

RECENT TRENDS IN AQUACULTURE

TROUT CULTURE IN RECIRCULATORY AQUACULTURE SYSTEM (RAS)



सत्यमेव जयते

National Fisheries Development Board

Department of Fisheries

Ministry of Fisheries, Animal Husbandry & Dairying,
Government of India



Pillar No: 235, PVNR Expressway, SVPNPA Post, Hyderabad - 500 052
Phone No. 040- 24000177/201, Fax No: 040-2401 5568,



nfdb.gov.in



info.nfdb@nic.in



twitter.com/@nfdbindia



facebook.com/nfdbindia

Introduction

To utilize the cold water resource, number of fast growing and economically viable species has been introduced, which include species of Carp and Trout. The Rainbow Trout (*Oncorhynchus mykiss*) is a temperate region (cold water) carnivorous fish species which needs crystal clear and highly oxygenated water, thus well suited for water systems of Himalayan states. Europe, North America, Chile, Japan and Australia are the main producer countries. Rainbow Trout farming has great potential in India since Trout is one of the high value species and having high demand in both domestic and international market. Trout farming is common in the states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh and Ladakh due to the suitable temperature range (5° to 18°C). These states have established a well-developed infrastructure for Trout production depending on the availability of water in required quantity and quality, i.e. from springs and snow/glacier-fed streams. Trout farming in India is having huge potential. These states have an ample cold water resources and is suitable for the culture of high value cold water fish like Trout.



Trout culture in raceways has been traditionally practised for hatchery production of fish, where a flow-through system is maintained to provide the required level of water quality. Environmental and water quantity parameters are easier to manage in raceways than in

pond systems. Flowing water flushes wastes from the culture units and also forces the fishes to exercise thus help in the better survival of the fish. The shallow water in raceways allows visual observation of the fish so that diet and /or disease problems can be promptly corrected. Feeding and harvesting are generally easier in raceway systems. Feeding and disease treatment are easily managed in raceway systems than in open systems or ponds.

However, Rainbow Trout are farmed extensively overseas both in Recirculatory Aquaculture System (RAS) as this land based aquaculture practice enables farmer to use water judiciously. Farming trout in RAS could overcome many of the issues faced by Trout farmers. In RAS, chances of disease outbreak can be minimised, judicious usage of water and land area helps farmer to get more profit. Also, exposure of stock to stress can be reduced for some factors such as adverse weather, unfavourable temperature conditions, pollution incidents and predation.

Advantage of Recirculatory Aquaculture System (RAS)

- Longer average life of tanks and equipment
- Reduced dependency on antibiotics and therapeutants hence, advantage of getting high quality 'safe' fish
- Reduction of direct operational costs associated with feed, predator control and parasites.
- Potentially eliminate release of parasites to recipient waters
- Risk reduction due to climatic factors, disease and parasite impacts
- RAS production can promote versatility in terms of location for farming, proximity to market
- Enable production of a broad range of species irrespective of temperature requirements.
- Feed management is potentially greatly enhanced in RAS when feeding can be closely monitored over 24h periods
- Exposure of stock to stress on RAS farms can be reduced for some factors such as adverse weather, unfavourable temperature conditions, pollution incidents and predation
- Enable secure production of non-endemic species
- Judicial use of water and land areas

Facts about Rainbow Trout

1. Hardy in nature, easy to spawn and fast growing
2. Large fry can be easily weaned on to an artificial diet (usually zooplankton)
3. Maturity in 3-4 years
4. Temperature tolerance range 0 °C to 27°C,
5. Optimum water temperature range is 5°C to 18°C
6. Monoculture is the most common practice in trout culture, and intensive systems are considered necessary in most situations to make the operation economically attractive.
7. Preferable water source is Spring or snow fed stream, which is crystal clear and silt free having pH range of 7 to 8.
8. Preferable water flow rate is 15 litre/min for fry and 0.5 litre/kg/min for fish below 250 gm.



Production Cycle of Rainbow Trout

Pre-stock management

- The seed rearing tanks should be cleaned before the fry/fingerlings arrived. Once the preparation of the tanks is over, water supply should be checked
- Trout is sensitive to changes in water temperature, especially when it is from cold to warm. The smaller the fish, the more sensitive they are, and susceptible to thermal shock particularly to warm thermal shock. Therefore, it is important to raise or lower the temperature of the transport water slowly in steps of 0.5 °C/min in order to ensure safety
- The optimal velocity of water in the raceway is 2–3 cm/sec (1.2–1.8 m/min) for smaller fish and 4–10 cm/sec (2.4–6 m/min.) for larger ones



Post-stock management

The physico-chemical parameters and hygiene leads to successful culture of Trout fish:

- **Optimum temperature:** 5 °C to 18°C
- **Dissolved oxygen:** 5.8 to 9.5 mg/l
- **pH:** A neutral or slightly alkaline pH is best for the trout. Optimum pH level of 7-8 is ideal for the growth
- **Turbidity:** Clear water without any contamination is required for culture. However, the turbidity should not be more than 25 cm in the Secchi disc
- **Hygiene:** The cleanliness is a very important factor in Trout farming. The fish should be cleaned and disinfected either with 10% formalin or 4 ppm KMnO_4 solution periodically through Dip treatment. The infected fish should be immediately removed from the tank and due care should be taken to consult some fishery expert regarding the disease, if any

Seed stocking

Fish seed must be transported in water with optimum temperature. It is also important to release fish seed after proper acclimatization. Therefore, the bucket or basin in which fish are transferred should be submerged into the water where the fish are released for proper acclimatisation.

Feed

Commercial Trout feed manufactured at Govt./Pvt. is available. Feeding @ 4-6 % of body weight is necessary for the fingerlings for better growth but due consideration should be given to the water temperature for following the feeding schedule. At the water temperature range of 10-12°C, feeding schedule of 6% is optimum but when it increases to 15°C, the feeding schedule to be lowered to 4%. The optimum growth rate per month is 30-40 g.

Re-circulatory Aquaculture System(RAS) Components for Trout Culture

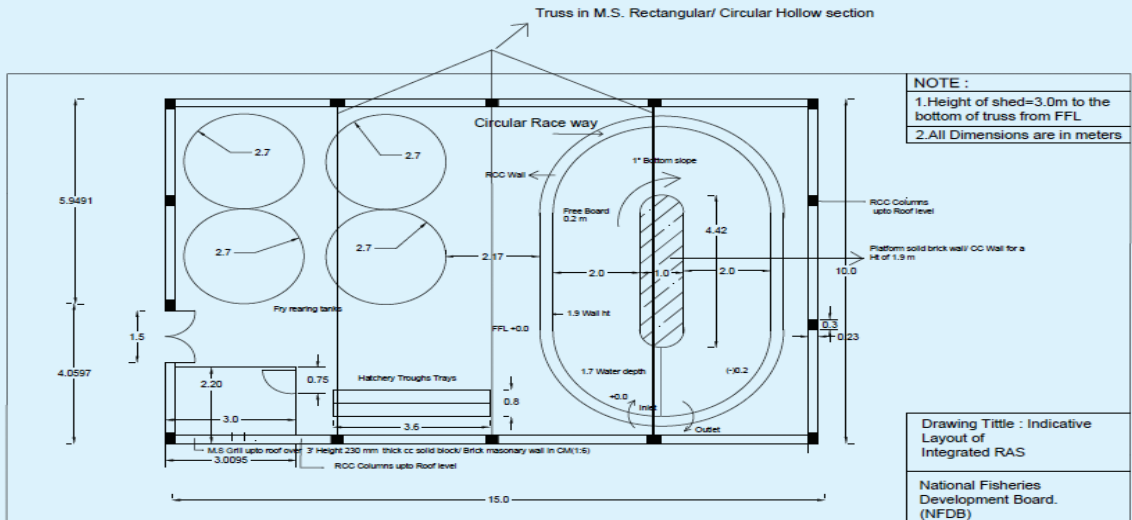
- Insulated shed/ Building
- Store cum office for feed and accessories
- Pump house
- Grow out tanks: Circular cement tanks/ FRP tanks, including inlet, outlet central drainage
- Settling tanks for sludge
- Water Storage (sump) tanks
- Overhead tanks
- Mechanical (Hydraulic) filters, Glass wool/ muslin cloth filter mat
- Pumps and motors
- Power generator
- Sludge collector, settable/ dissolved solid collectors
- Bio-filters, UV units
- Electrification
- Automatic feeder (wherever required)
- Aeration system (air/ oxygen), Carbon dioxide trapper system (degasser)

- Water testing kit
- Water supply system, bore well etc (wherever required)
- Inputs such as Seed, Feed, additives and supplements, electricity/ Diesel, man power etc.

Design and L

Model Technical Specification for Trout culture in Recirculatory Aquaculture System (RAS)

Title	Description
Name of Species	Rainbow Trout (<i>Oncorhynchus mykiss</i>)
RAS tank size	17 m x 2m x 2 m
Effective water depth	1.5 m
No. of tanks	4
Effective water volume	50 cum (total 200 cum for 4 tanks)
Average Depth	1.5 m
Stocking size	10g
Stocking density	100/cum
Stocking no.	20,000 (5000 nos. in each RAS tank)
Survival rate	80%
FCR	1:1.5
Culture period/crop duration	8-10 months
Cost of seed	Rs.10/seed
Cost of feed	Rs.110/kg
Total feed required	6 MT
Size at the time of Harvest	250 gm
Expected Total Biomass	4 MT
Sale price	Rs.500 / kg



Cost Estimate of Medium RAS for cold water Fisheries (with 4 tank of minimum 50 m³/tank capacity and fish production capacity of 4 ton/crop)

A. Capital Cost

Components	Amount (Rs.in lakh)
Shed-100 sqf	1.00
Store cum office for feed and accessories-100 sqf	1.00
Pump house	0.50
Tanks-4 nos @Rs. 2.00 lakh each , 50 cubic meter	8.00
Mechanical filter	1.00
Bio-filters, UV units	1.00
Generator 10 KVA	1.70
Pump-3 nos. of 1 HP; 1 no. of 3 HP	0.60
Sump -30 cubic meter capacity	0.90
Siltation tank 30 cubic meter capacity	0.90
Surge tank	0.50
Sludge collector, settleable/ dissolved solid collectors	0.30
Aerator/Air blower with accessories	1.00
Water testing kit	0.50
Electrification	0.60
Miscellaneous	0.50
Sub Total (A)	20.00

B. Operational Cost

Components	Amount (Rs.in lakh)
Cost of Seed (fingerlings) including transportation @Rs.10/pc for 20,000 nos. (5000 nos./tank)	2.00
Cost of Feed @Rs.110/kg for 6 MT (FCR 1:1.5)	6.60
Man power @Rs.8,000 per month for 10 months	0.80
Electricity	0.50
Transport & Miscellaneous	0.10
Sub total (B)	10.00
Total Cost (A+B)=Rs.30.00 lakh	
Gross Profit: Rs.20 lakh	

Economic feasibility (one crop) from Medium RAS with 4 tank of minimum 50 m³/tank

Sl.No.	Components	Amount (Rs in lakhs)
1	Capital Cost	20.00
2	Operational Cost	10.00
3	Total project Cost	30.00
4	Gross income per crop	20.00
5	Depreciation/maintenance @ 15% of capital cost	3.00
6	Interest @ 12% of TPC	3.60
7	Repayment @ 1/7 th of the TPC	4.28
8	Recurring cost for the next crop	10.00
9	Netprofit at the end of one crop 20-(3+3.60+4.28+10)	-0.88

Model Cost Calculation

- Establishment of Large RAS for cold water fisheries (with 10 tanks of minimum 50 m³/tank capacity and production capacity of 10 ton/crop)

A. Capital Cost	
Components	Amount (in Lakhs)
Shed-400 sqf	4.00
Store cum office for feed and accessories-200 sqf	2.00
Pump house	1.00
Tanks-10 nos @Rs. 2.00 lakh each , 50 cubic meter	20.00
Mechanical filter	2.00
Bio-filters, UV units	1.80
Generator 20 KVA	3.00
Pump-3 nos.of 1 HP; 2 nos. of 3 HP	1.00
Sump -100 cubic meter capacity	3.00
Siltation tank 100 cubic meter capacity	3.00
Surge tank	1.00
Sludge collector, settable/ dissolved solid collectors	0.50
Aerator/Air blower with accessories	2.00
Water testing kit	0.50
Electrification	5.00
Miscellaneous	0.20
Total	50.00

A. Operational Cost	
Components	Amount(Rs.in lakh)
Cost of Seed (fingerlings) including transportation @Rs.10/pc for 50,000 nos. (5000 nos./tank)	5.00
Cost of Feed @Rs.110/kg for 15 MT (FCR 1:1.5)	16.50
Man power @Rs.8,000 per month for 10 months	0.80
Electricity	0.60
Transport & Miscellaneous	0.10
Sub total (B)	23.00
Total Cost (A+B)=Rs.73.00 lakh	
Gross Profit: Rs.50 lakh	

Economic feasibility (one crop) from Medium RAS with 4 tank of minimum 50 m³/tank

S.No.	Components	Amount (Rs in lakhs)
1	Capital Cost	50.00
2	Operational Cost	23.00
3	Total project Cost	73.00
4	Gross income per crop	50.00
5	Depreciation/maintenance @ 15% of capital cost	7.50
6	Interest @ 12% of TPC	8.76
7	Repayment @ 1/7 th of the TPC	10.43
8	Recurring cost for the next crop	23.00
9	Net profit at the end of one crop 50- (7.50+8.76+10.43+23)	0.31

RAS for Cold Water Fisheries Scheme Under PMMSY

Beneficiary Oriented Sub-Components And Activities				
S.No.	Sub-Component And Activities	Unit	Unit Cost (Rs. Lakhs)	Page No.
A	Enhancement Of Production And Productivity			
3	Development Of Fisheries In North-Eastern And Himalayan States/Uts			
3.5	Establishment Of Medium Ras For Cold Water Fisheries. (With 4 Tank Of Minimum 50 M3/Tank Capacity And Fish Production Capacity Of 4 Ton/Crop)	(No)	20.00	105-108
3.6	Establishment Of Large Ras For Cold Water Fisheries (With 10 Tanks Of Minimum 50 M3/Tank Capacity And Fish Production Capacity Of 10 Ton/Crop)	(No)	50.00	105-108

How to avail subsidy?

- Beneficiary needs to submit the Self-Contained Proposal (SCP) along with required documents including documentary evidence of availability of requisite land (either own/registered lease document to the **concerned District Fisheries Office** for further process. In case of leased land, proper registered lease document for a period of 10 (ten) years from the date of submission of SCP shall be submitted.

- Self-Contained Proposal (SCP) shall be submitted with full justification & techno-economic details such as the species to be cultured, capital cost and the recurring cost. Project report should also contain details of anticipated direct & indirect employment generation to local population, enhancement of fish production, specific time lines for implementation of project etc has to be furnished to District Fisheries Officer.
- The governmental assistance is restricted to (a) 1 unit for establishment of Medium RAS (1 unit= 4 tanks) for individual farmer or 2 units (2 units=8 tanks) for groups such as Co-operative/SHG etc., with a production capacity of 4 ton/unit per group/society & (b) 1 unit for Establishment of Large size RAS (1 Unit=10 tanks) for individual beneficiary and 2 (two) units per group/society with production capacity of 10 ton/unit
- Groups of fishers and fish farmers i.e. fisher SHGs/Joint Liability Groups (JLGs)/Fisher Cooperatives etc. with minimum 10 members or those undertaken in a cluster/area approach. However, a cluster/area may have multiple groups/societies.
- However, a cluster/area may have multiple groups/societies. As far as FFPOs/Cs are concerned, the modalities of implementation and upper ceiling on the total area eligible for support would be decided by the CAC.

Import of Genetically Improved Eyed Ova:

- Being a seasonal Brooder, Trout culture suffers from seed unavailability in many cases which can be mitigated by importing Genetically Improved Trout eyed Ova for better performance of Brooder stock also can address In-breeding depression related issues (such as stunted growth, disease prone seeds, mortality etc)
- For importing, Trout farmer/Entrepreneur may contact respective State Fisheries Department for official procedures and guidance.
- Renowned Eyed ova suppliers:

1. AquaSearch ova Aps

Hedegaardsvej 8

DK- 7190 Billund, Denmark, Tel.: +45 55 44 22 11

E-mail: ova@aquasearch.dk

2. DenmarkAquagen

PO Box 1240, N-7462 Trondheim

Tel: +47 72 45 05 00, E-mail: firmapost@aquagen.no, faktura@aquagen.no

Training/Technical Guidance:

Name of the Person	Address	Contact details
Dr. Debajit Sarma, Director-ICAR DCFR	Directorate of Coldwater Fisheries Research (ICAR-DCFR), Anusandhan Bhavan, Industrial Area, Bhimtal-263136, Uttarakhand	E-Mail: director.dcfrc@icar.gov.in, dcfrcin@rediffmail.com, dcfrcin@gmail.com Mob: 9410581550
Mr. Rajnath Pandita Director of Fisheries (Retd.), Government of J&K and Consultant, FDB	Nowabad Fish Farm Complex Canal Road, Jammu-180016	E-mail: r.npandita16@gmail.com Mob: 9419190436
Mr. S. Pradhan, Director of Fisheries, Sikkim	DoF, Gangtok-737101, Sikkim	E-mail: sikkimfisheries@gmail.com Mob: 8637585042
Mr. Satpal Mehta, Director cum Warden,	DoF, Himachal Pradesh Matsya Bhavan, Bilaspur-174 001, Himachal Pradesh	E-mail: ddfisheries-bil-hp@nic.in Mob: 9418007615
Mr. Purohit, Director of Fisheries, Uttarakhand	295-Tea Estate, Banjarawala Dehradun-248001, Uttarakhand	E-mail: dcfrcin@rediffmail.com Mob: 8859001999
Mr. Mohammad Amin Mir, Director Fisheries Jammu & Kashmir	Nowabad Fish Farm Complex Canal Road, Jammu-180016	E-mail: kmrfisheries@yahoo.co.in Mob: 9469666480
Mr. M C Adak, Arunachal Pradesh, DFDO	Department of Fisheries, P.O. Itanagar-791111 Arunachal Pradesh	E-mail: madak2011@gmail.com Mob: 8794685514
Mr. Raja Ameen Lone, DoF	Department of Fisheries, Ladakh	E-mail: aminlone31@gmail.com Mob: 9419342851

List of Trout Feed manufacturer

Name of the Company	Address	Contact details
M/s Growel feeds pvt. Ltd.	R.S. No. 57, Chevuru Village, Sriharipuram Panchayat, Mudinepalli Mandal, Krishna District – 521329, Andhra Pradesh	E-mail: customercare@growelfeeds.com Mob: 9618763322, 9989453322
M/s Devee Biologicals Private Limited	Mr. Dushyanth Kumar, Director, Plot No-1307, Ist Floor, Yell Reddygudda, Ameerpet, Hyderabad, Telangana 500073	Email: deveebiologicals@gmail.com Mob: 9849122265
M/s BioMar Group	Vaerkmestergade 25, 6th floor 8000 Aarhus C, Denmark	Tel: +45 86 20 49 70 Website: www.biomar.com
M/s Aller Aqua Group	Allervej 130, 6070, Christiansfeld, Denmark	E-mail: info@aller-aqua.com Tel: +45 70 22 19 10 Website: www.aller-aqua.com



National Fisheries Development Board

Department of Fisheries

Ministry of Fisheries, Animal Husbandry & Dairying,

Government of India



Pillar No: 235, PVNR Expressway, SVPNPA Post, Hyderabad - 500 052

Phone No. 040- 24000177/201, Fax No: 040-2401 5568,