Hatchery and Seed Management in Freshwater Aquaculture: " Maharashtra Perspective"

Dr. Hukam Singh Dhaker

Former Dean

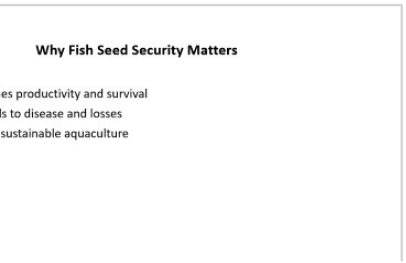
College of Fisheries

(Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth)

Ratnagiri

Why Fish Seed Security Matters

- Seed determines productivity and survival
- Poor seed leads to disease and losses
- Foundation of sustainable aquaculture



What is Fish Seed Security?

- Availability of quality seed
- Right species, size & time
- Affordable & accessible
- Sustainable & biosecure

Fish Seed Size Categories

- Fry: 30–40 mm
- Advanced fry: 41–60 mm
- Fingerlings: 61–100 mm
- Stunted seed: 100–140 mm

Maharashtra Seed Requirement

- Total: 92.17 crore fry
- Production: 55.94 crore fry (2022-23)
- Deficit: 36.23 crore fry

Source https://fisheries.maharashtra.gov.in/
Handbook on Fisheries Statistics2023

Rising Seed Demand

- Reservoir stocking
- Cage culture expansion
- Biofloc & RAS system
- Year-round stocking
- Intensive farming systems

Cultivable Species of Indian and Exotic Carps

Pangasianodon hypophthalmus

GIFT (Genetic Improvement of Farmed Tilapia)

Jayanti rohu

Species-wise Status

Indian Major Carps

- Dominated by government hatcheries
- Aging infrastructure and seasonal constraints
- Need for genetic rejuvenation and advanced nurseries

Tilapia

- Mostly private hatchery-driven production
- Mixed strains and inconsistent monosex supply
- High risk of TiLV transmission through seed

Pangasius

- Heavy dependence on seed from other states
- Transport stress and mortality common
- Limited skilled manpower in hatchery operations

Western Maharashtra

Focus: For IMC and Tilapia production (notably Pune and Solapur/Ujani).

Challenges:

High Input Costs: Farmers identify high costs of quality seed and feed as major constraints.

Disease Risk: Intensification increases vulnerability to pathogens like Tilapia Lake Virus (TiLV).

Regulatory Compliance: Deteriorating seed quality in non-certified private hatcheries leads to poor growth.

Marathwada

Focus: For Pangasius production.

Challenges:

Temperature Stress: Heatwaves exceeding 33°C causing mass mortality and spawning failure.

Water Hardness: "Hard" water in the Deccan Plateau causes mineral deposits on egg membranes, preventing hatching.

Supply Dependency: Heavy reliance on external states for Pangasius seed, leading to high transport mortality.

Vidarbha:

Focus: For Indian Major Carps (IMC).

Challenges:

Water Scarcity: Severe pre-monsoon (April–June) water shortages threaten nursery survival.

Inefficient Management: Low productivity in small reservoirs due to non-scientific stock management.

Seed Purity: High prevalence of "mixed/impure" seed from private suppliers, often containing weed fish.

Konkan Region (including Raigad & Palghar)

Focus: Rapid growth area (Palghar up 500% in 5 years) for Pangasius and Tilapia.

Challenges:

Brackish Water Intrusion: Coastal nurseries must manage salinity levels to protect freshwater fry.

Lack of Manpower: Acute shortage of personnel trained in modern broodstock management for catfish.

Circular hatchery comlex

FRP circular hatchery

Gift Tilapia htahery

Note: West Coast Aquatics - IMC & GIFT TILAPIA HATCHERY ISAPUR (Matsya beej Kendra)

Production of advanced fingerlings of carps in cages

- **Size of cage: 3 x 3 x 3 m**
- **Size of seed at stocking: 25 mm**
- **Number of fry stocked per cage: 3000**
- **Feed: GOC and Rice bran (1:1)**
- **Culture period: Three months**
- **Size at harvest: 80 – 120 mm**
- **Survival: 70-80%**

Where does the extra seed come from?

To meet the 36.23crore fish fry deficit, Maharashtra currently relies heavily on:

- West Bengal: The primary exporter of carp seed to Maharashtra.
- Andhra Pradesh: Supplies high-quality Tilapia and Catfish seed.
- Private Hatcheries: A growing number of private entrepreneurs in Western Maharashtra are setting up hatcheries to reduce dependence on other states.

The "Fingerling" Preference

It is important to note that while the demand is measured in "Fry" (small size), the state government is now shifting its focus to Fingerling (80-100 mm) demand. Because mortality rates for fry in large reservoirs are high, the demand for "Advanced Fingerlings" is skyrocketing, even though they are more expensive to produce and transport.

Shift in Seed Preference

- From seasonal monsoon demand to year-round stocking
- Preference shifting from fry to advanced fingerlings
- Uniform size and fast growth critical for intensive systems

Farm pond

Pravara Dam

Broodstock Management:

- Source Variation: Never source male and female breeders from the same hatchery or siblings from the same batch.
- Wild Stock Infusion: Periodically introduce "Wild Germplasm" (fish from rivers) to refresh the genetic pool.
- Avoid Negative Selection: Do not keep the "leftover" slow-growing fish as future breeders. Only the top 5–10% of the fastest-growing and healthiest individuals should be promoted to broodstock status.
- Protein & Lipids: Use high-protein diets (35–40% crude protein) enriched with Omega-3 and Omega-6 fatty acids. These are critical for egg yolk (vitellogenesis) quality.
- Vitamin E & Selenium: These act as antioxidants that prevent "egg oxidative stress" and significantly improve hatching rates.
- stocking density is 1,500–2,500 kg per hectare. Overcrowding leads to stress hormones (cortisol) that degrade egg quality.
- Record : maintain a digital record of each fish's age, weight, and breeding history to prevent accidental sibling mating.

Standard for "Quality Brood

Parameter	Brood
Age	2–5 years (Avoid very old or very young breeders)
Weight	Catla: > 3 kg; Rohu/Mrigal: > 1.5 kg
Body Condition	No deformities, bright scales, firm belly (females)
Fertilization Rate	Minimum 85% success in previous cycles
Hormone Dose	Use minimal effective dose (Ovaprim/Ovapel) to avoid "hormonal burnout"

Female

Male

AMR and Freshwater Hatcheries – Why It Matters

What is AMR?

Antimicrobial Resistance (AMR) occurs when microbes survive antibiotics meant to kill them

Resistant bacteria spread through fish, water, and environment

Why Hatcheries are Critical

Hatcheries are the first point of intervention in aquaculture

One hatchery supplies seed to hundreds or thousands of farms

AMR introduced at seed stage gets multiplied across the value chain

Key Message:

AMR control in aquaculture begins at the hatchery, not at the farm.

AMR-Safe Hatchery Management

Best Practices for Hatcheries

- Zero routine/prophylactic antibiotic use
- Antibiotics only after laboratory diagnosis
- Strong broodstock nutrition & stress reduction

Use of non-antibiotic alternatives:

- Probiotics
- Immunostimulants
- Iodine / salt disinfection
- Strict hygiene, water quality & biosecurity

Hatchery Certification Is Critical

- Prevents mixed species and hybrid seed
- Blocks pathogen transmission at source
- Ensures quality, traceability and accountability

- **Certification Criteria**
- Clean, treated and pathogen-free water
- Genetically pure broodstock (no hybrids)
- Pathogen-screened, uniform and robust seed

How AMR Develops in Seed Production

Common Hatchery Practices Leading to AMR

- Prophylactic antibiotic use in broodstock
- Antibiotic baths in eggs and larvae without diagnosis
- Repeated use of same antibiotics
- Use of antibiotics for viral or stress-related mortality

Results

- Selection of antibiotic-resistant bacteria
- Disruption of beneficial hatchery microbiota
- Seed becomes a carrier of AMR bacteria

Reality:

Antibiotics are often used to mask poor management, not to treat real disease

AMR Impact on Seed Quality & Environment

Impact on Seed Quality

- Weak immunity and poor growth
- Higher disease outbreaks after stocking
- Farmers forced into repeated antibiotic use
- Environmental Spread

Antibiotics and AMR bacteria released into:

- Ponds
- Canals
- Rivers and reservoirs

AMR genes persist in sediments and wild fish

Mandatory Seed Certification

To protect farmers from poor-quality stock, Maharashtra has implemented a mandatory Seed Certification regime under the 2025-26 National Guidelines.

The Certification Workflow

Accreditation: Hatcheries are audited for water quality, biosecurity, and broodstock source.

Pathogen Screening: Seed lots are screened for diseases.

The Azure Blue Tag: Certified seed is issued an official tag with a QR Code.

The QR System: Scanning the tag allows farmers to instantly verify the hatchery's license, the variety of fish (e.g., Jayanti Rohu), and the date of spawning, ensuring total transparency.

Critical Challenges in the Sector

Water Scarcity: Many hatcheries in the Marathwada region struggle during the pre-monsoon months (April–June).

Temperature Fluctuations: Sudden heatwaves can cause mass mortality in shallow nursery ponds.

Quality Control: The need for "Seed Certification" to ensure farmers aren't buying stunted or diseased stock.

Critical Success Factors for Maharashtra

Temperature Control: If the water temperature exceeds 33^0 C, hatching rates drop significantly. Many farms now use green shade nets over hatcheries.

Water Hardness: In the Deccan Plateau, water can be "hard." Ensure the water is filtered to prevent mineral deposits on the delicate egg membranes.

Strategic Opportunities for Maharashtra

1. Establish Tilapia & Pangasius Seed Hubs
Develop dedicated hatchery hubs for Tilapia and Pangasius, integrated with quality testing labs.

2. Quality Standards & Certification
Introduce seed certification programs for Tilapia and Pangasius fingerlings (size, health, genetic purity).

3. Private Sector Partnerships
Encourage private hatchery investment and cooperation with research institutions (e.g., ICAR, fisheries colleges).

4. Farmer Producer Organizations (FPOs)
Form seed producer FPOs to aggregate demand/supply, improve bargaining, and maintain quality controls.

5. Training & Extension
Expand training in broodstock management, hatchery operations, and disease management for these emerging species

THANK YOU