

**Ministry of Agriculture**  
(Department of Animal Husbandry, Dairying and Fisheries)

**NOTIFICATION**

New Delhi, the 22nd December, 2005

**G.S.R 740(E) – In exercise of the powers conferred by section 24 of the Coastal Aquaculture Authority Act, 2005 (24 of 2005), the Central Government hereby makes the following rules, namely:-**

**CHAPTER I**  
**Preliminary**

- 1. Short title and commencement:-** (1) These rules may be called the Coastal Aquaculture Authority Rules, 2005.
- (2) They shall come into force on the date of their publication in the Official Gazette.

**2. Definitions :-**

In these rules, unless the context otherwise requires:

- (a) “Act” means the Coastal Aquaculture Authority Act, 2005 (24 of 2005);
- (b) “Authority” means the Coastal Aquaculture Authority established under sub-section (1) of section 4 of the Act;
- (c) “Chairperson” means the Chairperson of the Authority;
- (d) “Fee” means any fee stipulated in these rules;
- (e) “Form” means Form annexed to these rules;
- (f) “Guidelines” mean the guidelines made under section 3 of the Act;
- (g) “member” means the member of the Authority appointed under sub-section (3) of section 4 of the Act and includes the Chairperson and the Member Secretary ;
- (h) “regulations” mean the regulations made by the Authority;
- (i) “notification” means a notification published in the Official Gazette;
- (j) Words and expressions used herein and not defined but defined in the Coastal Aquaculture Authority Act, 2005 (24 of 2005) or the Environment Protection Act, 1986 (29 of 1986) shall have the meaning respectively assigned to them in that Act.

**CHAPTER II**  
**Guidelines**

- 3. Guidelines for regulation of coastal aquaculture under section 3 of the Act are annexed to these rules:-**

**CHAPTER III**  
**The Authority and its Committees**

**4. Terms and conditions of the service of Chairperson and Members:-**

The terms and conditions of service of Chairperson and Member.

- (1) The Chairperson shall be entitled to such salary and allowances and such conditions of service in respect of leave, pension, and other matters as may from time to time, be fixed by the Central Government for a *Secretary* to the Government of India.
- (2) The Member Secretary of the Authority shall be entitled to such salary and allowances and such conditions of service in respect of leave, pension and other matters as may be fixed by the Central Government for an *Additional Secretary* to the Government of India.
- (3) The members appointed under clauses (b), (c), (d), (e), (f) and (g) of sub-section (3) of section 4 of the Act shall be part-time members. They shall not be entitled for any salary and allowances under this Act except that non-official members will be entitled to sitting fees as well as TA, DA, etc. as may be fixed by the Central Government from time to time.
- (4) A member appointed under clauses (b), (c), (d), (e), (f) and (g) of sub-section (3) of section 4 of the Act shall cease to be a member if he / she ceases to hold the office by virtue of which he/ she was appointed.
- (5) The Chairperson may resign his/ her office by giving notice in writing to the Central Government and upon such resignation being accepted by the Central Government, the Chairperson shall be deemed to have vacated his/ her office.
- (6) A member may resign his / her office by a letter addressed to the Chairperson. The office of a member shall fall vacant from the date on which the resignation of such member is accepted by the Central Government or on expiry of 30 days from the date of the receipt of the resignation by the Chairperson, whichever is earlier.
- (7) The Central Government may remove any member who becomes subject to disqualification under section 5 of the Act.
- (8) The Central Government may also remove any member, if he / she without the approval of the Chairperson, fails to attend three consecutive meetings of the Authority.
- (9) The Member Secretary shall be responsible for the implementation of the decisions arrived by the Authority or by the Committees set up by it and the discharge of the duties imposed on him/ her under the rules.
- (10) The Member Secretary shall in consultation with the Chairperson, fix the date, time, place and also draw up agenda for every meeting.
- (11) The Member Secretary shall have powers of general superintendence, which shall include:
  - (a) to grant leave to the Officers and Staff of the Authority;
  - (b) to exercise administrative control over all divisions and officers of the Authority;

- (c) to call for documents and record and to inspect or cause to be inspected, the accounts and places of storage or of business as required under the rules;
- (d) to sanction expenditure for contingencies, supplies and services and purchase of articles required for the working of the office of the Authority;
- (e) cause all important papers and matters to be presented to the Authority as early as practicable; and
- (f) issue directions as to the method of carrying out the decisions of the Authority.

**5. Functions of the Authority:-**

The Authority shall perform the following functions to -

- (i) ensure that the agricultural lands, salt pan lands, mangroves, wet lands, forest lands, land for village common purposes and the land meant for public purposes and national parks and sanctuaries shall not be converted for construction of coastal aquaculture farms so as to protect the livelihood of coastal community;
- (ii) deal with any issues pertaining to coastal aquaculture including those which may be referred to it by the Central Government;
- (iii) *survey the entire coastal area of the country and advise the Central Government and the State/ Union territory Governments to formulate suitable strategies for achieving eco-friendly coastal aquaculture development;*
- (iv) advise and extend support to the State/ Union territory Governments to construct common infrastructure viz., common water in-take and discharge canals by the coastal aquaculture farms and common effluent treatment systems for achieving eco-friendly and sustainable development of coastal aquaculture;
- (v) fix standards for all coastal aquaculture inputs viz., seed, feed, growth supplements and chemicals/ medicines for the maintenance of the water bodies and the organisms reared therein and other aquatic life;
- (vi) carryout and sponsor investigations and studies/schemes relating to environment protection and demonstration of eco-friendly technologies in coastal aquaculture;
- (vii) collect and dissemination of data and other scientific and socio-economic information in respect of matters related to coastal aquaculture;
- (viii) prepare manuals, codes and audio visual material relating to sustainable development of coastal aquaculture and activities relating there to;
- (ix) *organise through media and other means of communication a comprehensive programme regarding sustainable utilization and fair and equitable sharing of the coastal resources for aquaculture purpose;*
- (x) plan and organise training of personnel engaged or likely to be engaged in programmes for sustainable utilization of the coastal resources for aquaculture purposes;
- (xi) constitute various technical committees, sub-committees, working groups, sub-groups comprising the Members and Officers of the Authority, Scientists and Officers of the National Research Institutes/ State Governments/ Representatives of the Civil Society for preparation of technical manuals, code of conduct, etc.

- (xii) direct the owners of the farm to carry out such modifications to minimize the impacts on coastal environment including stocking density, residual levels/ use of antibiotics, chemicals and other pharmacologically active compounds.
- (xiii) order seasonal closure of farms for ensuring sustainability of the coastal aquaculture practices;
- (xiv) order closure of coastal aquaculture farm in the interest of maintaining environmental sustainability and protection of livelihoods or for any other reasons considered necessary in the interest of coastal environment.
- (xv) cancel the certificate of registration where it is satisfied that any person has obtained a certificate of registration under sub-rule (1) of rule 11 by furnishing false information or that he/she has contravened any of the provisions of these rules or of the conditions mentioned in the certificate of registration, without any prejudice to any other action, that may be taken against such person:  

Provided that before cancelling such certificate, the person concerned shall be given an opportunity to make his/ her representation,

Provided further that a copy of the order together with the reasons for the cancellation shall be communicated to the person concerned;
- (xvi) frame recruitment rules for the posts created for the Coastal Aquaculture Authority and till such time issue order that the recruitment to the posts be made on the basis of recruitment rules for analogous posts in the Central Government.
- (xvii) determine the pay, leave, allowances and other terms and conditions of the service of the employees of the Authority:  

Provided that the pay, leave, allowances, other conditions of service and other facilities and concessions such as advances of pay, advances of conveyance, construction of houses and the like in respect of all employees in Coastal Aquaculture Authority shall be regularised in accordance with such rules and orders as are for the time being applicable to officers and employees of the Central Government of the corresponding grades or status stationed at those places till separate regulations are made by the Coastal Aquaculture Authority.
- (xviii) make suitable recommendations to the Government for amending the guidelines under rule 3 from time to time taking into account the changes in technology, farming practices, etc, and incorporating such modifications in the guidelines to ensure environmental protection and the livelihoods of the coastal communities.

**CHAPTER IV**  
**Powers and functions of the one man Authority**

**6. Powers and functions of the one man Authority:-**

- (a) The one man authority to be appointed under sub-section (2) of section 11 of the Act shall exercise the powers of a District Magistrate with regard to the compensation as may be settled between the workers and the management.
- (b) While settling the compensation to be paid to the workers factors such as the likely loss of income for the workers, the alternate employment opportunities for them and the paying capacity of the employer may be taken into account.
- (c) For the purpose of ensuring that the amount of compensation settled is paid to the workers, the one man authority shall exercise the powers of the Collector and District Magistrate under the land revenue laws of the respective States.

**7. Power to enter on any coastal aquaculture land. The powers of a person authorised by the Authority to enter on any coastal aquaculture land, pond, pen or enclosure shall be subject to the following:-**

- (i) the person authorized by the Authority shall have the powers to take one or more persons including police personnel to carry out the functions mentioned in this section;
- (ii) the Authority's decisions to make any inspection, survey, measurement, valuation or inquiry as well as removal or demolition of any structure shall be intimated to the owner of the coastal aquaculture land, pond, pen or enclosure or his/her representative at least 24 hours in advance in writing and delivered to him/her by registered post or by messenger. In addition, such notice shall also be pasted at a prominent place in the premise of the coastal aquaculture farm. In case of refusal by the owner to accept the notice, such pasting shall be deemed to be due service of the notice on him;
- (iii) the activities mentioned in section 12 of the Act shall be carried out in the presence of the owner or his/her representative if he desires to do so. The owner may also be permitted to bring his/ her own staff (not more than two) to assist in the inspection, survey, measurement, valuation or inquiry;
- (iv) removal or demolition of any structure should be carried out under a panchanama and wherever possible a representative of the local body should be included in the team and his / her signature recorded in the panchanama;
- (v) the person(s) authorized by the Authority to perform the functions as mentioned under clauses (a) and (b) of section 12 of the Act shall do so only during the daytime, i.e., after sunrise and before sunset;
- (vi) the person(s) authorized by the Authority to perform the functions under clause (a) of section 12 of the Act shall endeavour that such functions are carried out without causing any damage to the civil structures, equipment, machinery or the standing crop.

**8. The acts or things which are to be done under clause (c) of section 12 of the Act: Any person authorised by the Authority shall :-**

- (1) take samples of water, soil and the farmed animal for the purpose of detection of banned antibiotics, chemicals and other pharmacologically active compounds and to adopt appropriate procedures for collection, analysis, reporting and follow up action;

- (2) subject to the provision of rule 7, remove or demolish any coastal aquaculture farm which is causing pollution and which was not removed or demolished after an order to that effect, passed under clause (d) of sub-section (1) of section 11 of the Act.
- (3) drain the water from the coastal aquaculture farm or destroy the crop which is causing pollution in respect of which an appropriate order passed under clause (e) of sub section (1) of section 11 of the Act has not been complied with.
- (4) authorize/recognize laboratories to carry out analysis of soil, water, farmed animals/ other farmed aquatic life for the purpose of detection of banned antibiotics, chemicals and other pharmacologically active compounds.

## CHAPTER V

### Registration and Renewal

#### 9. Application for registration and the fees to be paid under sub-section (4) of section 13:-

- (1) Every application for the registration of a coastal aquaculture farm shall be made to the District Level Committee as set up by the Authority in **Form I**, obtainable from the office of the District Level Committee or the office of the Authority or be downloaded from the website of the Authority.
- (2) Every application under sub-rule (1) for the registration of coastal aquaculture farm specified in column (1) of the Table below shall be accompanied by the fee specified in the corresponding entry in column (2) of the said Table.

TABLE

(1)	(2)
1. Up to 5.0 hectare (ha) water spread area	Rs.200 per ha (or fraction of a ha), subject to a minimum of Rs. 500/-
2. From 5.1 to 10 ha water spread area	Rs. 1000 plus Rs. 500 per ha (or fraction of a ha) in excess of 5 ha.
3. From 10.1 ha water spread area and above	Rs. 3500 plus Rs. 1000 per ha (or fraction of a ha) in excess of 10 ha.

- (3) The fees for registration shall be payable in the form of Demand Draft in favour of the Member Convenor of the District Level Committee set up by the Authority.

#### 10. The manner of considering application for registration:-

- (1) On receipt of an application under sub-rule (1) of rule 9, the District Level Committee shall verify the particulars given in the application in respect of all coastal aquaculture farms irrespective of their size; and
  - (a) in the case of coastal aquaculture farms up to 2.0 ha water spread area, the District Level Committee upon satisfaction of the information furnished therein shall recommend the application directly to the Authority for consideration of registration under intimation to the State Level Committee

- (b) in the case of coastal aquaculture farms above 2.0 ha water spread area, the District Level Committee shall inspect the concerned farm to ensure that the farm meets the norms specified in the guidelines with specific reference to the siting of coastal aquaculture farms and recommend such applications to the State Level Committee, which upon satisfaction shall further recommend the application to the Authority for consideration of registration.
- (2) In case any defect is noticed in the application, the attention of the applicant shall be drawn in writing, requesting him/her to rectify the defect within a specified period and in case of failure on the part of the applicant to rectify the defect within such period, the registration shall be refused.
- (3) The time-frame for consideration of application for registration shall be as specified in the regulations.
- (4) For the purpose of this rule, the compositions of District Level and State Level Committees shall be as below:-

**A. District Level Committee**

- (a) District Collector - Chairperson
- (b) Representative of the State/Union Territory Revenue Department - Member
- (c) Representative of the State/Union Territory Agriculture Department - Member
- (d) Representative of the State/Union Territory Environment Department - Member
- (e) Representative of the State/Union Territory Zilaparishad - Member
- (f) Assistant Director / District Level Fisheries officer of the State/Union Territory Fisheries Department - Member-Convener

**B. State Level Committee**

- (a) Secretary-in-charge of Fisheries of the State/Union Territory Government - Chairperson
- (b) Secretary-in-charge of Revenue of the State/Union Territory Government - Member
- (c) Secretary-in-charge of Environment of the State/Union Territory Government - Member
- (d) Representative of the Marine Products Export Development Authority - Member
- (e) Director / Commissioner-in-charge of Fisheries of the State/Union Territory Government - Member-Convener

- (5) Where the applications for registrations is refused, the reasons for such refusal shall be recorded in writing and a copy of the same along with the order of refusal shall be furnished to the applicant;
- (6) The Authority or any officer authorised by the Authority may require the applicant to furnish within a specified period such additional information as he/she may consider necessary for the purpose of registration / renewal and every such applicant shall be bound to furnish such information within the specified period.
- (7) The Authority may, by order, refuse an application for registration/renewal of a coastal aquaculture farm if the applicant fails to furnish the information asked for or furnishes incorrect information; a copy of the order together with reasons for such refusal shall be communicated to the applicant.
- (8) Nothing in sub-rule (5) shall preclude the applicant to apply afresh for registration after six months of the rejection made there under, if the applicant has rectified the defects and has reasons to believe that he can fully comply with the standards specified by the Authority.
- (9) If during the period when the registration of the coastal aquaculture farm is in force, the owner thereof desires to make any change, he/she shall apply to the Authority at least thirty days in advance and the Authority shall make such enquiries, as considered necessary before order can be passed for effecting the change. Where the Authority agrees to the change, details of such change shall be entered in the certificate of registration.
- (10) Any person aggrieved by an order of refusal under sub-rule (5) of rule 10 may within thirty days from the date of receipt by him of a copy of the order of refusal or cancellation, as the case may be, appeal to the Chairperson who may either affirm, vary or set aside such order.

**11. The form for using a certificate of registration:-**

Where the application for registration is not refused, a certificate of registration shall be granted in **Form II** and shall be subject to the terms and conditions specified in the certificate.

**12. Application for renewal of registration and the fees to be paid:-**

- (1) Every application for renewal of registration of a coastal aquaculture farm shall be made before two months of the expiry of such registration to the Authority in **Form III** and the Authority shall renew the registration for a further period of five years.
- (2) The fees payable for renewal of registration shall be same as specified under sub-rule (2) of rule 9 for registration.
- (3) Every application for renewal of registration of a coastal aquaculture farm shall be made to the District Level Committee, which upon examination shall forward it to the Authority through the State Level Committee.
- (4) The time frame for consideration of renewal of registration shall be as specified in the regulations.
- (5) Where the Authority is satisfied that further continuation of the said coastal aquaculture farm is harmful to the coastal environment it shall refuse to renew the registration:  
Provided that before refusal to renew the registration, the Authority shall give the concerned person an opportunity to be heard;



Provided further that a copy of the order together with the reasons for the refusal to renew the registration shall be communicated to the person concerned.

- (6) Any person aggrieved by an order of refusal of renewal may within thirty days from the date of receipt by him of a copy of the order of refusal, appeal to the Chairman who may affirm, vary or set aside such order.

**13. The form and time for preparation of the budget:-**

- (1) The Authority shall, in each financial year, prepare a budget for the Coastal Aquaculture Authority for the next financial year and shall submit it for sanction to the Central Government on or before such dates as may be appointed by the Central Government.
- (2) No expenditure shall be incurred until the budget is sanctioned by the Central Government and the sanction for that expenditure by the competent authorities is received.
- (3) The budget shall be prepared in the following form or as may be directed by the Central Government indicating:-
- (a) the estimated opening balance;
  - (b) the estimated receipts referred to in sub-section (1) of section 17 of the Act;
  - (c) the estimated expenditure classified under the following broad heads or such other heads as per the schemes approved by the Central Government, namely
    - (i) Administration;
    - (ii) Development;
    - (iii) Statistics;
    - (iv) Inspection / Works;
    - (v) Financial and other assistance / subsidy scheme;
    - (vi) Others

*Note:- Wherever applicable, full details shall be given, under various sub heads for each broad head, indicating estimated expenditure including that of pay of officers, pay of establishment, allowance, honoraria, contingencies and the like.*

- (4) Supplementary estimates of expenditure, if any, shall be submitted for the sanction of the Central Government in such form and on such dates as may be directed by it in this behalf.

**14. The form and time for preparation and submission of annual report:-**

- (1) The Chairperson or such employee of the Authority as may be authorized in this behalf, shall prepare, as soon as may be after the commencement of the each financial year the annual report which shall include an account of the activities of the Authority during the previous financial year which shall contain the following information –
- (a) a statement of corporate and operational goals and objectives of the Authority;
  - (b) annual targets and physical and financial terms set for various activities in the background of sub-rule (1) together with a brief review of the actual performance with reference to those targets;
  - (c) an administrative report on the activities of Authority during the previous financial year and an account of the activities which are likely to be taken up during the next financial year;

- (d) a summary of the actual financial results during the previous financial year and year of report;
  - (e) important changes in policy and specific measures either taken or proposed to be taken, which have influenced or are likely to influence the profitability or functioning of the Authority;
  - (f) new projects or expansion schemes contemplated together with their advantages, financial implications and programme for execution;
  - (g) important changes in the organisational set up of the Authority;
  - (h) report on employer-employee relations and welfare activities of the Authority; and
  - (i) report on such other miscellaneous subjects as deemed fit by the Authority or the Central Government for reporting to the latter.
- (2) The annual report shall be placed for adoption in the meeting of the Authority and shall be signed by the Chairman or in his absence by two members authorized for the purpose by the Chairman and authenticated by fixing the common seal of the Authority and required copies thereof shall be submitted to the Central Government by the thirty-first day of December of the following year.

**15. The form and manner of maintaining the accounts of the Authority:-**

- (1) The Authority shall maintain accounts of all receipts and expenditure relating to every financial year.
- (2) A separate bank account shall be maintained for the registration fee.
- (3) The expenditure incurred in a particular financial year shall be shown under separate heads and Sub-heads.
- (4) The opening balance, if any, shall also be stated as such separately.
- (5) The closing balance of the year shall be shown at the foot of the accounts on the expenditure side.
- (6) The books of accounts, other books in relation to the accounts, will be maintained in the form as laid down in various General Financial Rules, Central Treasury Rules, Receipts and Payment Rules in force from time to time except as otherwise provided in these Rules, the provisions of the Central Treasury Rules, the Delegation of Financial Power Rules, 1958, and the General Financial Rules, 1962 of the Central Government, for the time being in force, shall subject to such modifications or adaptations as may be made by the Authority therein with the previous approval of the Central Government and shall apply to all financial transactions of the Authority.

[F.No. 33036/5/2005-Fy (T-2)]

(Ajay Bhattacharya)  
Joint Secretary to the Govt. of India

**FORM I**  
(see rule 9)

**COASTAL AQUACULTURE AUTHORITY**  
**MINISTRY OF AGRICULTURE**

Application for Registration of Coastal Aquaculture Farm

1. Name of the applicant(s)/ registered company/ establishment (in BLOCK LETTERS with permanent address) :
2. Address for Communication (in BLOCK LETTERS) :
3. Whether the application is for:
  - (a) Registration of aquaculture farm already operating in coastal area : Yes/ No
  - (b) Registration of new aquaculture farm to be constructed : Yes/ No
4. Details of land for which registration is applied for :
  - (a) State :
  - (b) District :
  - (c) Taluk/ Mandal .
  - (d) Revenue village :
  - (e) Survey Number :
  - (f) Ownership right (whether freehold or lease hold) :
  - (g) Total Farm Area (in hectare) :
  - (h) Water Spread Area (in hectare) :
5. If the whole or a part of the above land falls under any one of the following categories, please furnish details :

Category	Village	Survey Numbers	Extent (in ha)
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- (f) Mangroves
  - (g) Salt pan
6. Indicate the distance of unit site from
- (a) High tide line :
  - (b) Nearest drinking water source :
  - (c) Agricultural land :
  - (d) Mangrove :
  - (e) Marine protected area :
  - (f) Adjacent aquaculture farm :
  - (g) Human settlements (Indicate the population of the settlement) :
  - (h) National parks :
  - (i) Sanctuaries :
  - (j) Reserve forests :
  - (k) Breeding spawning grounds and other aquatic life :
  - (l) Beaches :
  - (m) Coral reefs :
  - (n) Heritage area :
7. Water source for the Aquaculture Unit
- (a) Sea : Yes/ No
  - (b) Creek/estuary/ canal/ back water : Yes/ No
  - (c) If the water source is as mentioned in (b) above, indicate the name of the source
8. Date of commencement of operations of existing aquaculture farm :
9. \* Furnish Project Report giving details with sketch (to scale) of design and layout of the aquaculture farm in operation/ proposed along with operational details, water intake and wastewater treatment facility :
10. \* Whether Environment Impact Assessment (EIA) / Environment Management Plan (EMP) were carried out on the environment of the aquaculture farm with reference to other land uses in its neighborhood and based on operational details of the unit as furnished in the Project Report, please state specifically, whether

- (a) the aquaculture activity has the effect of causing water logging of adjacent areas or polluting the drinking water sources. :
  - (b) by use of supplementary feeds/ medicines/ drugs, etc. will consequently increase sedimentation which will be harmful to the environment. :
  - (c) such activity would cause siltation, turbidity with detrimental implication on local fauna and flora :
11. \*If, Environment Impact Assessment (EIA) has been done, please attach the report :
  12. \* If Environment Management Plan (EMP) has been drawn up, please furnish details :
  13. \*If effluent treatment system (ETS) has been in operation/ proposed, please furnish layout, design and technical details :
  14. Details of remittance of processing fee :

#### **Declaration**

I/ We \_\_\_\_\_ son(s)/daughter(s) / wife of \_\_\_\_\_ residing at \_\_\_\_\_ hereby declare that the information furnished above is true to the best of my/our knowledge and belief. I am/ we are fully aware that if it is found that the information furnished by me/us is false or there is any kind of deviation/ violation of the conditions on which certificate of registration may be issued by the Authority, the Certificate of Registration issued may be either suspended or cancelled.

Signature of the applicant(s)

Date:

Place:

\* Applicable for farms with water spread area of more than 2 (two) hectares.

**FORM II**  
(see rule 11)

**COASTAL AQUACULTURE AUTHORITY**  
**MINISTRY OF AGRICULTURE**

**CERTIFICATE OF REGISTRATION OF COASTAL AQUACULTURE FARM**

Under section 13 of Coastal Aquaculture Authority Act, 2005 and rule 11 of Coastal Aquaculture Authority Rules, 2005.

Reg. No.

Dated:

The coastal aquaculture farm of Shri/ Smt/ M/s \_\_\_\_\_ son/ daughter/ wife of  
\_\_\_\_\_ residing at \_\_\_\_\_  
\_\_\_\_\_ is registered by the Coastal Aquaculture  
Authority vide No. \_\_\_\_\_ dated \_\_\_\_\_.

**DETAILS OF UNIT AND TECHNOLOGY TO BE FOLLOWED**

1. LOCATION OF THE FARM

State	District	Taluk/ Mandal	Revenue village
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2. Survey Numbers:

1. Area of the Farm (in hectare):

- a) Total farm area
- b) Total water spread area

2. Species to be cultured:

3. Stocking Density:

4. No of Crops/ Year

Place:

Signature of the officer

Date:

issuing the Certificate

(Seal of the Authority)

#### **Conditions for Registration of Coastal Aquaculture Farm**

1. This Certificate of Registration is granted subject to the provisions of the Coastal Aquaculture Authority Act, 2005, the Coastal Aquaculture Authority Rules, 2005 and the Coastal Aquaculture Authority Regulations, 2005 and the Guidelines issued thereunder.
2. This Certificate of Registration is not transferable.
3. Any change in the layout, design, area and stocking density (or) other matter should be got approved by the Authority.
4. The environmental requirements should conform to the Guidelines and the regulations issued in this behalf by the Coastal Aquaculture Authority from time to time.
5. The owner of the coastal aquaculture farm shall also comply with such other instructions/ conditions as may be from time to time issued by the Authority.

**FORM III**  
(see rule 12)

**COASTAL AQUACULTURE AUTHORITY**  
**MINISTRY OF AGRICULTURE**

**APPLICATION FOR RENEWAL OF REGISTRATION BY COASTAL AQUACULTURE**  
**AUTHORITY FOR UNDERTAKING SHRIMP AQUACULTURE**

1. Name(s) of the Applicant(s) :  
registered company/ establishment  
(in BLOCK LETTERS)
2. Address for Communication :  
(in BLOCK LETTERS)
3. Details of location/ land of the farm  
for which approval had been issued :
  - (a) Total Area and Water Spread Area :
  - (b) Survey No. of the Farm/ Pond :
  - (c) Village :
  - (d) Taluk :
  - (e) District :
  - (f) Average Stocking Density followed :  
(in number/ m<sup>2</sup>)
  - (g) Average Production obtained :  
(Kg/ ha/ crop)
  - (h) Technology followed :
  - (i) No. and date of the Registration :  
issued by the Authority (Photo  
copy of the approval issued by  
the Authority has to be enclosed)
4. Details of remittance of Processing fee :



## DECLARATION

I/We \_\_\_\_\_ Son(s)/ Daughter(s)/ Wife of  
\_\_\_\_\_ residing at \_\_\_\_\_

hereby declare that information furnished above is true to the best of my/ our knowledge and belief. The shrimp culture operations carried out by me/ us had not neither polluted the environment nor damaged the ecology of the adjacent area. I am/ we are fully aware that if it is found that the information furnished by me/ us is false and there is any kind of deviation/ violation of the conditions on which registration was granted by the Authority, the authorisation/ renewal granted to me/ us may be either suspended or cancelled.

Signature of applicant(s)

Date :

Place :

**Annexure**  
**(see rule 3)**  
**Guidelines for Regulating Coastal Aquaculture**  
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## **Guidelines for Regulating Coastal Aquaculture**

### **1.0 Introduction**

- 1.1 Coastal aquaculture entails managed farming or culture of organisms in saline or brackishwater areas for the purpose of enhancing production, both for domestic and export markets. Coastal aquaculture in the broader sense includes culturing of crustaceans like shrimp, prawn, lobsters, crabs and finfishes like groupers, sea bream, mullets and molluscs like clams, mussels and oysters.
- 1.2 These guidelines are to ensure orderly and sustainable development of shrimp aquaculture in the country. The guidelines are intended to lead to environmentally responsible and socially acceptable coastal aquaculture and also enhance the positive contributions that shrimp farming and other forms of aquaculture can make to socio-economic benefits, livelihood security and poverty alleviation in the coastal areas.
- 1.3 The present guidelines are to cover the entire gamut of shrimp farm management and measures to reduce the environmental impact of the wastewater discharged from shrimp farms, treatment of such wastes and mitigation of the adverse impact of such wastes on the environment as well as resolution of social conflicts, which could lead to sustainable development of shrimp aquaculture. The guidelines are intended to assist the farmers in adopting good management practices (GMP).
- 1.4 These guidelines are for the use of all stakeholders involved, including shrimp farmers, the coastal community, State Fisheries Departments, Pollution Control Boards and the Ministries and Departments of the Governments of India and the States.

### **2.0 Shrimp aquaculture**

- 2.1 Shrimp aquaculture is one of the most common and popular farming practices in the coastal areas. By the end of 2004 out of an estimated 12 lakh ha amenable for coastal area only about 1 50 000 ha is under shrimp farming producing about 1 20 000 tonnes of shrimp every year. *Peneaus monodon* is the most commonly farmed species for which the technology is also well established. Presently, about 80 per cent of the shrimp culture activities in the country are under traditional/ extensive systems.
- 2.2 Shrimp aquaculture also resulted in development of several ancillary/ associated activities such as seed production, feed production and processing units as well as aquaculture machinery/ equipment production. Together, these activities have contributed to the generation of livelihood options and employment opportunities in the coastal areas.

### **3.0 Shrimp aquaculture practices**

- 3.1 The technology, scale and intensity of shrimp aquaculture determine the production and productivity as well as the environmental and socio cultural impacts on the coastal environment. Presently, traditional/ improved traditional and scientific extensive shrimp farming practices are most common and adopted by the farmers in the coastal areas of the country. Traditional/ improved traditional systems are characterized by low stocking densities and limited application of supplementary feeding or fertilizers. In scientific extensive farming, supplementary seed and feed are encouraged as a means of integrating more effectively the use of land and water resources in the coastal areas.
- 3.2 The other technologies of shrimp farming such as semi-intensive and intensive are not recommended as they involve the use of higher stocking density of seed and larger quantities of feed and fertilizers. Such practices generally place larger demands on the natural resources and result in higher organic load leading to pollution and social impacts in the coastal areas. Therefore, only traditional/ improved traditional and scientific extensive systems of shrimp farming shall be permitted in the coastal areas.

#### 4.0 Site selection

- 4.1 Site selection is an important process in aquaculture as this can often decide the success or failure of the shrimp farm, small or large. Besides technological (biological, physical and chemical) aspects of aquaculture, the environmental and socio-economic aspects covering social, economic and legal issues are important parameters to be considered while finalizing the site for setting up a shrimp farm. It is also essential to look into the previous use(s) and topography of the site to determine the adequacy of the site and cost of farm construction.
- 4.2 The following guidelines on site selection are to ensure that shrimp farms are harmoniously integrated into the local environment and social settings. By identifying the limitations that influence the suitability of a site, it is possible to incorporate corrective measures in the farm design and also formulate remedial measures for the negative impacts likely to arise out of these limitations.
- 4.3 Large-scale shrimp aquaculture may bring in excessive demand on land resources, resulting in multi-user conflicts. Construction of shrimp farms may make inroads into agricultural land. The States must undertake detailed surveys to identify lands/ areas, which are fit for different purposes and allocate suitable area for shrimp farming. They should discourage conversion of agriculture land for aquaculture. Construction of shrimp ponds on marginal land not fit for cultivation alone should be permitted. However, the competitive and cooperative activities of the different sectors concerned should also be considered while giving approval to setting up of shrimp farms.
- 4.4 Generally clayey loam soils are preferred. High capital and operational cost will be involved in maintaining a farm in sandy area, which is also to be avoided owing to the high water percolation through the sandy soils, and possible environmental damage which could arise from it. Further, the topography of the soil and its contour should be ascertained in relation to the water intake and drainage points as well as construction costs. A better site is the one, which involves lesser capital investment for constructing fully drainable ponds.
- 4.5 The quality of soil should be ascertained for soil pH, permeability, bearing capacity and heavy metal content. Soil with low pH of below 5 (example acid sulphate soils) should be avoided. Similarly, soils with high concentrations of heavy metals also should be avoided. The suitable soil characteristics ideal for construction of a shrimp farm are as follows:

pH	Organic carbon	Calcium carbonate	Available nitrogen	Available phosphorus	Electrical conductivity
7-8	1.5 – 2.5%	> 5%	50–75 mg/100 g soil	4–6 mg/100 g soil	> 4 $\mu$ mhos

- 4.6 The hydro-meteorological data of the proposed area is very important to develop the design of the farm and to ensure the availability of acceptable water quality in the farm. The most important data required in this regard are rainfall, tidal fluctuation, wind direction and velocity, flood levels, frequency and time of occurrence of natural calamities such as storm, cyclone, hailstorm, etc. Construction of farms in cyclone prone areas and places where natural calamities such as floods occur should be avoided.
- 4.7 Mangroves play an important role in soil binding, as a source of nutrient cycling, as a buffer and a natural biological filter of several pollutants and as a breeding ground and

nursery area for many important fin and shellfishes. There is evidence that removal of mangroves leads to a decline in fin and shellfish recruitment to the open waters through reduced availability of post-larvae. Mangroves are now legally protected under the environment law of the country.

Large concentration of shrimp farms in mangrove areas has not proved sustainable elsewhere in the world. Mangrove soils are potential acid sulphate soils and not conducive for setting up of shrimp farms. The States should not permit shrimp farm construction *within natural mangrove areas, or ecologically sensitive wetlands, swamps, etc.*

- 4.8 The infrastructure facilities like roads, electricity, proximity to hatcheries, feed manufacturing units/ feed retailers, ice plants, processing plants should be considered while choosing the site for a shrimp farm since these play an important role in the economics of culture operations.
- 4.9 The following guidelines, which are mandatory, should be adopted for site selection and also to avoid subsequent social and environmental impacts.
  - Mangroves, agricultural lands, saltpan lands, ecologically sensitive areas like sanctuaries, marine parks, etc, should not be used for shrimp farming.
  - Shrimp farms should be located at least 100 m away from any human settlement in a village/ hamlet of less than 500 population and beyond 300 m from any village/ hamlet of over 500 population. For major towns and heritage areas it should be around 2 km.
  - All shrimp farms should maintain 100 m distance from the nearest drinking water sources.
  - The shrimp farms should not be located across natural drainage canals/ flood drain.
  - While using common property resources like creeks, canals, sea, etc, care should be taken that the farming activity does not interfere with any other traditional activity such as fishing, etc.
  - Spacing between adjacent shrimp farms may be location specific. In smaller farms, at least 20 m distance between two adjacent farms should be maintained, particularly for allowing easy public access to the fish landing centers and other common facilities. Depending upon the size of the farms, a maximum of 100 – 150 m between two farms could be fixed. In case of better soil texture, the buffer zone for the estuarine-based farms could be 20 –25 m. A gap having a width of 20 m for every 500 m distance in the case of sea based farms and a gap of 5 m width for every 300 m distance in the case of estuarine-based farms could be provided for easy access.
  - Larger farms should be set up in clusters with free access provided in between clusters.
  - A minimum distance of 50 – 100 metres shall be maintained between the nearest agricultural land (depending upon the soil condition), canal or any other water discharge/ drainage source and the shrimp farm.
  - Water spread area of a farm shall not exceed 60 per cent of the total area of the land. The rest 40 per cent could be used appropriately for other purposes. Plantation could be done wherever possible.
  - Areas where already a large number of shrimp farms are located should be avoided. Fresh farms in such areas can be permitted only after studying the carrying/ assimilation capacity of the receiving water body.

## 5.0 Construction and preparation of shrimp farms

- 5.1 Farm Design and Construction: Proper designing and construction of shrimp farm is essential for their efficient management and for promoting environmental protection. Good site selection and incorporation of mitigatory features in the farm design are the best ways to avoid problems related to flood levels, storms, erosion, seepage, water intake and discharge points. A site-specific approach to design and construction of shrimp farms is necessary, as site characteristics vary greatly from place to place. The following checklist should be considered while designing and constructing shrimp farms:

Checklist for farm design and construction	
<ul style="list-style-type: none"><li>• Embankments should be designed to prevent flooding and erosion, after taking into consideration the tidal amplitude, water current, wind direction, wave action and the past histories of flooding in the area during cyclones/ storms.</li><li>• In soils, which are seepage prone, design should include an inner clay core in the dykes with greater compaction and trench around the farm to reduce saline water intrusion into the neighbouring lands.</li><li>• The elevation of the pond bottom, drainage canal and the outlet should be designed in such a way that the water in the farm can be drained fully and easily through gravity.</li><li>• Ponds should have separate intake and outlet structures to permit control of filling and draining.</li><li>• A minimum water depth of 80-100 cm should be maintained in the ponds.</li><li>• Inlet and discharge canals should be separate so that water supply and wastewater are not mixed. In areas where such a provision cannot be made, it is advisable that waste treatment pond should be included in the design.</li><li>• The farm design should not alter natural water flows, or impound floodwater.</li><li>• The sluice gates should be watertight and provided with net filters.</li><li>• Where possible, vegetative buffer zones, riparian vegetation and habitat corridors should be maintained and vegetative cover provided on exposed earthwork.</li><li>• Pump intakes should be screened, vegetative buffers provided around pump stations, and containments installed to prevent fuel spills.</li></ul>	

- 5.2 Construction of Intake Reservoirs and Effluent Treatment Ponds: In areas where the source water is turbid with suspended particles, an intake reservoir for settling the silt is very essential. Similarly, in areas where there is overcrowding of shrimp farms and the intake and outfall are from the same source (*i.e.* creek, estuary, backwater) the intake reservoir with provision for treatment of water is essential. In areas where the tidal current is swift and tidal amplitude is high, the wastewater from the farm can be directly let out during the low tide. But in areas where the tidal current is very low, it is essential that the wastewater be treated in an Effluent Treatment Pond (ETP) before it is released into the natural system. An ETP, as a reservoir for holding and regenerating wastewater, is mandatory for farms larger than 5 ha. A minimum of 10 percent of the total farm area should be reserved for this purpose. It is also necessary that smaller farms that are located in close proximity to each other (farm clusters) should consider setting up of common ETP to avoid self-pollution and also release of excess nutrients and suspended solids, which could lead to eutrophication of the receiving water body.

For better water management, individual culture units should be within 5 ha areas and suitable feeder channel system should be provided within the farm so that the water intake can be effectively managed in all the individual units.

5.3 **Pond Preparation:** Pond preparation is an essential part of culture practices during which the metabolite load and contaminants (chemical and biological) in the soil from the previous culture cycle is removed through tilling, ploughing and drying. During pond preparation, the pests and predators are removed and pH and nutrient levels in the water and soil are brought to optimal concentrations through application of lime, organic manures and inorganic fertilisers. The following checklist would assist in pond preparation and reduction of the possible environmental impacts:

- Pond sediments from the previous culture, which are likely to have accumulation of nutrient loads and other contaminants, should not be disposed off in the natural environment. In case it is necessary to remove the sediments it should be disposed off within the farm site itself, by putting such sediments in trenches made in the wide dykes. However, it should be ensured that these sediments do not leach out.
- Application of lime is useful in correcting the pH of the soil and water, as a disinfectant and for increasing the mineralisation process. If the soil pH is not below 7.5, a basal dose of 300-500 kg/ ha can be applied. However, in acid soils, where the pH is low, the quantity of lime to be applied should be calculated based on the pH and type of lime used.
- Unwanted /pest organisms should be killed and removed from the pond by drying of the pond bottom. In cases, where complete drying is not possible, organic, biodegradable piscicides such as *Mahua* oil cake (100-150 ppm), tea seed cake (15-20 ppm) and also lime (*Calcium oxide preferred*) can be used. No chemical piscicide should be used.
- After the application of the organic piscicide at least a period of 10 days should be given for its toxic effect to be removed. Chlorination can be done to remove the pests and pathogens in ponds where drying of pond bottom is not possible.
- Fertilizers and manures should be used judiciously as per the requirement, according to recommended doses (Table 1 below). Over fertilization should be avoided. Fertilizer schedule should be decided based on the phytoplankton growth in the ponds. The colour and transparency of the water can be taken as indicators of plankton growth. Optimal density of phytoplankton should be maintained throughout the culture period.
- Heavy algal bloom should never be allowed to develop since crash of algal bloom may lead to anoxic conditions in the pond thereby affecting the survival and growth of the shrimps.

**Table 1. Recommended dosages of organic manures and inorganic fertilizers for improving production from traditional and extensive systems of farming**

<b>Dosage of manures in relation to organic carbon content of soil</b>		
Organic Carbon in soil (%)	Prescribed basal dose	
	Raw cow dung (kg/ha)	Dry chicken manure (kg/ha)
1	500	175
0.5	1000	350
0.25	2000	700

<b>Application of Urea in relation to available Nitrogen</b>	
Available N in soil (mg/100g soil)	Urea to be applied (kg/ha)
12.5	100
25.0	50
50.0	25

<b>Application of super phosphate in relation to available Phosphorus</b>	
Available P in soil (mg/100g soil)	Super phosphate to be applied (kg/ha)
1.5	100
3.0	50
6.0	25

(Source: Aquaculture Authority, 1999)

## 6.0 Water quality and its management

- 6.1 Brackishwater/ seawater in adequate quantities should be available throughout the year. The water source could be from backwaters, canals/creeks, lagoons or sea. The quality of the water available in the site has a strong influence on the success of the shrimp farm. Water quality parameters like pH, salinity, dissolved oxygen (DO) and the presence of toxicants/ pollutants should be ascertained. Low pH water will pose serious problems and similarly wide fluctuation in salinity will also be detrimental to the cultured species. The water source should be free from any industrial/ agricultural pollution. The presence of contaminants and their levels should be considered in the light of the tolerance and also sub-lethal effects on the species to be cultured. The optimal levels of various water quality parameters for better survival and growth of shrimps are listed in the Table 2 below:

**Table 2. Optimal levels of water quality parameters for shrimp farms**

Sl. No.	Water Quality Parameters	Optimal Level
1.0	Temperature (°C)	28 – 33
2.0	Transparency (cm)	25 - 45
3.0	pH	7.5 - 8.5
4.0	Dissolved oxygen (ppm)	5 – 7 (above 50% air saturation)
5.0	Salinity (ppt)	15 - 25
6.0	Total alkalinity (ppm)	200
7.0	Dissolved inorganic phosphate (ppm)	0.1 - 0.2
8.0	Nitrate - N (ppm)	< 0.03
9.0	Nitrite - N (ppm)	< 0.01
10.0	Ammonia - N (ppm)	< 0.01
11.0	Cadmium (ppm)	< 0.01
12.0	Chromium (ppm)	< 0.1
13.0	Copper (ppm)	< 0.025
14.0	Lead (ppm)	< 0.1
15.0	Mercury (ppm)	< 0.0001
16.0	Zinc (ppm)	< 0.1



6.2 Nutrients and organic wastes produced in shrimp culture ponds consist of solid matter (mainly uncaten feed, faecal matter and dead plankton) and dissolved metabolites (mainly ammonia, phosphate, carbon dioxide, nitrite and nitrate). Various management methods are followed to maintain these within the tolerable limits. Among these, the most economical is water exchange. A water exchange of 5 – 30 percent per day is usually done depending on the availability of water and the quality of pond water. A variety of chemicals and probiotics are used in improving the water and soil quality.

6.3 The following guidelines are to ensure that the harmful effects of these practices are reduced.

- Good water quality should be maintained by using water stable feed with minimal wastage.
- Water quality parameters should be monitored regularly and periodical water exchange is necessary to maintain optimal water quality conditions. While exchanging water, care should be taken to avoid wide fluctuations in water quality, so as to avoid stress to the shrimps and proper screens should be used to prevent the entry of pests and predators. Dissolved oxygen concentrations should be measured during early morning hours.
- Fertilisers and lime should be used in a responsible manner only when it is actually required.
- Use of freshwater to reduce the *salinity* of the culture water should be avoided for sustainability reasons; even though the shrimps can adapt and grow in a wide range of salinity, it is better to avoid salinity fluxes so as to avoid stress to the shrimps, which could make them more prone to diseases.
- In low density cultures, high level of water exchange is not required. In view of the complaints of nutrient loading in the open environment and the fear of viral contamination in the source water, the water exchange should be need-based. If water quality remains within optimal limits no water exchange is required for the first two months of rearing.
- Indiscriminate use of chemicals, bacteriological and enzyme preparations that supposedly enhance nutrient removal, organic matter, oxidation and removal of ammonia from water and soil should be avoided.

## **7.0 Seed production**

- 7.1 All shrimp hatcheries need to be registered by MPEDA as per their norms which may be reported to the Authority at its subsequent meeting. The Authority will have the power to review the registration of hatcheries and to take appropriate decisions in tune with the requirements of the Coastal Aquaculture Sector.
- 7.2 Production of healthy and disease free shrimp seed is the first step towards sustainable shrimp farming. About 300 shrimp hatcheries were set up in the country by the end of 2004 with a total production capacity of 12 billion post-larvae. These hatcheries are mostly located on the East coast of the country.
- 7.3 Hatchery operations can be broadly classified into broodstock, larval/ post larval rearing and live feed management. Since production of healthy seed is a primary step towards disease free farming, shrimp hatcheries are required to maintain strict sanitation, quarantine and quality control management to ensure bio-security and health management. These following guidelines should be adopted by the shrimp hatchery to ensure production of standard and homogeneous quality seed, which are pathogen free.
- 7.4 Water quality: Hatcheries should ensure good supply of oceanic quality seawater with the following optimal water quality characteristics in its rearing systems so as to avoid any stress to the larvae. This can be achieved by selecting a good site with the required water quality.

**Table 3. Recommended water quality parameters for shrimp hatcheries**

Parameters	Tolerable Limit	Optimal Levels
Temperature (°C)	18 - 36	28 - 32
Salinity (ppt)	26 - 34	30 - 34
pH	7.0 - 9.0	8.0 - 8.4
Dissolved oxygen (ppm)	Above 3	Above 4
Ammonia - N (ppm)	Up to 0.1	Less than 0.01
Nitrite - N (ppm)	Up to 0.1	Less than 0.01

Further, the water should be treated to remove all the suspended solids, dissolved nutrients and bacterial and viral pathogens. This could be achieved by following a good water treatment protocol, which includes:

- Sedimentation
- Water chlorination and dechlorination
- Filtration with sand filters
- Filtration with activated carbon filter
- Cartridge filtration up to 1 micron size
- UV filtration/ Ozonation

7.5 Spawner/ broodstock quality: Vertical transmission of viral pathogens from mother shrimps to larvae through the ovarian tissue is one of the sources of introduction of viral pathogens into the hatchery system. In addition to that any stress caused to the spawners will result in spawning of poor quality eggs. The following measures should be strictly followed to obtain good quality eggs.

- Spawners/ broodstock collected from commercial trawling operations will be stressed after being caught in the trawl nets. They should be immediately transported to the hatcheries without further stress/ injuries.
- The spawners collected should be placed individually in disinfected water and immediately transported individually under oxygen packing. Maintaining the spawners individually from the time of their capture is more important to avoid cross contamination with viral pathogens.
- The broodstock should be quarantined on arrival at the hatchery to prevent the entry of pathogens.
- Spawners/ broodstock, which do not have lesions, damage to gills, loss of appendages and red colouration, should only be selected.
- Prophylactic treatment of spawners/ broodstock with formalin at 50 ppm for 1 hour under strong aeration should be done before introducing the stock into the hatchery/ maturation system.
- Spawners/ broodstock should be kept individually for acclimatization and screened for the presence of WSSV using a terminal portion of pleopods and for monodon baculo virus (MBV) from the faecal matter. Only spawners free from these pathogens should be taken into the hatchery/ maturation system.

7.6 Induced maturation under captive conditions: Healthy, pathogen free, immature, broodstock, collected from wild, after the prophylactic treatment and acclimatization

should be taken into the maturation tanks and allowed to recover from the stress of capture and transportation for 4-5 days. Then they are induced to mature through eyestalk ablation following the guidelines given below:

- Hard shelled, intermoult healthy female shrimps free from disease or injury having spermatophore in the thelycum should be selected for eyestalk ablation.
- The females should be above 100 g in size for ensuring good quality eggs.
- Eyestalk ablation is to be avoided for newly moulted and ready to moult female shrimps.
- Electrocauterisation is the best way of ablating eyestalk since it causes minimum stress.
- The ablated female shrimps are stocked in the maturation tanks along with unablated males @ 4 nos/ m<sup>2</sup>. Stocking of females and males in the ratio of 2: 1 ensures best mating success.
- Fresh feeds such as clam (*Meritrix sp.*), mussel (*Perna viridis*) and squid (*Loligo sp.*) having similar amino acid profile as shrimps, polychaete worms, *Artemia* biomass rich in long chain poly-unsaturated fatty acids are used as maturation feeds. Feed should be provided in sufficient quantities by visual observation. Feeds like crabmeat, which are carriers of pathogens, should be avoided.
- In addition to live feed items, pelleted feed fortified with polyunsaturated fatty acids (PUFA) such as arachidonic acid, eicosopentaenoic acid and decasohexaenoic acid should be used to ensure good egg quality.
- Water quality should be maintained under optimal conditions with 100 percent to 200 percent water exchange per day.
- Light intensity should be maintained low and the movement of personnel near the maturation tanks should not disturb the ablated shrimps.

#### 7.7 Spawning and hatching:

- Wild spawners/ induced matured stock should be disinfected with formalin treatment before placing them individually in spawning tanks.
- Feed should not be provided in the spawning tanks.
- Spawned eggs should be collected, washed thoroughly and disinfected by formalin dip treatment and re-suspended in fresh seawater for hatching.
- The quality of the eggs should be assessed within 2 hours after spawning when it will be easier to identify the fertilized and unfertilized eggs.
- If the quality of eggs is very poor, it is advisable to discard the eggs.
- Only active positively photo tactic nauplii should be collected for transfer to larval rearing tank.
- Nauplii should be tested for WSSV before transfer to larval rearing tank.

#### 7.8 Larval rearing/ nursery rearing:

- Nauplii from a single spawner should be reared separately to avoid cross contamination.
- Stocking density of nauplii should be maintained at 50 no./l in larval rearing tanks.
- Algal feed should be initiated before nauplii moult to zoea 1.

- Algal feed should be given in required quantity from cultures that are in exponential stage of growth.
- Algal feed should be concentrated to avoid introduction of large quantities of algal culture water with its nutrient load.
- Water quality in the larval rearing should be monitored for ammonia, nitrite and bacterial load.
- Uniform aeration in all parts of the tanks should be provided through air diffuser stones placed @ 1 no/sq. ft. This will keep the larvae and the algal feed uniformly distributed in the tank.
- During water exchange, appropriate mesh size nets should be used for draining the water so as to facilitate the removal of faecal matter without stressing the larvae.
- Artemia nauplii/ flake diets should essentially be used from Mysis II stage onwards along with the algal diet.
- Prophylactic use of antibiotics or other drugs should be avoided and only permitted antibiotics, chemicals, etc should be used. Probiotics should be used to the maximum extent possible.
- At PL5, the larvae should be collected from the larval rearing tanks, disinfected with formalin dip treatment and distributed in outdoor nursery tanks @ 15-20 nos/litre.
- During later stages of nursery rearing, along with artemia nauplii, other live feed items like clam meat or balanced compounded feed can be used.
- Acclimatization to required salinity levels should be done gradually in the nursery stage of rearing.
- Only PL20 should be sold to the farmers after testing its quality with reference to presence of Monodon Baculo Virus (MBV) and White Spot Syndrome Virus (WSSV). At any stage of rearing, if WSSV is detected, the larvae from the whole tank should be discarded.
- For long distance transportation, the seed should be packed in thermocol boxes at reduced temperature.
- Supplementary feeds and raw materials should be properly handled and stored to avoid spoilage.

#### 7.9 Algal culture:

- Algal culture should be maintained in pure form in indoor; temperature controlled rooms and used as started culture for outdoor mass culture.
- It is advisable to use UV treated water for the pure culture of the algae, to prevent contamination.
- The quality of the mass culture should be tested before feeding in larval rearing tanks.

#### 7.10 Artemia hatching:

- Artemia cysts should be disinfected before keeping them for hatching.
- Hatched artemia nauplii should be segregated from the cyst wall and un-hatched cysts before being used as feed in larval rearing tanks.
- Only the nutritionally superior instar I nauplii should be used as feed.

#### 7.11 General bio-security procedures:

- The quality of intake water is very important for healthy operation of a shrimp hatchery. The pollution free water drawn from natural sources should be filtered and possibly, sterilized before usage.
- Movement of men, materials and paraphernalia between different sections of the hatchery should be controlled to avoid contamination.
- Foot pits, washbasins, toilets, etc. should be provided to ensure adequate sanitation and hygiene in the hatchery premises.
- The effluent water should be properly treated in a effluent treatment system before discharge. Regular monitoring of effluents to ensure environment standards, *stipulated*.
- Hatchery should have adequate facilities for pathology lab like microbiology/PCR facilities to check the health condition of brooders/seeds at different stages.
- Diseased or moribund shrimps should be disposed off safely to prevent contamination of the stock.
- Bio-filters, tanks, buckets, nets, etc. should be thoroughly washed and cleaned using sanitizers and dried thereafter. Regular disinfections should be carried out to ensure bio safety.
- The hatcheries are required to monitor their effluents frequently so that the water quality standards remain within the limit stipulated in Table 5. Considering the need for maintaining effluent discharge standards, effluent treatment system shall be mandatory for all hatcheries.
- It is essential that hatcheries maintain proper records of their activities in various sections, for verification by the supervising agencies and also to ensure traceability and easy market access.

7.12 Shrimp hatcheries require large quantity of seawater for their day-to-day operations. The water used in the hatchery and let out is likely to be contaminated with dissolved or suspended organic matter, nutrients, chemicals, antibiotics, etc. When contaminated water is discharged into open, it is likely to result in environmental pollution that could be detrimental to the hatchery operation itself, since intake and discharge points are nearby. Therefore, it is necessary to properly treat the effluents so that the discharged water conforms to environmental standards.

### 8.0 Seed selection and stocking

8.1 Seed quality has a direct relationship with the survival and growth of the cultured shrimps and the stocking density has a strong bearing on the level of waste generated in the pond. The higher the stocking density the larger the quantity of feed that has to be used. Higher stocking densities also stress the animals leading to greater incidence of disease. In ponds with excessive stocking and feeding rates, the wastewater is generally of low quality and has a greater potential to cause water pollution than wastewater from ponds stocked at more reasonable densities. Hence, it is essential that the following guidelines be observed:

- Only healthy and pathogen-free seed from registered hatcheries should be used for stocking.

- The health status of the shrimp seed should be checked through standard testing procedures, including PCR.
  - Seed collection from the natural resources should be banned by the State Governments with a view to protecting a large spectrum of fin and shellfish species from being destroyed.
  - Before stocking the seed should be acclimatised to the prevailing temperature, salinity and pH in the pond conditions by gradual mixing. In areas with very low salinity, salinity adjustments are to be made over a period of 4 –5 days and hence should be done at the hatchery itself.
- 8.2 In view of the strong impact of stocking densities on sustainability of farming practices, low stocking densities would only be permitted in shrimp aquaculture. However, such stocking densities for different types of practices shall be as per the regulation of the Coastal Aquaculture Authority.

## **9.0 Feed and feed management**

- 9.1 All shrimp feed manufacturing units need to be registered by MPEDA as per their norms which may be reported to the Authority at its subsequent meetings. The Authority will have the powers to review the registration of feed mills and to take appropriate decisions in tune with the requirements of the coastal aquaculture sector.
- 9.2 Feed is the basis for optimum yield levels in shrimp farming. About 33 shrimp feed mills with a production capacity of 1 50 000 metric tonnes of feed were set up in the country by the end of 2004. Besides, there are a large number of small feed manufacturing units, meeting local requirements.
- 9.3 However, shrimp do not eat all of the feed provided to them, and only a portion of the feed consumed is converted to shrimp flesh. Uneaten feed, feces and metabolic wastes add to the nutrient load in the wastewaters. As feeding rates increase, water quality and soil quality in ponds usually deteriorate.
- 9.4 Fresh diets increase nitrogen loads in shrimp ponds. Considerable amount of detritus and wastes often accumulate on the pond bottom, in areas where water circulation is slow, leading to increased BOD and release of harmful gases, which could cause stress on bottom living shrimps. On the contrary, regular feeding with pelletised diets is known to maximize the growth of shrimps and minimize the nutrient enrichment of the wastewater.
- 9.5 Feed quality and conversion ratio/ efficiency have considerable influence on waste levels. Reduction of phosphorus content in feed, control of dietary nitrogen in relation to metabolism and improvement in physical characteristics such as attractability, water stability, texture and appropriate size of the feed will help to reduce the nutrient loading to a large extent.
- 9.6 Careful feed management is essential for successful shrimp farming. By using good quality feed in reasonable quantities, water and soil quality in ponds remains in optimum conditions. This reduces stress on shrimp, there is less likelihood of disease, and they convert feed more efficiently to improve the feed conversion ratio and minimize feed costs. Better water quality in ponds allows minimum load of nutrients in wastewater and reduces the possibility of environmental impacts in receiving water bodies.

- 9.7 Monitoring of feed input is required to keep feed wastage to the minimum. Similarly, careful monitoring of standing stock in the ponds will also help to ensure that correct feeding levels are observed. The feeding rate prescribed by the manufacturer varies depending on the quality of the feed. The feeding rates given in Table 4 below are recommended. However, it should be regulated based on the check tray observations.

**Table 4. Recommended feeding rates for different sizes of the shrimp**

<b>Shrimp size (g)</b>	<b>Daily Feed as Percentage of Body Weight</b>
2 - 5	4.0 - 3.0
5 - 10	3.0
10 - 15	3.0 - 2.5
15 - 20	2.5 - 2.0
20 - 35	2.0

- 9.8 The following guidelines should be adopted for feed and feed management in shrimp farming:

- Feed ingredients should not contain contaminants, anti-nutritional factors, microbial toxins, banned antibiotics or other adulterating substances.
- Farm-made wet diets should not be used. However, when wet feeds are used crustaceans should be avoided as an ingredient.
- Only dry, nutritionally balanced pelleted feed with optimal water stability should be used.
- Freshly obtained feed should be used to the extent possible. In any case feed stored for more than two months should not be used. Feed should be stored in cool, dry areas to prevent mould and other contamination.
- Feeding rates should be determined from standard feed curves/charts (Table 3 above) and adjusted for shrimp biomass on a weekly basis.
- Feed check trays should be used to regulate feeding rates. Feed trays should be widely distributed in the pond.
- Both overfeeding and underfeeding should be avoided. Efforts should be directed to ensure that the shrimps consume the maximum amount of supplementary feed given, since excess feed lying uneaten would decompose and lead to poor water quality, stress to the shrimps and consequently increased vulnerability to diseases.
- Since the shrimps require about 4 hours for digestion of feed, feeding frequency should be 4 – 6 times in a day. Since shrimps are nocturnal, more than 60 percent of the feed should be fed during night.
- Feed Conversion Ratio (FCR) should be monitored. Reductions in FCR through careful feeding schedule will improve production efficiency and reduce waste loads.
- Feeds with high acceptability, high digestibility and assimilation efficiency will reduce waste generation and nutrient loading. Further this will reduce the cost of production since feed accounts for more than 50 percent of the recurring cost.

- Shrimp farmers should keep full records of daily feed schedules to enable assessment of FCR, which should be used to increase feeding efficiency and reduction in feed waste.

## 10.0 Health management of shrimps

- 10.1 Viruses, bacteria and protozoa cause the major shrimp diseases. The “ White Spot Disease”, caused by the White Spot Syndrome Virus (WSSV), which led to devastations in shrimp farming in India as elsewhere is the most known virus disease; the other well known virus disease is the “Yellow Head Disease”, which has not been reported from India but is frequent in Thailand and other parts of Asia. Bacteria cause vibriosis. Protozoan diseases such as gill and external fouling caused by *Zoothamnium* also cause problems in shrimp farming.
- 10.2 Outbreak of disease in shrimp culture systems is related to the environmental factors such as deterioration of water quality, sedimentation and self-pollution. Treatment should be undertaken only when a specific disease has been diagnosed and it is known that this disease is treatable. Also, effective measures must be taken to minimize the spread of disease between farm stocks and natural stocks.
- 10.3 The following guidelines envisage health management as a holistic activity with disease prevention as the main objective. The approach includes reduced stocking of disease free seed, better handling, maintenance of good pond environment, and optimal feed management to reduce the stress and prevent most infectious and non-infectious diseases.
  - The health of the shrimps should be monitored continuously and those with any one or more of the following conditions are diagnosed to have some disease: inactive and sluggish, empty gut, bluish/blackish coloration, body blisters, flared up gills, broken appendages, black / white spots, coloured gills and opaque muscles.
  - Any disease should be diagnosed immediately with the help of trained pathologists/ microbiologists.
  - Chemical treatments that can stress the animals should not be employed.
  - Disease problems arising in aquaculture can be attributed primarily to the environmental degradation and most of the pathogens are facultative pathogenic in nature. Hence, management of pond environment is of utmost importance for disease prevention and control.
  - For non-infectious diseases related to pond conditions, treatment of animals should be carried out or pond conditions corrected.
  - For mild infectious diseases with potential to spread, the pond should be quarantined and the best options for disease treatment should be carried out.
  - For serious infectious diseases that may spread widely, the pond should be isolated, remaining shrimp should be net harvested and the pond should be disinfected without discharging any water.
  - Dead and diseased shrimp should be disposed off in a sanitary manner that will discourage the spread of disease.
  - When disease occurs in a pond, transfer of shrimp, equipment, or water to other ponds should be avoided.



- Drug, antibiotic, and other chemical treatments should be done in accordance with recommended practices and all national and international regulations should be complied with.

#### 11.0 Use of chemicals and drugs

- 11.1 Chemicals and drugs used in aquaculture include those associated with structural material, soil and water treatment, antibacterial agents, therapeutants, pesticides, feed additives, anesthetics, immuno-stimulants and hormones. Chemicals and drugs presently in use are mostly derived from agriculture/ veterinary field and have never been tested/ evaluated specifically with regard to their effects on the aquatic environment.
- 11.2 Some of the chemicals and antibiotics can accumulate in the flesh of shrimp and represent a potential health hazard to the consumer and also affect trade prospects. Some chemicals may also exist in effluents as residues and be harmful to natural aquatic ecosystems. Reducing the use of these agents and chemicals will improve environment performance but also reduce cost of operating shrimp farms. Shrimp health management should focus on disease prevention through good nutrition, sound pond management, and overall stress reduction rather than disease treatment.
- 11.3 *Use of chemicals:* Chemicals should be avoided in shrimp ponds for prevention or treatment of disease, as feed additives, disinfectants, for removal of other fish or for treatment of soil or water. However, chemicals may be required in hatcheries. The hatchery operators should carefully monitor entry of such chemicals into the natural waters from the hatcheries and they should take steps to remove such materials from the wastewaters.
- 11.4 *Use of fertilizers:* Both organic and inorganic fertilizers are used widely in shrimp culture for promoting the growth of fish food organisms, particularly for the early post-larval stages. This may contribute to the nutrient load in waters receiving the effluents. Therefore, as far as possible only organic manure/ fertilizers and other plant products should be used for such purposes.
- 11.5 *Use of piscicides:* Similarly, piscicides and molluscicides are widely used for removing predators and competitors from shrimp ponds. It would be advisable for aquaculturists to use only the biodegradable organic plant extracts for this purpose, as they are less harmful than the chemical agents. Use of chemical piscicides should be avoided.
- 11.6 *Use of chemotherapeutants:* Some of the chemotherapeutants such as formalin and malachite green which are commonly used as disinfectants are toxic and may affect adversely the pond ecosystem, the external waters, etc. and hence their usage in culture system should be avoided.
- 11.7 *Use of antibiotics/ drugs:* The use of antibiotics in shrimp culture is strictly prohibited as their use may result in development of pathogens resistant to such drugs and the transfer of these pathogens into human beings might result in development of resistance in human pathogens. The list of 20 antibiotics/ pharmacologically active substances presently banned for use in shrimp culture is given in Table 5. This ban will also apply to other substances so notified by the Government from time to time.

**Table 5. List of Antibiotics and other pharmacologically active substances banned for using in shrimp aquaculture**

Sl. No.	Antibiotics and other Pharmacologically Active Substances
1	Chloramphenicol
2	Nitrofurans including: Furaltidone, Furazolidone, Furfylfuramide, Nifuratel, Nifuroxime, Nifurprazine, Nitrofurantoin, Nitrofurazone
3	Neomycin
4	Nalidixic acid
5	Sulphamethoxazole
6	Aristolochia spp and preparations thereof
7	Chloroform
8	Chlorpromazine
9	Colchicine
10	Dapsone
11	Dimetridazole
12	Metronidazole
13	Ronidazole
14	Ipronidazole
15	Other nitroimidazoles
16	Clenbuterol
17	Diethylstilbestrol (DES)
18	Sulfonamide drugs (except approved Sulfadimethoxine, Sulfabromomethazine and Sulfaethoxypyridazine)
19	Fluroquinolones
20	Glycopeptides

11.8 The Maximum Permissible Residual levels for various antibiotics and other pharmacologically active substances stipulated by the Government for fish and fishery products is as per appendix attached to these guidelines. Shrimp farmers and input providers should strictly follow these stipulations, which may be revised by the Government from time to time.

## **12.0 Harvest and post-harvest**

12.1 During the harvesting maximum suspended particles are likely to be released into the open waters. Hence great care should be taken to prevent such a release. The farmers are advised to adopt the following norms while harvesting the crop:

- Harvesting can be done by completely draining the pond either by gravity or through pumping and hand picking or trapping.
- The water drained out for harvesting should be pumped into the waste stabilization ponds and kept for a few days for settlement before releasing into the open water.
- Icing should be done immediately after harvest.
- Generally, the processors/ buyers collect the harvest from farm site and transport in refrigerated vans. When such a facility is not available and the produce has to be transported over a long distance, the shrimps should be beheaded and stored in ice to prevent spoilage.

### 13.0 Wastewater management

13.1 The waste from shrimp ponds contain mainly suspended solids, comprising unconsumed feed, faecal matter and plankton, and dissolved nutrients such as ammonia, nitrite, phosphorus, carbon-dioxide, hydrogen sulphide. The former component is the result of physical qualities of feed and fertilizers while the nutrients are influenced by the chemical composition of the feed ingredients and the fertilisers. The nutrients and organic matter in shrimp pond wastes have potential for the following impacts:

- reduce dissolved oxygen in receiving waters, due to discharge of waste water low in dissolved oxygen and breakdown of dissolved and particulate organic matter and other waste materials (BOD and COD).
- hyper-nitrification and eutrophication of receiving waters, resulting in increased primary productivity (with potential risks of phytoplankton blooms), alteration of biological community structure and secondary productivity; and
- increased sedimentation due to organic matter, leading to changes in productivity and benthic community structure, plus possible siltation.

13.2 Such impacts depend on the quantum of wastewater outflow and the capacity of the environment to assimilate the waste materials. It is, therefore, desirable to match loads with the capacity of the environment to accept the waste materials. The following checklist will guide the shrimp farmer in responsible waste management and for protection of the water and land resources.

Checklist for wastewater management
<ul style="list-style-type: none"><li>• Proper designing of the farm with independent intake and outfall will reduce the nutrient loading.</li><li>• Proper compaction of bunds with vegetative cover should be provided which will reduce erosion.</li><li>• Proper pond preparation methods will reduce nutrient loads.</li><li>• Proper water and soil quality management in the culture ponds will reduce the nutrient loading of wastewater</li><li>• Responsible feed management will reduce feed wastage.</li><li>• During harvest, water should be drained carefully avoiding re-suspension of sediment.</li><li>• Shrimp pond wastewater should not be discharged into freshwater areas or onto agricultural land.</li><li>• Removing of sediments from the pond bottom should be avoided. It should be corrected <i>in situ</i>.</li></ul>

13.3 Direct output of waste from shrimp farms and hatcheries can alter the water quality along the coastline. The dissolved and particulate nutrients and organic matters including small quantities of chemicals, micro-organisms and detritus can alter the water quality to a great extent and hence have to be properly treated before such wastes are discharged into the open waters or in the drainage canal. Such wastewater could also be used for undertaking secondary aquaculture projects, particularly for culture of mussels, oysters, seaweed, other finfishes, etc. Such integrated projects would also offer scope for

improving the wastewater quality, reducing the organic and nutrient loss and producing an additional cash crop. In addition to this biological amelioration of wastewater, settlement/ sedimentation ponds may be constructed along the drainage canals. The drainage canals may be designed in such a way that they are wide enough to slow down the flow of water from ponds, so as to allow the settlement of these suspended solids.

- 13.4 Effluent Treatment System (ETS) is mandatory for farms above 5 ha. At least 10 per cent of the total pond area should be earmarked for the ETS which may be used for secondary aquaculture projects, particularly for culture of mussels, oysters, seaweed, other fin fishes, etc. Such integrated projects would help improving the wastewater quality, reducing the organic and nutrient loads and producing an additional cash crop.
- 13.5 The standards shown in Table 6 are laid down for the wastewater discharged from the aquaculture systems, hatcheries, feed mills and processing plants. The same may, however, be modified by the Authority from time to time.

**Table 6. Standards for treatment of wastewater discharged from the aquaculture farms, hatcheries, feed mills and processing units**

S.No	Parameters	Final Discharge Point	
		Coastal Marine Waters	Creek or estuarine courses when the same inland water courses are used as water source & disposal point
1	pH	6.0 – 8.5	6.0 – 8.5
2	Suspended solids mg/l	100	100
3	Dissolved oxygen mg/l	Not less than 3	Not less than 3
4	Free Ammonia (as NH <sub>3</sub> -N)mg/l	1.0	0.5
5	Biochemical Oxygen Demand-BOD (5 days @ 20 c) Max mg/l	50	20
6	Chemical Oxygen Demand-COD mg/l Max	100	75
7	Dissolved Phosphate (as P) mg/l Max	0.4	0.2
8	Total Nitrogen (as N) mg/l	2.0	2.0

- 13.6 It is advisable to let ponds dry between harvests rather than removing sediment accumulations from the pond bottom. This method is probably less environmentally damaging than indiscriminate discharge of bottom sediment. If shrimp stocking densities are kept low (below 15 Pl per m<sup>2</sup>), then sediments can be kept in good condition by simply drying the pond bottom between harvests. The solid waste of the farms, including sludge and scrapped soil from the ponds should not be disposed off into the waterways. The waste shall be disposed off within the premises of the farm after adequate treatment without allowing it to get into waterways.

#### **14.0 Farm hygiene and management**

14.1 The objectives of shrimp farming practices should be to produce contaminant-free products for consumers through responsible pond operations and good management practices that prevent, eliminate, or appropriately reduce levels of chemicals, drugs and pathogens that pose human health concerns. The following guidelines should be used to achieve this goal:

- All waste materials should be disposed of in a sanitary way.
- In evaluating the suitability of a site for aquaculture, include testing for any chemicals, drugs and pathogens that might pose a human health risk and are likely to occur at the site.
- Avoid the potential for septic runoff from humans or other animals, as well as any indication of frequent use of pesticides, herbicides, and drugs; and past contamination with fuel oil or any other chemical contaminants.
- Feed should not contain chemical or microbial contaminants. Feeding of uncooked organisms or any nutrient source derived from uncooked organisms is discouraged.
- The shrimp industry and individual producers should work with the government to prepare lists of pathogens, drugs and chemical contaminants that pose existing or potential human health concerns and takes effective measures to control these risks.
- When using any chemical products at or near shrimp-farming sites, shrimp farmers should be attentive to the information on product labels that regards human health concerns.
- Approved drugs, or other chemicals should be used only when necessary to control identified disease problems.

#### **15.0 Environment impact assessment**

15.1 An Environment Impact Assessment (EIA) should be made even at the planning stage by all the aquaculture units above 40 ha size. For 10 ha and above a statement will be required to be given in the detailed plans. The District/ State Level Committees set up by the Coastal Aquaculture Authority should ensure that such an EIA has been carried out by the aquaculture units before their proposal is recommended to the Coastal Aquaculture Authority for approval.

#### **16.0 Environment monitoring and management plans**

16.1 The shrimp culture units with a net water area of 40 ha or more shall incorporate an Environment Monitoring Plan and Environment Management Plan (EMMP) covering the areas mentioned below:

- Impact on the water courses in the vicinity;
- Impact on ground water quality;
- Impact on drinking water sources;
- Impact on agricultural activity;
- Impact on soil and soil salinisation;
- Waste water treatment;
- Green belt development (as per specifications of the local authorities) and
- All farms of 10 ha and more but less than 40 ha shall furnish detailed information on the aforesaid aspects.

### **17.0 Cluster management, record maintenance and networking**

- 17.1 There should be an awareness of avoiding social conflicts and the stakeholders together should discuss common problems and adopt appropriate management measures to avoid conflicts and increase sustainability of the farming systems.

- 17.2 **Farmers' Associations and Self-Help Groups:** Shrimp farmers should form co-operatives, associations or self-help groups in order to exchange technology and to achieve co-operation in water use and waste management. Shrimp culture techniques are also constantly improving, and it is important that shrimp farmers continue to increase their knowledge of sustainable farming techniques.

Small farmers should gain benefit by forming such co-operatives or self-help groups/associations for facilitating supply of inputs, synchronised farming operations, common necessities for monitoring seed and feed quality, shrimp health management and water quality, sale of product and also in organising credit and crop insurance. Formation of an Apex body of Shrimp Farmers associations in the State/ District would be helpful, especially in negotiations with credit agencies and other major organisational activities.

- 17.3 Facilities for regular extension work and different aspects of training should be made available to the farmers. Individual farmers and self help groups/Associations should arrange to interact with the extension staff in the State Department of Fisheries, MPEDA, ICAR institutions, Agricultural Universities, and NGOs, as the case may be to assist the small farmers.

Appropriate awareness programmes through extension work and training of shrimp farmers and officials should be initiated for enhancing the technical knowledge and environmental awareness among the fisheries personnel, extension workers, aquaculturists and all those involved in related activities for planning and operation of sustainable aquaculture.

- 17.4 For facilitating data collection on the practices and farm accounts shrimp farmers/self-help groups should co-operate with the State Department of Fisheries to collect, organize, and evaluate data to demonstrate the adoption of the guidelines and document the benefits of their use and also for other statistical purposes.

- 17.5 Farmers should be encouraged to join shrimp farmers information network at the local, national and regional levels. The shrimp farmers should also see the various developments in shrimp farming in the country and elsewhere. The aquaculture networks available should be made use by shrimp farmers/Groups for improving their knowledge and skills and also for obtaining latest developments and market trends.

### **18.0 Integrated coastal zone management**

- 18.1 Integrated coastal zone management plans should be prepared for each coastal State by the States concerned with zoning for different activities and with buffer zones. This could at best be only a rolling plan (dynamic) in the initial stages so that improvements can be effected annually or biannually, with improved databases and knowledge on site-specific interactions of aquaculture with other sectors.

- 18.2 Detailed master plans for development of aquaculture through macro and micro-level surveys of the potential areas and zonation of coastal area delineating the land suitable and unsuitable for aquaculture using the remote sensing data, ground truth verification, Geographical Information System (GIS) and socio-economic aspects should be considered. In areas where pond density or water surface area (WSA) of shrimp ponds are in excess of the carrying capacity (CC) of the eco-system, which can also be defined as the assimilation capacity of the receiving waters, a reduction in pond density and thus a reduction in the overall WSA should be effected.

## **19.0 Protecting the livelihood of various coastal communities**

- 19.1 Coastal aquaculture, which is now confined mainly to shrimp farming, is one among the several activities in the coastal area involving the coastal communities. Much of the social conflicts in coastal areas are due to the larger demands on the limited resources, resulting in competition amongst the various stakeholders. There are also instances where through harmonious use of resources coastal communities have set up excellent examples of integrated coastal development.
- 19.2 Badly planned and unregulated operation of shrimp farms, as already indicated can cause considerable level of avoidable conflicts with the community and other sectoral activities in the vicinity of the farms. Conflicts could arise between shrimp farmers and others who either live in the coastal zone or depend on coastal zone resources for their livelihood, as also between shrimp farm owners/ managers and employees, especially in the case of larger farms. Some of the more serious inter-sectoral problems would be addressed in the overall governance and regulation by adopting the following guidelines.
- Shrimp farm owners/managers should respect the community rights and needs and in case of any conflicts arising always attempt to solve the problems in amicable ways for ensuring harmony in the community and sustainability of the shrimp farms. They should cooperate with the community and other sectoral users of the coastal resources, in common efforts for improving environmental conditions and community welfare.
  - Farmers, especially with larger holdings should employ local workers as far as possible.
  - Workers should be provided with good working conditions and should also be trained for their skill upgradation.
  - Access to the sea front and other common resources to the coastal communities by the aquaculture units should be ensured. The interests of the communities and organisations in the area should be safeguarded.
  - Care should be taken to see that the natural drainage canals which are used as water source for aquaculture units are not blocked so as to avoid flooding of low lying areas and villages.
  - Salinisation of land and drinking water should be avoided by providing suitable buffer zones between agricultural land, villages and shrimp farms.
  - Use of common property resources like the creeks, canals, etc should be carried out in a harmonious manner and the traditional rights of the coastal communities should not be affected in any way.
  - To avoid problems of ground water salinisation, drawal of ground water is strictly prohibited for shrimp aquaculture. It must be ensured that piezometers/groundwater monitoring bore wells preferably 4/ha (along the periphery of the pond) are installed to monitor salinity ingress. In case of salinity ingress the Coastal Aquaculture Authority should ensure immediate closure of the farms.

**Maximum Permissible Residual Levels  
for Fish and Fishery Products**

<b>Substance</b>	<b>Maximum Permissible Residual Levels (ppm)</b>
<b>A Antibiotics and other Pharmacologically Active Substances</b>	
1. Chloramphenicol	Nil
2. Nitrofurans including: Furaltadone, Furazolidone, Furfuramide, Nifuratel, Nifuroxime, Nifurprazine, Nitrofurantoin, Nitrofurazone	Nil
3. Neomycin	Nil
4. Nalidixic acid	Nil
5. Sulphamethoxazole	Nil
6. Aristolochia spp. and preparations thereof	Nil
7. Chloroform	Nil
8. Chlorpromazine	Nil
9. Colchicine	Nil
10. Dapsone	Nil
11. Dimetridazole	Nil
12. Metronidazole	Nil
13. Ronidazole	Nil
14. Ipronidazole	Nil
15. Other nitroimidazoles	Nil
16. Clenbuterol	Nil
17. Diethylstilbestrol (DES)	Nil
18. Sulfonamide drugs (except approved Sulfadimethoxine, Sulfabromomethazine and Sulfaethoxypyridazine)	Nil
19. Fluroquinolones	Nil
20. Glycopeptides	Nil
21. Tetracycline	0.1
22. Oxytetracycline	0.1
23. Trimethoprim	0.05
24. Oxolinic acid	0.3



<b>B. Substances having anabolic effect and unauthorised substances</b>		
1. Stilbenes, stilbene derivatives and their salts and esters.	Nil	
2. Steroids	Nil	
<b>C. Veterinary drugs</b>		
1. Antibacterial substances, including quinolones	Nil	
2. Ante helminthic	Nil	
<b>D. Other substances and environmental contaminants</b>		
1. Organochlorone compounds including PCBs	Nil	
2. Mycotoxins	Nil	
3. Dyes	Nil	
4. Dioxins	4 picogram per gram, fresh weight	
<b>E. Pesticides</b>		
1. BHC	0.3	
2. Aldrin	0.3	
3. Dieldrin	0.3	
4. Endrin	0.3	
5. DDT	5.0	
<b>F. Heavy Metals</b>		
1. Mercury	1.0	
2. Cadmium	3.0	
3. Arsenic	75	
4. Lead	1.5	
5. Tin	250	
6. Nickel	80	
7. Chromium	12	