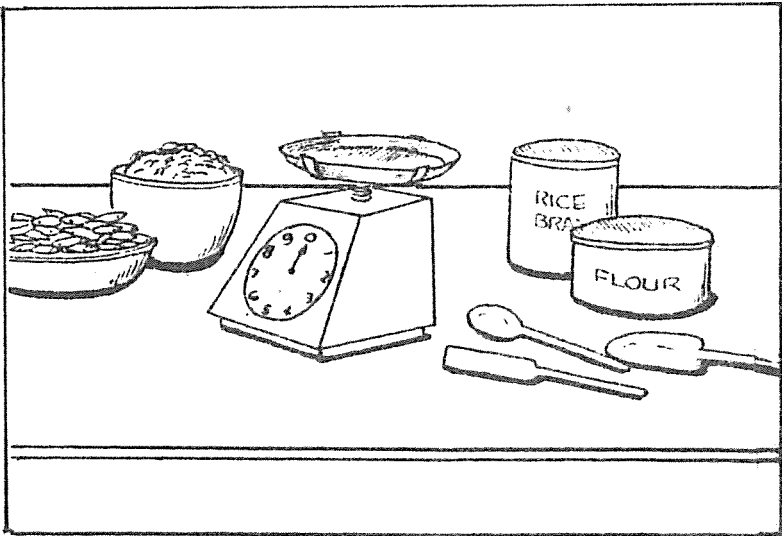
1. Use finely ground ingredients. Grind dry ingredients like fish meal, shrimp head meal, and soybean meal into uniform particles using a coffee or rice-corn grinder.



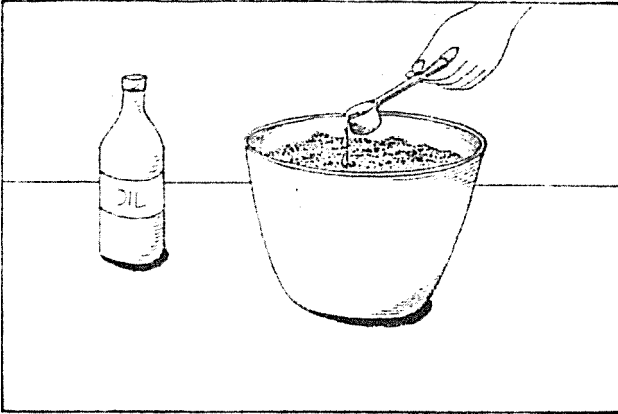
2. Strain all dry ingredients using a sieve with nylon mesh (No. 40) to ensure uniform fine particles. Ingredients that are not uniform in size result in unstable pellets.



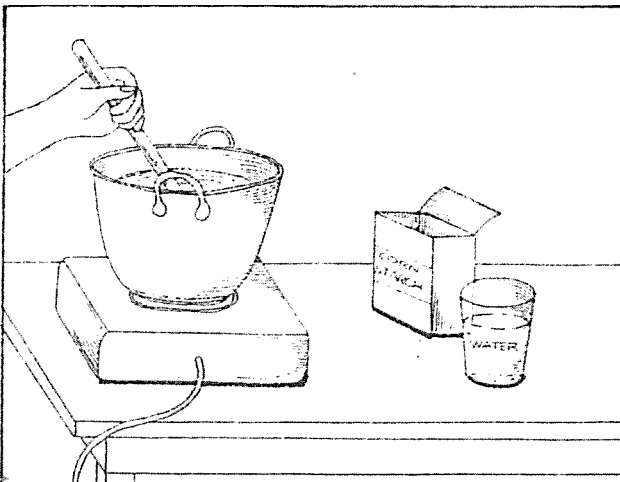
3. Weigh or measure all ingredients properly.



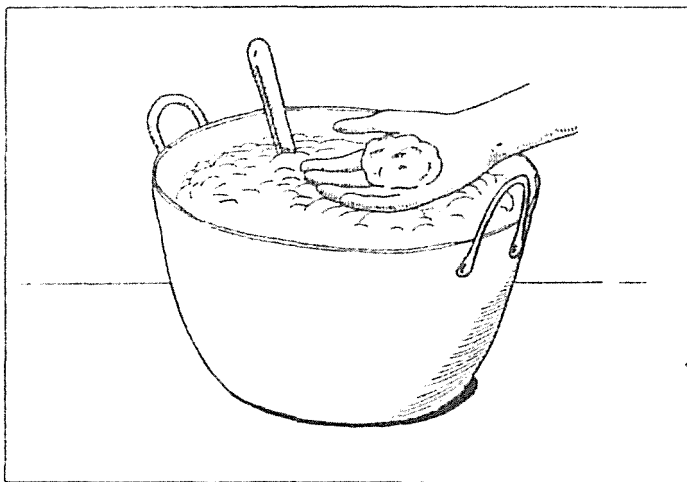
4. Mix thoroughly all dry ingredients for 5 minutes. Add oil to the dry ingredients and mix thoroughly for another 5 minutes.



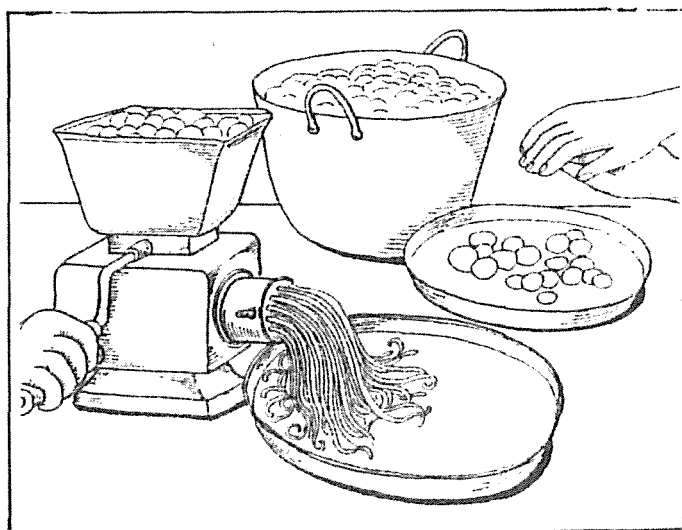
5. Gelatinize cornstarch similar to the way it is cooked for starching clothes. You need one part starch to four parts of water, or 500 g of cornstarch to 2000 ml or 8 cups water for 10 kg of feeds. Suspend and mix 500 g cornstarch in 500 ml or 2 cups of water. Boil 5 cups of water. Pour the suspended cornstarch into the boiling water, stirring the mixture constantly to prevent lumping and to make a smooth binder.



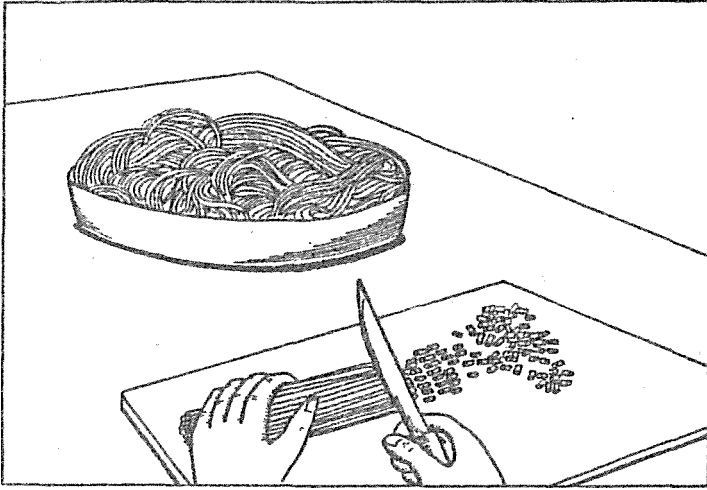
6. Add gelatinized cornstarch to the dry ingredients and mix.
7. Add the remaining 1 cup water to the mixture and mix very well to make stiff dough. Use a ladle in mixing for better results.



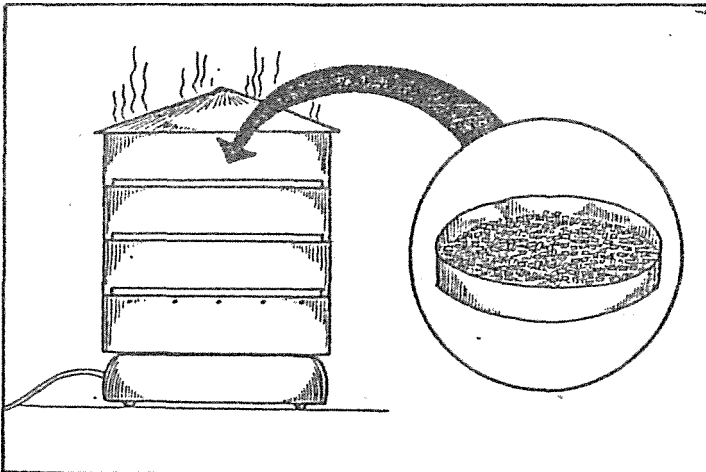
8. Pass the dough through a meat grinder, using an appropriate size of die depending on the size of prawns to be fed. For instance, use 1-mm diameter die for about 0.35 g prawn juveniles; 2-mm diameter die for about 2 g prawns; 3-mm diameter die for prawns weighing 10 g or more. For easy extrusion, make small balls from dough.



9. Cut the extrusions which look like noodles into 0.5-cm long pellets. Use a sharp knife.

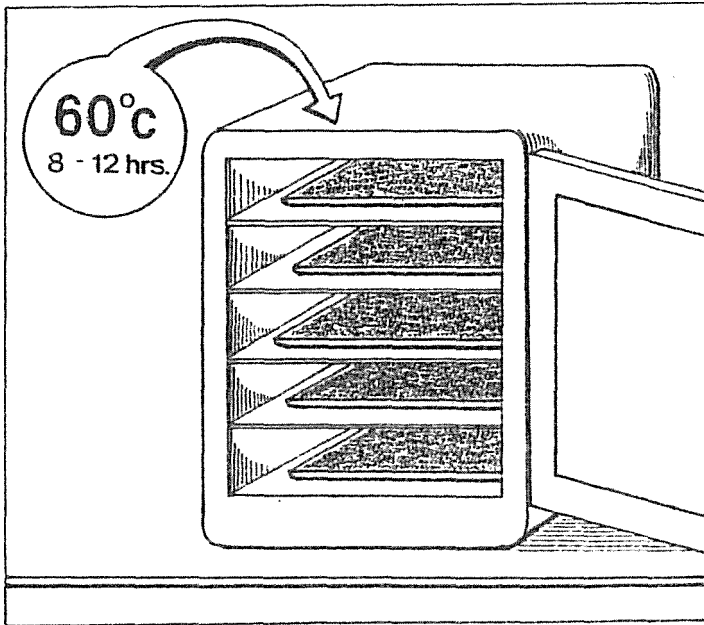


10. Steam the pellets for 5 minutes in an ordinary steamer as in cooking *puto* or *siopao*, with 2-3 layers to accommodate more pellets.

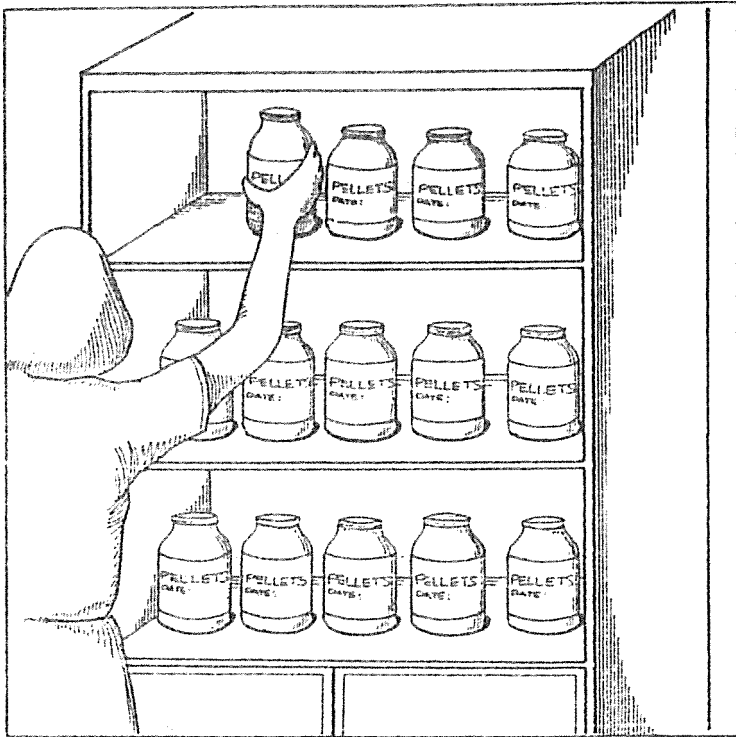


Unsteamed pellets break up within 30 minutes in water; steamed pellets are stable and stay intact in water up to more than 6 hours. Since prawns are slow eaters and may not be able to find their food quickly, they should be fed with pellets that stay firm and last longer in water.

11. Arrange the steamed pellets in screen trays and dry them in an oven overnight or for 8-12 hours at 60°C depending on the size of the pellets. Sun-drying may be recommended especially during summer, but some vitamins may be destroyed. Pellet feeds must be completely dry to prevent molds from developing.



12. Place dry pellets in covered plastic containers and store in a cool, dry place or in a refrigerator. Pellets can be prepared once a week or as often as needed depending upon the need of the prawns for feed, the dryness of the pellets, and the availability of storage space. Label containers properly and be sure to indicate the dates of preparation. Always use first the ones prepared earliest.



WHEN TO FEED PRAWNS

The manner of feeding is just as important as feed preparation. You need to feed the right amount at the right time and in the right way. You may start giving formulated feeds to the prawns one month after stocking in the pond; prawns subsist mainly on natural food during the first month. However, if natural food is lacking, pellets can be given right away. As a rule of thumb, feeds can be given initially at 10% of body weight and then reduced gradually to 8%, 6%, 4% every two weeks thereafter.

Feeding may be done by broadcasting the feed or by using feeding trays submerged in the water and suspended from poles at various places in the pond. The use of feeding trays is advantageous because the prawns learn when and where to get their food.

Also, the fish farmer will be able to tell whether the feed is lacking or sufficient from the amount of feed left in the tray. He can then adjust the amount of feed to place in the tray according to the need of the prawns. The observant fish farmer will be able to determine how much feed to give.

Feed the prawns once in the morning at around 8:00 AM, and once in the afternoon at about 4:00 PM or before the sun sets. Since prawns eat more and forage at night, give about 70% of the daily feed allowance in the afternoon and 30% in the morning.

The following guides should help you on how and when to feed the prawns and how much feed to give every day.

DETERMINING THE AMOUNT OF DAILY FEED RATION (DFR)

$$\text{DFR (kg)} = \text{ABW (g)} \times \text{No. of stock} \times \% \text{ survival} \times R \times \frac{1 \text{ kg}}{1000 \text{ g}}$$

- Where: ABW (g) = average body weight of stock sample during a particular period
- % survival = the estimated percentage of survivors during that particular period
- R = feeding rate as percentage of the estimated total weight of all prawns during the particular period

EXAMPLE:

- Given: No. of stock in 1 ha pond = 25 000 pcs.
- After 45 days, the ABW (g) = 5.0 g
- Estimated % survival = 92%
- Feeding rate based on total wt. = 6%

- Calculate: a) daily feed ration (DFR) (kg)
- b) total feed requirement (TFR) for 15 days (kg)

a) DFR (kg) = 5 g x 25 000 x 0.92 x 0.06 x $\frac{1 \text{ kg}}{1000 \text{ g}}$ = 6.9 kg

b) TFR (15 days) = 6.9 kg/day x 15 days = 103.5 kg

Suggested Feeding Scheme at Stocking Density of 25,000 Fry/ha

Age (days)	Average Body weight (ABW) (g)	Expected Survival rate (%)	No. of Prawns	Feed (% Body weight, BW of prawns)*	Amt. of Feed in Kg	
					Per day	Per 15 days
0	0.5 - 1.5	100	25,000	-	-	-
1 - 30	2.6	96	24,000	-	-	-
31 - 45	5.0	92	23,000	6	6.9	103.5
46 - 60	9.3	89	22,000	6	12.4	186.2
61 - 75	14.2	85	21,250	5	15.1	226.3
76 - 90	19.8	82	20,500	4	20.3	304.4
91 - 105	25.3	78	19,500	4	19.7	296.0
106 - 120	30.5	75	18,750	4	22.9	343.1
Total Feeds:						1,459.5

*If one decides to feed soon after stocking in case of intensive culture, suggested feeding rates are:

1 - 30 days	=	10% Body weight
31 - 60 days	=	8% Body weight
61 - 90 days	=	6% Body weight
91 - 120 days	=	4% Body weight

Suggested Feeding Schedules

<i>I</i>	<i>II</i>
8:00 AM - 30% of daily feed ration	8:00 AM - 30% of daily feed ration
1:00 PM - 20% of daily feed ration	4:00 PM - 70% of daily feed ration
6:00 PM - 50% of daily feed ration	

Total feed ration for the day could be divided into four lots and could be given at 8:00 AM, 2:00 PM, 6:00 PM, and 10:00 PM.

SOME TIPS FOR YOU

1. Before you prepare the prawn diets, it is wise to seek the advice of an expert or someone who has already prepared diets successfully. Researchers at SEAFDEC Aquaculture Department, especially those directly involved in feed development and pond culture, are ready to assist you.

2. Most of the ingredients for prawn diets are available from any poultry store. Be sure, however, that they are fresh, dry, and of good quality when you buy them.

3. Do not use moist or rancid ingredients, especially rice bran, cod liver oil, and flour. Molds easily develop and produce aflatoxin, a substance that causes cancer in man and which can cause mass mortality of prawns in your pond.

4. For vitamin and mineral mixes, you can use the commercial poultry mixes from any poultry store but add around 0.5% to 1% Vitamin C if it is not included in the vitamin mix.

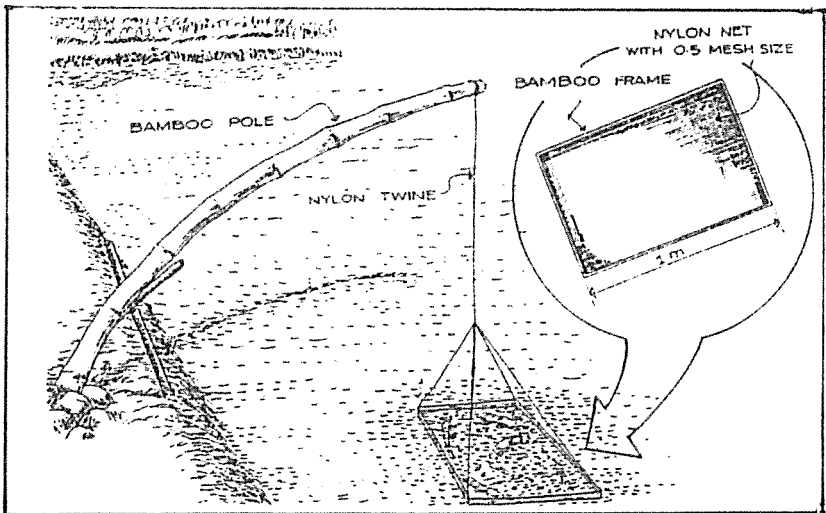
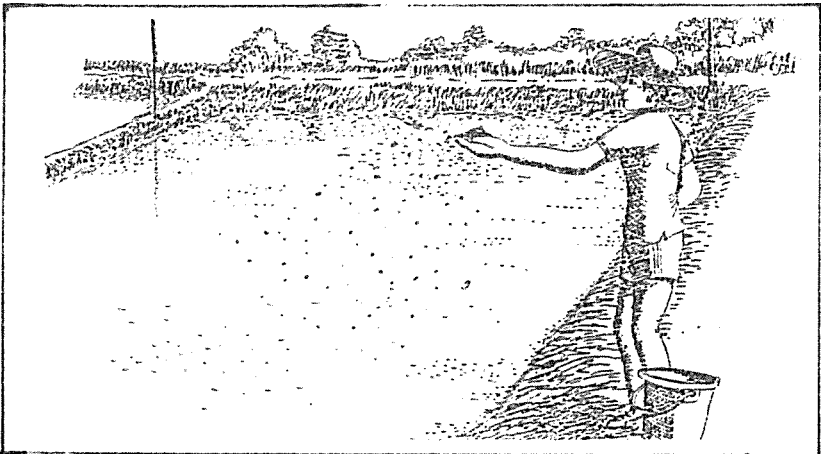
5. Feed millers can also be requested to help. You can ask them to prepare your vitamin and mineral mixes. This is more practical than mixing these yourself. However, feed millers may not accept orders of less than 10 kg of vitamin-mineral mix. You may pool together some prawn producers in your area and make a joint order so all of you will have these important ingredients anytime you need them. The vitamin mix can be stored for up to one month if kept in a cool, dry place. Mineral mixes can be kept for several months. Store vitamin and mineral mixes in tightly covered containers.

6. If you use full-fat soybean meal, it should be heat-treated at 170°C for 10 minutes before mixing it with other ingredients.

7. Store extra ingredients in a cool, clean, and dry place. Seal and label each container properly.

8. It is practical to produce not less than 10 kilograms of pellets to save on time and effort in preparation.

9. Attend aquaculture seminars or workshops conducted by SEAFDEC AQD to keep abreast of the latest findings in prawn production and feed development.



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