APPENDIX-1

PRP QUESTIONNAIRE FOR SHRIMP FARMERS

District:

1. Name and address
2. Nature of the farm (Proprietary, Partnership, Public Ltd)
3. Title/ right of the property (Owned / Leased in )
4. Total culturable area owned by the person
5. Farm water spread area
6. Have you registered with AAI?
7. Year of establishment
8. Educational level
9. Age group
10. Experience
11. Carrying capacity of the farming zone to which you belong to
12. Location of the farm (Good, Satisfactory, Bad)
13. Surroundings (Good, Satisfactory, Bad)
14. Is shrimp farming your main occupation (yes / no)
15. Is there any shrimp farmers association or cooperatives in your village? (yes/no)
16. Are you a member of the society? (yes/no)
17. Are you satisfied with the functioning of the association? (yes/no)
18. Whether adequate water supply is available (yes/no)
19. Nature of soil (Acidic / Alkaline / Salty)
20. Whether the sand is suitable for (aquaculture / agriculture / both)
21. Source of electricity (Agricultural / Industrial)
22. No. of crops per year
23. No. of days in a crop cycle
24. Carrying capacity of your farm
25. Total number of employees
26. Number of persons / shift
27. Number of shifts
28. Details of equipments
29. Expenditure ( per crop )

**Pond preparation**

1. Where do you dispose the bottom sludge? (By the side of the pond, in a trench dug along the bund, Outside the pond)
2. Whether the sludge is removed; (Manually, Mechanically)
3. Black soil is an indication of poor bottom soil quality; (Yes / No)
4. The optimum soil PH for shrimp culture should be above 6 (Yes / No)
5. What is the condition of the soil while ploughing? (Dry, Wet)
6. Ploughing on wet soil is the recommended practice (Yes / No)
7. Do you dry the pond bottom after ploughing? (Yes / No)
8. How many days the pond bottom is allowed to dry; (5-7, 7-15, 15-21)
9. Whether compaction of the bottom is done after the pond preparation; (Yes / No)
10. Compaction avoids turbid water conditions during culture period: (Yes / No)
11. Do you check the soil PH and pond water PH before the application of lime? (Yes / No)
12. Whether the PH is checked by using: (PH meter, PH indicator solutions, PH papers)
13. Liming during pond preparation optimizes PH and alkalinity conditions of soil and water (Yes / No)
14. There are recommended levels for lime application (Yes / No)
15. Quick lime or hydrated lime is used only when the soil PH is <5 (Yes / No)
16. Shell lime, agricultural lime or dolomite is used if the soil PH is >5 (Yes, No)
17. In acid sulfate soil, the lime is applied after filling the pond with water (Yes / No)
18. In case of disinfecting, which is applied first (Lime, Disinfectant)
19. Whether the influent water is filtered (Yes / No)
20. What is the mesh size of the filter used?
21. Are you using water from the reservoir or directly?
22. Keeping in reservoirs improve the water quality (Yes / No)
23. How long the water is to be kept in reservoirs before pumping into the farm?
24. The grow-out ponds should be filled at least 14 days before stocking (Yes / No)
25. The optimum water depth in the pond should be 1.2m (Yes / No)
26. Whether the foot valve of the suction line is kept sufficiently (half a foot) above the pond bottom (Yes / No)

**Fertilization**

1. Fertilization increases production of natural food in shrimp ponds (Yes / No)
2. Extensive culture systems rely completely on the natural productivity and fertilizers (Yes / No)
3. Green algae reduces stress on shrimp PL and prevents growth of harmful benthic algae in the pond bottom (Yes / No)
4. Green algae prevents sunlight touching the pond bottom (Yes / No)
5. A heavy bloom ultimately leads to a collapse (Yes / No)
6. Green water ponds have better production and lower risk of disease outbreaks (Yes / No)
7. Higher nutrient load and less water exchange may lead to excessive algal bloom (Yes / No)
8. Quantity of cowdung used per ha (300-500kg)
9. Organic fertilizers like fresh cowdung may contaminate the pond water (Yes / No)
10. Are you using any inorganic fertilizers like urea or superphosphate (Yes / No)
11. What is the quantity used per ha (30-50kg)
12. Fertilisation is done 10 days before stocking (Yes / No)
13. Do you know that organic fertilizers like cowdung or chicken manure give a stable bloom (Yes/No)

14. Inorganic fertilizers result in sudden development and crash of bloom (Yes/No)

15. Mixed fertilization is the best method (Yes/No)

16. Semi intensive culture systems require a combination of fertilizers and supplemental feeds (Yes/No)

**Seed and seeding**

1. Whether the seed is procured from hatchery or nursery
2. Do you carry out the PCR test before purchasing the seed (Yes/No)
3. No. of PL used for PCR test (59, <59, >59)
4. Prevalence of WSSV in the seed tested usually (5%, <5%, >5%)
5. Transportation time from hatchery to farm (6hrs, >6hrs, <6hrs)
6. What is the mortality rate during transportation?
7. Colour of the seed
8. Size of juveniles (16mm, 10-15mm, 15-20mm)
9. Age of the seed
10. Quality of the seed (active, less active)
11. Stocking density; (3-5, 5-7, 6-8, 8-10 PL/ m²)
12. Are you transporting the seeds in transportation bags? (Yes/No)
13. Do you know that there are recommended densities of seeds in transportation bags?
14. Do you separate the weak seeds before stocking? (Yes/No)
15. Do you employ any formalin treatment? (Yes/No)
16. What is the concentration and dipping time?
17. Do you know that it is 100ppm for 30 minutes in the case of hatchery procured seeds (Yes/No)
18. Do you know that it is 150ppm for 15 minutes in the case of nursery procured seeds (Yes/No)
19. Do you know that the formalin treatment should be done along with aeration? (Yes/No)
20. Do you know that the formalin treatment should not be done if the PL are moulting (Yes/No)

21. The formalin treatment is helpful in reducing the external parasites and fouling (Yes/No)

22. Do you acclimatize the PL to the pond water conditions before stocking (Yes/No)

Water quality management

1. Do you know that the water exchange should not exceed 30% of water in the pond (Yes/No)

2. Do you know that the ideal water exchange should be 10% of water in the pond (Yes/No)

3. Do you know that it changes algal blooms, PH, salinity etc. (Yes/No)

4. The water depth in the shallowest part of the pond should be at least 80cm (Yes/No)

5. Is the water inlet and outlet screened (Yes/No)

6. Do you know that PH above 8.5 is not favourable for shrimp farming (Yes/No)

7. How do you adjust the changes in PH (by water exchange, by application of lime)

8. Are you using probiotics, zeolite, BKC, iodine etc. (Yes/No)

9. What are the water quality parameters evaluated daily (PH, Temp., Colour, transparency)

10. How often do you check the alkalinity?

11. Low alkalinity and algal blooms can change the PH suddenly (Yes/No)

12. It is easier to control the water quality in low salinity areas (Yes/No)

13. Whether other water quality evaluation tests done (TSS, BOD, COD, DO, TN, TP)

14. Do you know the recommended ranges of values for these? (Yes/No)

15. The level of total ammonia nitrogen should not exceed 1ppm at a PH of 8.5 (Yes/No)
18. Are you providing aeration? (Yes/No)
19. When is the aeration employed? (morning, evening, morning to evening, evening to morning)
20. Do you know that aeration should be provided after 30 days of culture when the stocking density exceeds 6 Shrimp / m² (Yes/No)
21. Aeration is applied when (Shrimps start surfacing, Bottom soil quality is bad, Water becomes turbid and dark in colour)
22. How often do you check the pond bottom soil (Daily, Weekly, Monthly)
23. Whether the soil is examined for (black soil, benthic algae, bad smell)
24. Do you know that low dissolved Oxygen is mainly the result of organic wastes at the pond bottom (Yes/No)
25. Black and toxic bottom sediments adversely affect shrimp health (Yes/No)
26. What do you usually do if the shrimp is found to come to the water surface unusually?
27. Do you use any antibiotics (Yes/No)
28. Prophylactic treatments should be avoided due to the chance for development of antibacterial resistance (Yes/No)
29. The effluents containing chemical residues should not be discharged to natural water bodies (Yes/No)

Feed Management
1. Intensive culture systems rely heavily on feeds and require less input of fertilizers (Yes/No)
2. Sources of feed: a) Within the state ( ) Outside the state ( ) b) (Direct, supplier, both)
3. Do you evaluate the suppliers according to the feed quality, availability, rate etc (Yes/No)
4. Are your suppliers able to supply adequate quantity of feed at the right time (Yes/No)
5. Does the farm maintain adequate reserve stock of feed? (Yes/No)
6. No. of feed suppliers (single / many)
7. Are the feed suppliers registered? (Yes/ No/ do not know)
8. Do you test the feed before or after purchasing? (Yes/No)
9. What is the type of arrangement with your suppliers?
10. Do you give medicated feed? (Yes/No)
11. Is the feed completely taken (Always / often / sometimes )
12. Types of feed used : (cut fish/ artificial)
13. Whether pellet feeding is employed ( Yes / No )
14. Are you following the feed tables supplied by the feed manufacturers
   ( Yes / No )
15. Whether meal quantity is decided on the basis of (body weight of shrimp,
    feed tray result, both )
16. Whether mixing two feed pellet sizes done
    ( Yes / No )
17. When is the feed trays first introduced ( after one week of stocking?)
    ( Yes / No )
18. Is it also used for checking the general condition of shrimp ( Yes / No )
19. How often do you change the feeding area (once in 10 days, 15, 20)
20. Whether the feeds are stored properly
21. Length of storage of feeds:
22. Do you keep any feed records ? ( Yes / No )
23. Do you know that antibiotics and a range of probiotics have no significant
    effect on the risk of shrimp disease outbreaks ( Yes / No )
24. Lime, fertilizers and disinfectants have some protective effect against
    shrimp diseases
    ( Yes / No )
25. Feed additives including vitamin and mineral premix and some bacterial
    products have some beneficial effect on shrimp production ( Yes / No )
26. Pesticides and antibiotics lead to residues in harvested shrimp ( Yes / No )
27. Fertilizers, lime, zeolite and related compounds do not lead to residues in harvested shrimp ( Yes / No )
Chemicals Management

1. EDTA can reduce the bioavailability of heavy metals by complexation (Yes/No)
2. Zeolites are tectosilicate minerals applied to shrimp ponds to remove ammonia (Yes/No)
3. Zeolite is applied at a dose of 100-500kg/ha (Yes/No)
4. Fertilizers if used indiscriminately can cause deterioration of soil and water conditions (Yes/No)
5. Chlorine decays with time by the action of sunlight and by use for oxidation of organic matter (Yes/No)
6. Release of chlorinated water to the receiving water body can cause localized biological effects (Yes/No)
7. Iodophores are widely used as disinfectants in shrimp farming (Yes/No)
8. Quaternary ammonium compounds like BKC have detergent and antibacterial activity and are widely used as bactericides and fungicides (Yes/No)
9. Use and ingestion of chloramphenicol in humans is associated with aplastic anaemia (Yes/No)
10. The major environmental hazard of chloramphenicol is its potential to increase drug resistance (Yes/No)
11. Antibacterial agents like nitrofurans are potential carcinogens (Yes/No)
12. The use of some drugs like chloramphenicol are banned in aquaculture (Yes/No)
13. Whether the enforcement of such bans is existent, weak or non-existent in your region (Yes/No)
14. Do you think such regulations are to be strengthened for better consumer protection (Yes/No)
15. Is there proper surveillance programmes to monitor compliance with limits on tissue residues (Yes/No)
16. Treatment concentrations of chemicals are as per instructions on the product (Yes/No)
17. Formalin is a potential carcinogen and should be handled carefully
18. Malachite green is widely used as an antifungal and antiprotozoan agent (Yes/No)

19. Malachite green is a respiratory enzyme poison and lengthy withdrawal period is needed following its application (Yes/No)

20. Treflan is the most commonly used prophylactic fungicide in shrimp hatcheries (Yes/No)

21. Ammonia and Saponin are widely used in shrimp culture as piscicides prior to stocking (Yes/No)

22. Vitamin C has got widespread use as a feed supplement (Yes/No)

23. Tiger shrimp with ascorbic acid deficiency show moulting incompetence, malformation of carapace, disorder of the gill and associated high mortality (Yes/No)

24. Do you use any chemicals like astaxanthin during growth phase for the artificial colouration of shrimp flesh (Yes/No)

25. The importing countries are imposing restrictions on compounds used by the shrimp farmers in the exporting countries and have introduced residue monitoring programmes for imports (Yes/No)

26. When an animal is treated with any chemical for therapeutic or other purposes, either by bath, oral or via injection, the chemical will generally be absorbed by the animal concerned (Yes/No)

27. MRL is the maximum concentration of residue considered to be without any significant toxicological risk for human health resulting from the use of a drug that is recognized as acceptable in food (Yes/No)

28. Withdrawal period is the time delay between cessation of therapy and harvesting (Yes/No)

29. There is potential for some chemical compounds used in aquaculture to pose health risks to farm workers (Yes/No)

30. Are the farm workers properly trained to handle chemicals (Yes/No)

31. Whether the chemicals are stored properly (Yes/No)
32. Is there any recommended practices for the application and use of chemicals (Yes / No)

33. Do you keep records regarding use of chemicals, daily checks and observations etc. (Yes / No)

**Disease management**
1. How many times the shrimp is examined daily? (Morning / Evening / both)
2. Peak disease season, if any noticed.
3. Major disease problems faced: (WSD, Vibriosis, Loose shell syndrome)
4. WSSV is the necessary cause of WSD (Yes / No)
5. WSSV alone can’t bring out a WSD outbreak in the pond (Yes / No)
6. WSSV can enter the shrimp and the pond through different routes (Yes / No)
7. Good pond management practices can reduce the risks of WSD (Yes / No)
8. Loose shell syndrome is a bacterial infection (Yes / No)
9. Viral diseases like WSD can’t be treated by antibiotics (Yes / No)
10. Vibriosis called ‘one month mortality syndrome’ is caused by vibrios (Yes / No)
11. HPV attacking the hepatopancreas of shrimp will cause slow or stunted growth (Yes / No)
12. Have you noticed any relation between WSSV and temperature? (Yes / No)
13. What measures are taken for preventing spreading of diseases (isolate the pond, inform the neighbouring farmers, net harvest the shrimp, disinfect the pond before discharging the water)
14. Do you treat the effluent before discharging into the water supply? (Yes / No)

**Harvesting**
1. What is the average size of shrimp at harvest
2. Gear used for harvesting?
3. Time taken for harvesting (2-4 hr; 4-6 hrs; 6-8 hrs; above 8 hrs)
4. What is the source of water used for washing the catch? (Well water, Public tap, Others)
5. What is the source of ice?
6. How many ice plants are there in your Panchayat?
7. What is the source of water used in the ice plant?
8. Is there any kind of monitoring system in the ice plant?
9. What is the type of ice used? (Block; Tube; Flake)
10. Icing ratio; (1:1, 1:2, 1:3)
11. Whether the raw material is kept in plastic krates, ss vessels or others
12. Are you using chlorinated water for washing the shrimp (Yes / No)
13. Chlorination levels (1-2 ppm; 2-5 ppm; 5-10ppm)
14. Do you employ any metabisulphite treatments? (Yes / No)
15. What is the concentration and dipping time?
16. Who is supervising the icing and the treatment processes?
17. Assessment of raw material quality is by (Sensory method, chemical, Microbiological, Physical)
18. Raw material temperature (Upto +5°C +5-10°C Above +10°C)
19. Raw material texture (Soft, Hard, Rubbery)
20. What is the time lag between harvest and despatch of the raw material?
   (Upto 2 hrs, 2-4 hrs, 4-6 hrs, above 6 hrs)
21. Do you encounter any quality problems in the shrimp raised?
22. Are you satisfied with the present level of production output?
23. What is the peak season of demand for your product?
24. Is the buyer and the price pre fixed? (Always, sometimes, never)

Facility
1. Adequate water exchange facilities
2. Surroundings maintained in good condition
3. Temperature and PH recording measures
4. Storage facilities for feed, chemicals and other things
5. Do you calibrate your thermometer and PH meter
General

1. Do you possess a GAP (Good Aquacultural Practices) manual (Yes / No)

2. Do you possess any literature on shrimp farming / shrimp health management (Yes / No)

3. Do you know there are standards for aquacultural inputs (Yes / No)

4. Do you know there are guidelines for effluent treatment (Yes / No)

5. Have you undergone any training in any aspects of shrimp farming (Yes / No)

6. Which agency provide you with the necessary technical support (Govt., Private, both)

7. Have you got any financial assistance from the Govt. or Govt. agencies (MPEDA, BFFDA, ADAK)

8. Have you heard about the recently enforced Coastal Regulations and Management Plans in your Panchayat? (Yes / No)

9. Whether HACCP plan is implemented? (Yes / No)

10. Are the CPs and CCPs clearly demarcated? (Yes / No)

11. Are there effective monitoring procedures? (Yes / No)

12. Whether corrective action techniques are satisfactory? (Yes / No)

13. Are there record keeping procedures? (Yes / No)

14. Are you satisfied with the present quality control set up? (Yes / No)

15. What are the factors influencing quality? (seed, feed, water quality, all these)

16. Are you aware of the latest developments in the field of quality assurance in seafood in India and abroad? (Yes / No)

17. Do you monitor the cost components regularly? (Yes / No)

18. What are the problems faced by you in this field?

19. Whether any type of support is needed (Research, credit, training, infrastructural, financial)

Signature

Date

xxx
APPENDIX-II

PRP QUESTIONNAIRE FOR THE SHRIMP HATCHERIES

General

1. Name and address
2. Nature of the firm (proprietary, partnership, public Ltd)
3. Title/ right of the property (Owned / Leased in)
4. Have you registered with any agency (Yes/No)
5. Year of establishment
6. Total area
7. Educational level
8. Age group
9. Experience
10. Is there any shrimp hatchery owner’s association in your district or state (Yes/No)
11. Are you a member ? (Yes/No)
12. Total number of employees
13. Number of persons per shift

Geographical location

1. Location of the hatchery (Good, Satisfactory, Bad)
2. Surroundings (Good, Satisfactory, Bad)
3. Whether good quality seawater is available (Yes/No)
4. How far is the seawater inlet from the hatchery?
5. Whether the climatic conditions are suitable (Yes/No)

Broodstock management

1. Is the broodstock available year round (Yes/No)
2. Transportation time from landing centre to hatchery
3. Average price of the spawners
4. Length/ weight of spawners/ brooders
5. Do you acclimatise the spawners before release into the maturation tank (Yes/No)
6. Whether they are disinfected (Yes/No)
7. If yes, what is the concentration and dipping time
8. Whether any antibiotic dip treatment is given (Yes/No)
9. What is the stocking density of the brooders (6-7 per m²)
10. What is the sex ratio at stocking (1:1)
11. How much is the water depth in the maturation tanks (60 cm)
12. The water exchange percentage (200%)
13. What all precautions do you take to maintain the noise and disturbance to the minimum
14. What are the water quality parameters checked (salinity, temp. and PH)
15. Are you using any cartridge filters for the breeding section (Yes/No)
16. What are the feeds given (squid, beef liver, clams, shrimps, polychaetes etc)
17. The feed quantity is 12% of the estimated shrimp biomass (Yes/No)
18. Details of the prophylactic and therapeutic treatments given;
19. What are the antibiotics used (chloramphenicol, prefuran, erythromycin, oxytetracycline)
20. How many times a day the siphoning is done (morning and evening)
21. Soft (moulted) females are not taken for eyestalk ablation (Yes/No)
22. Are the ablated females put in antibiotic solution before transfering to the maturation tanks (Yes/No)
23. How do you identify the potential spawners (by the thickening of the ovary and a diamond pattern in the first abdominal segment)

**Spawning and Hatching Management**
1. Whether the water in the spawning tank is treated (Yes/No)
2. If yes, upto what level it is treated
3. Good eggs will appear as a greenish granular accumulation at the bottom of the tank (Yes/No)
4. What is the mesh size of the hand net used for harvesting the eggs (350 micron) What is the mesh size of the harvesting bucket used for siphoning the eggs (100 micron)

5. The fertilized eggs can be identified by the symmetrical nature of cell divisions as well as by the presence of appendages and setae (Yes/No)

6. The unfertilized eggs appear as opaque or dark brown spheres with irregular cell divisions (Yes/No)

7. The fertility % usually obtained

8. How much volume of egg water is used for counting the eggs?

9. Whether the water in the hatching tanks are treated (Yes/No)

10. The aeration in the hatching tanks are kept to a minimum level (Yes/No)

11. What is the optimum temp and salinity required for the nauplii(28-320c and 29-34ppt)

12. The time lag required for the nauplii to reach the 6th sub stage, N6 (36 hours)

13. What is the mesh size of the harvesting bucket used for harvesting of nauplii (100 micron)

14. The nauplii are attracted towards the light (Yes/No)

15. It is preferable to reject nauplii produced from spawns with hatching rate below 40%

16. The nauplii that are not active and do not show a fairly regular rhythm of swimming and positive phototaxis also has to be rejected

17. The nauplii with physical deformities such as incompletely formed appendages and setae, twisted setae and those with accumulation of dirt also should be discarded

18. The nauplii pass through three zoeal and three mysis stages before they reach post larval stage

**Larval management**

1. Larval stages are critical and sensitive phases of shrimp life cycle

2. The adult P.monodon mature, mate and release eggs in the deep oceanic waters
3. The hatched out larvae dwell in the surface waters of the ocean till they reach the PL stage.

4. The Post larvae grow to sub adult stage in coastal, brackish waters.

5. Coastal, brackish waters have a salinity of 5 to 25 ppt whereas oceanic waters have a salinity of 28 to 35 ppt.

6. The larval phases of P. monodon needs an oceanic environment with a salinity of 28 to 35 ppt.

7. The nauplii can subsist on yolk (Yes/No)

8. The zoea feeds on phytoplankton (Yes/No)

9. Zoea is the first feeding stage (Yes/No)

10. Mysis feeds on phytoplankton and zooplankton (Yes/No)

11. The recommended stocking density of nauplii is 100,000/ton.

12. At what stage do you start artificial pellet feeding (from mysis stage onwards)?

13. How long is the post larvae reared in the larval section (upto PL 3 to 5)?

14. The larval rearing from N6 to PL 3 takes 13 days (Yes/No)

15. Do you properly record the salinity, temp. and pH. (Yes/No)

16. Are you facing any temp. fluctuation problems (Yes/No)

17. Are you using any thermostatically controlled insulated immersion water heaters (Yes/No)

18. Are you passing the seawater through electrical heating systems before filling the tanks (Yes/No)

19. Whether the room is provided with shade clothes over the tanks to prevent direct sunlight from entering the tanks (Yes/No)

20. The recommended range of seawater pH for a shrimp hatchery is 8.2-8.5 (Yes/No)

21. Is the larval rearing room isolated from other sections to avoid cross contamination (Yes/No)

22. The PL should be transferred to the post-larval section at PL-3 stage (Yes/No)
**Post larval management**

1. Do you acclimatise the PL before leaving into the tank (Yes/No)
2. Which type of tanks are used for rearing PL (reinforced concrete tanks of 20 ton capacity)
3. Whether the inner surface of the tanks are coated with food grade epoxy paints (Yes/No)
4. What is the stocking density of post larvae (25-50/lit)
5. Healthy post larvae appear to be clean, active, with full guts and well developed tail muscle.
6. Whether filtered, chlorinated, dechlorinated, EDTA treated water is used for larval rearing (Yes/No)
7. Whether filtered, dust and oil free air is used for aeration (Yes/No)
8. Do you know that there is a formula for estimating the number of eggs, nauplii, PL etc. in the tank (Yes/No)
9. The recommended salinity range for a shrimp hatchery is 28-35 ppt. (Yes/No)
10. The recommended range of seawater temp. for a shrimp hatchery is 28-320c. (Yes/No)
11. Aeration helps to keep optimum dissolved oxygen levels and proper circulation of water for facilitating availability of feed to larvae (Yes/No)
12. Feeding is one of the important factors determining the growth of larvae (Yes/No)
13. What types of feeds are given to the post larvae (Artemia, Micro-encapsulated diet, Egg custard)
14. When do you start giving the egg custard (from PL8 onwards)
15. What is the optimum temp required for the PL (28-10c) 29-34ppt
16. What is the optimum salinity required for the PL (31.5-1.5 ppt)
17. What is the optimum PH required for the PL (8.2)
20. Whether the water is treated with an antibiotic and 0.05 ppm Treflan as prophylaxis (Yes/No)

21. How often do you test the water sample in a recognised laboratory (annually, half yearly, never)

22. Whether the waste materials are siphoned out daily (Yes/No)

23. What will be the size of 20 days old PL (13 mm)

24. The viability of the hatchery depends on the cost of production of post larvae (Yes/No)

Feed Management

1. Sources of feed (within the state, outside the state)

2. Do you import any of the feeds (Yes/No)

3. Do you test the feeds before or after purchasing (Yes/No)

4. Are you following the feed tables supplied by the feed manufacturers (Yes/No)

5. What types of feeds are given? (Algae, Artemia, Micro encapsulated diets)

6. Is there an algal rearing section in your hatchery (Yes/No)

7. Zoeal stages are given only algae

8. Mysis and PLs need Artemia nauplii along with algae

9. Algae has to be fed after water exchange and in the evening at 3 P.M (Yes/No)

10. Do you estimate the residual algal cell density using a haemocytometer (Yes/No)

11. Cysts and cyst shells if introduced along with artemia nauplii may bring bacteria into the larval tank (Yes/No)

12. Do you think that supplementary feeds along with natural diets are needed for faster and healthy growth (Yes/No)

13. Are you using supplementary feeds as substitutes for natural feeds during periods of scarcity and vice versa (Yes/No)

14. What is the capsule size of micro encapsulated diets suitable for zoea (5-30 microns)

15. What is the capsule size of micro encapsulated diets suitable for mysis (40-90 microns)
16. What is the capsule size of micro encapsulated diets suitable for PL (90-150 microns)
17. Whether mixing of two feed pellet sizes done (Yes / No)
18. Is the feed mixed with water before feeding (Yes/No)
19. How many times a day the feed is given (6 A.M, 1 P.M, 5 P.M and 10 P.M.)

**Algal culture**

1. Which one is the best suitable algal species for P. monodon hatchery (Chaetoceros)
2. What is the recommended range of light intensity for good algal growth (1000-8000 lux)
3. What is the recommended temp. range for healthy and fast growth of algae (24-260c)
4. Aeration is necessary to keep the algae in suspension, to supply CO2 needed for growth and to stabilize PH (Yes/No)
5. Temp has a pronounced influence on photosynthesis, respiration and other metabolic activities of algae (Yes/No)
6. Whether the algal culture room is isolated from other sections of the hatchery (Yes/No)
7. Are you using filtered and chlorinated seawater for algal culture (Yes/No)
8. Whether you are isolating pure algal strain from the sea water or purchasing it
9. What is the price (Rs.300/25ml)
10. How many days do you store the stock culture (15 days)
11. How many days before the acquisition of gravid shrimp, do you start mass culture of algae (one month before)
12. Prolonged culture results in a decrease in size and nutritive value (Yes/No)
13. Vitamins are added to the autoclaved and cooled F/2 medium just before inoculation (Yes/No)
14. Whether ten percent inoculum is required at all culture levels to get the desirable cell density (Yes/No)
15. Are you recording the microscopic observation details, salinity, temp. etc. in a daily data sheet (Yes/No)
16. Are you maintaining a material consumption record (Yes/No)

**Artemia cyst Hatching**

1. Artemia can survive in salinities of 150-200ppt, but resorts to encystment of the embryo at gastrula stage (Yes/No)
2. How long the artemia cysts can usually be preserved (8-12 months)
3. What is the hatching time of artemia cysts (24-36hrs)
4. Which type of tanks are used for culture of artemia (fibre glass tanks of 450 lit capacity)
5. The optimum salinity required for efficient hatching of artemia cysts is 25-35ppt (Yes/No)
6. The optimum temperature required for efficient hatching of artemia cysts is 28-3200 (Yes/No)
7. The optimum PH required for efficient hatching of artemia cysts is 8.0-8.5 (Yes/No)
8. The optimum light intensity required for efficient hatching of artemia cysts is 2000 lux (Yes/No)
9. Whether continuous aeration is required for efficient hatching of artemia cysts (Yes/No)
10. Are you using special FRP tanks with transparent conical bottom for hatching of artemia cysts (Yes/No)
11. Whether the tank is provided with continuous aeration and fluorescent lights above it
12. Do you disinfect the artemia cysts in chlorine before stocking in the hatching tanks (Yes/No)
13. If so, what is the concentration and dipping time (200ppm for 15 minutes)
14. What is the stocking density of artemia cysts (1-2 g/l)
15. How is the nauplii separated from hatched shells and unhatched cysts?
16. The unhatched cysts will settle at the bottom and the unhatched shells will float at the surface (Yes/No)
17. The harvested nauplii should be thoroughly washed in seawater before feeding to the PL (Yes/No)
18. Do you estimate the hatching efficiency and population density? (Yes/No)
19. Do you keep a record of all these? (Yes/No)

**Seawater Quality Management**

1. Are you passing the sea water through a filter bed before it is collected and pumped into the reservoir (Yes/No)
2. Upto what level the water is chlorinated? (5-10 ppm)
3. Whether the water is filtered using rapid and slow sand filters(50u) (Yes/No)
4. Are you checking the residual chlorination with the help of chlorine test kits (Yes/No)
5. Do you allow at least one hour settlement time after adding EDTA (Yes/No)
6. What is the concentration of EDTA applied (10ppm)
7. What are the water quality parameters evaluated daily (PH, Temp, salinity, Colour, transparency)
8. Chlorination kills all pathogenic microbes as well as chemically removes iron by forming a red precipitate with it (Yes/No)
9. Do you treat the effluent before discharging into the water supply? (Yes/No)
10. Do you know the recommended ranges of values for these? (Yes/No)
11. Whether other water quality evaluation tests done (TSS, BOD, COD, DO, TN, TP)
12. Do you record it (Yes/No)

**Inspection**

1. How many times a day do you carry out the walk through examination; (7 A.M, 2 P.M, 10 P.M)
2. What are the parameters examined (tank water condition, aeration, algal density, artemia density, animal behaviour, health, feeding etc.)
3. Whether the microscopic examination is done on (swimming activity, feeding, morphological and developmental stages, symptoms of stress, presence of parasites and diseases etc.)
4. Do you encounter any quality problems in the PL raised? (Yes/No)
Transportation

1. Is it in order to reduce the normal activity of the PL that the temp. in the tub is reduced to 50°C before packing for transportation (Yes/No)
2. The water to air ratio in the transportation packets should be 1:3 (Yes/No)
3. Whether the bag is placed in a cardboard carton lined inside with thermocole sheet during transportation (Yes/No)
4. Why feed is avoided in the bag while in transportation (this will affect the water quality)
5. How is the packing density of the PLs in the bag decided upon (based on the transportation time and size of PLs)
6. Are you transporting the seeds in transportation bags? (Yes/No)
7. Do you know that there are recommended densities of seeds in transportation bags?
8. (Yes/No)
9. Do you separate the weak seeds before stocking? (Yes/No)
10. Do you carry out the PCR test before selling the seed (Yes/No)

Drug treatments

1. Whether the bioassay is conducted in the laboratory before a new batch of drugs is applied (Yes/No)
2. Do you take care to avoid drug treatments at transition stages (Yes/No)
3. Are you using only aquatic grade drugs which are water soluble (Yes/No)
4. The drugs should be dissolved in fresh water and administered near aeration points for thorough mixing (Yes/No)
5. All prophylactic and therapeutic treatments are given immediately after water exchange and feeding (Yes/No)
6. Photodegradable drugs should be given during night time (Yes/No)

Laboratory

1. Is there a laboratory attached to the larval rearing section (Yes/No)
2. Whether the laboratory is equipped with necessary equipments for conducting microbiological studies (Yes/No)
3. Is there a PCR lab attached to the hatchery (Yes/No)
4. Do you carry out the PCR test (Yes/No)

Equipments, Chemicals and drugs

1. Whether equipments (microscope, haemocytometer, PH meter, salinometer, autoclave, air oven, incubator, seawater testing kits etc.), adequate quantity of glasswares and utensils like Strainers with 100, 250, 350 and 500 nylon mesh, harvesting buckets, plastic buckets, tubs, plastic cans, glass and plastic beakers, feeding trays etc. are available (Yes/No)

2. Whether bleaching powder, detergents, antibiotics (chloramphenicol, oxytetracycline, erythromycine, furazolidon, prefuran), fungicides (Treflan, Malachite green, Formaline), EDTA and other required chemicals are available (Yes/No)

Disease management

1. History of disease outbreaks
2. Peak disease season, if any noticed
3. Which of the following diseases are more frequent? (bacterial, fungal, protozoan and or nutritional/toxic/environmental)
4. What measures are taken for preventing cross-contamination?
5. In case a disease outbreak occurs,
6. You discontinue the operation till the pathogen is eradicated by disinfection and drying (Yes/No)
7. Try to fight against the disease with drugs (Yes/No)
8. According to your opinion, which of the following primary stress factors affect most adversely (pollution effects, under-nourishment, overcrowding, bad water quality)

Disinfection and Shut down operations

1. Do you clean and sanitize the utensils before and after each use (Yes/No)
2. Whether the culture tanks, utensils, walls and floor of the building and reservoir are cleaned with a detergent and washed with fresh water (Yes/No)
3. What is the concentration of chlorine used for disinfection (200ppm)
4. How many days it is allowed to dry (7 days)
5. Whether the PVC lines are filled with 1000ppm chlorine for three days (Yes/No)
6. Whether the water supply lines and reservoir tanks cleaned and disinfected at frequent intervals (Yes/No)
7. What is the concentration and duration of formalin soaking (50ppm for 3 days)
8. Whether rinsed with freshwater and dried (Yes/No)
9. Cleaning and drying of every part of the hatchery is essential to ensure better production in the next cycle (Yes/No)
10. Whether the facility is shut down at least annually for maintenance work (Yes/No)
11. Are you recording the day to day activities to facilitate production traceability and economic efficiency (Yes/No)

**Hygiene precautions**

1. Are you restricting the movement of people, equipments and other things from one section to the other (Yes/No)
2. Whether the employees are following good hygienic practices (Yes/No)
3. Whether proper washing facilities and hand and foot dips are provided at the entrance to each section (Yes/No)

**General**

1. Do you possess any literature on good hatchery management practices (Yes/No)
2. Do you know there are standards for hatchery feeds (Yes/No)
3. Do you know there are guidelines for influent and effluent water (Yes/No)
4. Have you undergone any training in any aspects of hatchery management (Yes/No)
5. Which agency provide you with the necessary technical support (Govt., Private, both)

6. Have you got any financial assistance from the Govt. or Govt. agencies (MPEDA, BFFDA, ADAK)

7. Whether HACCP plan is implemented? (Yes/No)

8. Are the CPs and CCPs clearly demarcated? (Yes/No)

9. Are there effective monitoring procedures? (Yes/No)

10. Whether corrective action techniques are satisfactory? (Yes/No)

11. Are there proper record keeping procedures? (Yes/No)

12. Are you satisfied with the present quality control set up? (Yes/No)

13. What are the factors influencing quality? (Spawners, feed, water quality, all these)

14. Are you aware of the latest developments in the field of quality assurance in seafood in India and abroad? (Yes/No)

15. Which aspect is more difficult (water/ feed/ disease management)

16. Do you monitor the cost components regularly? (Yes/No)

17. Are you satisfied with the present level of production output? (Yes/No)

18. What is the peak season of demand for your product?

19. Is the buyer and the price pre fixed? (Always, sometimes, never)

20. What is the selling price of PL

21. What are the problems faced by you in this field?

Date    Signature

xxx