APPENDIX I

The specific objectives of the Project

The specific objectives for the collaborative research programme were as follows :

i. To develop shrimp feeds which maximized the use of indigenous raw materials, thus minimizing imports.

ii. To formulate shrimp feeds for the growth of tiger shrimp (Penaeus monodon) under farming systems used by artisanal culturists.

iii. To use feed manufacturing machinery, preferably of Indian origin.

iv. To evaluate the performance of feeds in pellet and doughball forms, with and without additional fertilizer pond supplementation.

v. To prepare financial evaluations of shrimp productivity under the different feed treatments.

To meet these objectives, a three-phase project was established as follows :

Phase 1. An evaluation of the availability of raw materials for shrimp feed production in India, and the potential availability of machinery of Indian origin to meet the manufacturing requirements for shrimp feed.

Phase 2. A feeding trial to be conducted with CIBA to determine, under small pond research conditions, the effect of feed form and fertilizer application on the growth rate, survival and yield of P. monodon under conditions of artisanal shrimp culture in West Bengal. In West Bengal, ponds are filled and emptied with water during changes in tidal amplitude.

Phase 3. A feeding trial to be conducted with the DoF, Andhra Pradesh, using farm scale ponds of 0.75 ha, to determine the effect of feed form as demonstrated from the West Bengal trial against the performance of the local Andhra Pradesh doughball feed in the pump-filled ponds used by artisanal shrimp culturists in Andhra Pradesh.

APPENDIX II

Estimated composition of feed raw materials for calculation of diet formulations.

RAW MATERIALS

DRY FEEDS

	Wheat Atta	*Broken Rice*	*Soya Meal*	*Fish Meal*	*Shrimp Head Meal*	*Squid Meal*
Dry matter	89.0	89.5	90.0	87.4	91.4	91.0
Crude protein	12.5	7.0	43.5	43.8	39.1	78.7
Ether extract	1.3	0.5	1.0	1.6	1.7	1.1
Crude fibre	2.5	0.5	5.5		–	
Ash	1.7	1.0	5.5	12.3	36.1	2.4
Calcium	0.05	0.01	0.30	6.1	10.1	0.11
Phosphorus	0.34	0.10	0.60	0.91	2.03	0.47
Methionine	0.20	0.27	0.80	0.54	0.58	3.37
Methionine + Cystine	0.44	0.37	1.40	1.04	0.94	4.67
Total Lysine	0.35	0.27	3.00	2.33	1.94	5.80
Avail Lysine	0.29	0.24	2.70	2.20	1.73	5.43

** includes chitin nitrogen.

WETLOCALAPFEED
(Estimated composition of raw materials)

	Cooked beef	*Trash fish*	*DOB*	*Rice bran*	*GNC*	*Soya meal*	*Dried* fish	*Wheat* **flour**
Dry Matter	75.0	75.0	90.0	90.0	90.0	90.0	85.0	88.0
Composition at appx. 10 per cent moisture content.								
Crude Protein	75.0	61.0	14.0	12.5	40.0	42.0	50.0	13.5
Ether extract	11.5	6.0	2.0	13.0	6.0	2.5	8.0	3.0
Crude Fibre	–	–	12.0	10.0	7.5	5.5	–	3.0
Ash	3.5	23.0	8.0	11.0	5.7	5.5	30.0	2.0
Calcium	0.3	6.2	0.1	0.1	0.1	0.3	8.2	0.1
Phosphorus	0.3	3.0	1.1	1.0	0.6	0.6	4.0	0.3
Methionine	1.0	1.9	0.2	0.2	0.5	0.8	1.5	0.2
Methionine * Cystine	3.0	2.5	0.3	0.3	1.1	1.4	1.9	0.4
Total Lysioe	5.3	5.0	0.5	0.5	1.4	3.0	4.6	0.4
Available Lysine	5.0	5.0	0.3	0.3	1.3	2.7	4.2	0.3

APPENDIX III

Derivation of dry feed costs

Raw Materials	Cost/kg I Rs	Inclusion %	Costs (IRs) Doughballs	Costs (IRs) Pellets
Wheat Atta	4.0	28.75	–	
Wheat Atta	4.0	19.25	77	77
Soya meal (44%CP)	4.1	39.00	160	160
Soya flakes (52%CP)	7.0	31.00	–	
Broken rice	2.0	5.00	IO	IO
Fishmeal	4.6	10.00	46	46
Shrimp head meal	4.0	10.00	40	40
Squid meal	23.0	5.00	115	115
Fish oil	22.0	3.00	66	66
Soya lecithin	80.0	2.00	160	160
Mineral premix	92.0	2.00	184	III4
Vitamin premix	106.0	1.00	106	106
Choline chloride	65.0	0.25	16	16
Plaster of Paris	3.0	2.00	6	6
Sodium Alginate	90.0	1.50	135	135
Total Raw Material Costs (Rs/100kg)			II21	1121
Rs/kg			II.21	II.21
Pulverization cost			0.65	0.65
General manufacturing cost(estimated)			1.00	1.50
Product cost ex-mill			12.86	13.36
Profit t Transport, (IS per cent)			1.92	1.99
Sales price feed delivered (Rs/kg)			14.78	15.35

CP = Crude Protein

APPENDIX IV

Feeding schedule (Large pond trial)

The shrimp feeding schedule for the trial was based on anticipated shrimp survival (%) and feeding rates (%) of biomass), and estimated animal weights.

Provisional Feeding Regime · Per pond

Week no.	Est. survival %	No. of shrimp in pond	Est. shrimp weight (g)	Est. biomass in pond (kg)	Feed rate % bodyweight	Doily feed/pond (kg)	Feed size
0	100	75,000	0.13	9.7	10	0.97	St
1			0.5	37.5	10	3.75	
2			1.0	75.0	10	7.5	
3	90	67,500	2.5	168.8	10	8.4	
					10	+ 8.5	Gr
4			3.0	202.5	10	20.2	
5			4.0	270	10	27.0	
6			6.0	405	7	28.4	
7	80	60,000	7.0	420	7	29.4	
8			9.0	540	6	32.4	
9			11.0	660	6	39.6	
10			13.0	780	5	39.0	
11	70	52,500	15.0	788	5	39.4	
12			18.0	945	4	37.8	
13			21.0	1102	4	44.1	
14			23.0	1207	3	36.2	
15	65	48,750	26.0	1268	3	38.0	
16			28.0	1365	3	41.0	
17			30.6	1492	3	44.8	
18			33.5	1633	3	49.0	
19			36.5	1779	3	53.4	
20			39.0	1901	3	57.0	

St = starter crumb

Gr = grower granules

Fi = finisher pellets

Using these figures : cumulative feed total = 4801 kg

liveweight gain = 1901 kg

Hence estimated apparent FCR = 2.52

Note : Weeks l-5, feed according to this table.

Weeks 6-harvest according to cast net sampling.

During the first 5 weeks of the trial the shrimp were considered to be too small for handling for the assessment of survival and weight and the revision of daily feeding rates,

APPENDIX V

Calculation of labour costs for daily feeding

	fellers	*Doughball*	*AP jeed*
a. Time for feed collection(hrs) : (fresh beef and fish)			3
b. Time for preparation :			
2 x 15 minutes (hr)	—	*0.5*	
2 men x 3 hrs (hr)			6
c. Time for feeding :			
4 x 15 minutes (hr)	1		
2 x 30 minutes (hr)		1	1
d. TOTAL TIME (hr)	1	1.5	10
e. Time cost per day at Rs 2.50 per hour (I Rs) :	2.5	3.75	25
f. No days of feeding :	154	155	152
g. TOTAL LABOUR COST FOR FEEDING DURING FEEDING TRIAL (Rs)	385	581	3800

APPENDIX VI

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