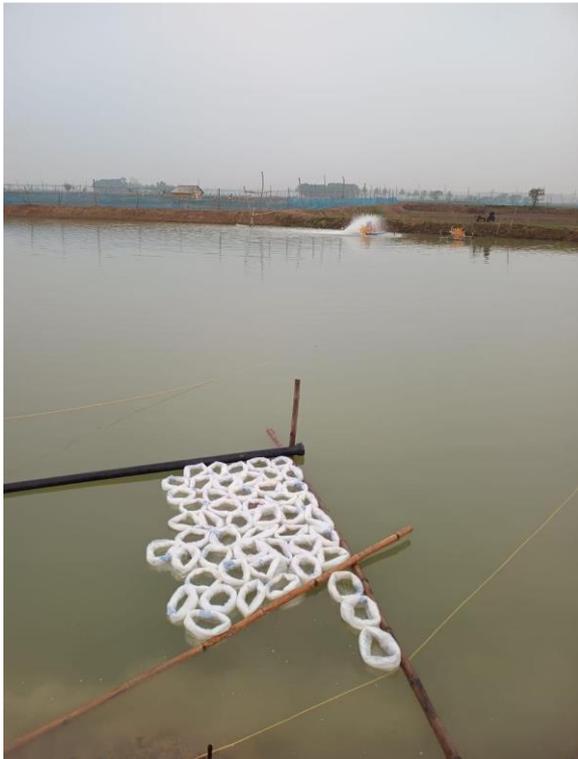


Sustainable Shrimp Farming in Odisha

An Analysis Of Quality and Safety Challenges



Ph.D. Presentation

Research by

Sukumar Dash

Roll Number: 2381215

Supervisor: Dr. Damodar Jena

Supervisory Committee Members

Dr. H.S. Ganesha

Dr. Srilata Patnaik

Framework

01

Background & context

02

Objectives

03

Research Questions

04

Literature Review

05

Conceptual Framework

06

Methodology

07

Scope of the Study

08

Relevance of the Study

09

Research Gap

10

References

11

Q&A

Growth & Significance

● Sectoral Growth

Aquaculture has emerged as one of the fastest growing food production sectors globally including India. In Aquaculture Shrimp production has emerged as the predominant segment.

● Odisha's Role

Odisha has seen a significant production rise in Aquaculture since last three decades and is a major export earner for the State. In this Balasore district, it accounts for (38.8%) of marine fisherfolk population and is a major producer and exporter.

Increasing global concerns regarding food safety, antibiotic residues and compliance with International quality standards have highlighted significant sustainability challenges involving environment and economic fall out.

Sustainability Dimensions: Quality & Safety

- **Physical Dimension**

Attributes influencing market acceptance & issues involving quality.

Size

Uniformity

Colour

Freshness

- **Chemical Dimension**

Residues and Water quality & issues involving quality.

Antibiotic Residues

Water quality

Chemical Inputs

- **Microbiological Dimension**

Pathogens, microbial balance & issues involving safety.

Pathogenic Microbial

Antimicrobial resistance

Microbial Balance

Objectives

- ❖ To understand the physical quality attributes of shrimp as shaped by farm management practices.
- ❖ To understand the health and safety risks associated with the use of antibiotics and chemical inputs in shrimp farming.
- ❖ To understand water quality management and bio security practices and their underlying rationale among shrimp farmers in the district.
- ❖ To understand how sustainability standards are interpreted, adopted and practised by shrimp farmers in the district.
- ❖ To propose policy and farm level interventions for improving sustainable and quality compliant shrimp farming in Odisha based on the analysis of quality, safety and perceived economic implications of current farming practices.

Research Questions

1. How are the physical quality attributes of shrimp shaped by farm management practices?
2. How do shrimp farmers understand and manage health and safety risks associated with the use of antibiotics and chemical inputs?
3. How are water quality management and bio security practices adopted and implemented by shrimp farmers in the district?
4. How are sustainability standards interpreted and adopted in shrimp farming practices in the district?
5. How do quality, safety and perceived economic implications of shrimp farming practices inform policy and farm level interventions in Odisha?

Literature Review

❖ Water Quality

- Shrimp farming has progressively transitioned from natural marine environments to semi-intensive and intensive production systems. Thus, water quality becomes a central factor in shrimp survival, growth performance and final product quality.
- Dissolved Oxygen, Temperature, PH, Salinity, Alkalinity and water transparency influence shrimp metabolism, growth and survival.

Literature Review

❖ Proper Pond Management

- Adequate water exchange and proper aeration, proper feeding schedules and methods, good bio security measures and proper pond preparations between culture cycles and regular monitoring of water parameters are essential. In the absence of these, there would be deterioration of water quality, which lead to higher incidence of diseases.

❖ Nitrogenous Wastes

- A Proper management would prevent nitrogenous wastes from accumulation and thereby maintain the pond quality and check the diseases .

Literature Review

- Existing literature provides substantial quantitative evidence on water quality parameters and antibiotic use and effects
- Farmers perceptions of risk, disease and productivity and how these shape feeding practices, pond management and antibiotic use remain largely unexplored.
- The gap between recommended best management practices and actual on farm practices has not been properly examined using context specific situation.

Conceptual Framework

STRUCTURAL & CONTEXTUAL FACTORS

- Pond Size
- Production risk Env
- Regulations
- Export Market pressure



MANAGEMENT & BEHAVIOURAL PRACTICES AT FARM LEVEL

- Chemical & antibiotic use
- Water quality management
- Biosecurity practices



QUALITY & SAFETY OUTCOMES

- Physical Quality
- Chemical safety risks
- Compliance



PERCEIVED ECONOMIC IMPLICATIONS

- Rejection risk
- Compliance cost
- Income uncertainty



POLICY & FARM-LEVEL INTERVENTIONS

- Extension services
- Implementation and enforcement mechanisms
- Incentives

Methodology

To understand how farm management practices influence the physical quality attributes of Shrimp

Data Type

Nature of Information

Data Source

Participants & Documents

Analysis

Tools & techniques

Qualitative Data: Primary Sources

- Key Informant Interviews (KIIs)
- Farm Supervisors & Technicians

Secondary Sources

- Relevant guidelines and quality standards:
- *MPEDA, ASC, FAO, Directorate of Fisheries*

Thematic Analysis

- Coding interview transcripts to identify recurring themes related to physical quality attributes.

Grounded Theory

- Open & Axial coding to link management practices with perceived quality outcomes.

Comparative Analysis

- Comparing practices across different farms to identify similarities and variations in quality management.

Methodology

To understand the health and safety risks associated with the use of antibiotics and chemical inputs in shrimp farming.

Data Type

Nature of Information

Data Source

Participants & Documents

Analysis

Tools & techniques

Qualitative Data:

Primary Sources

- Shrimp Farmers
- Input Suppliers
- Extension Officers & Regulatory Officials

Secondary Sources

- Literature on antibiotic use & food safety
- Policy Documents (MPEDA, CAA, FSSAI)

Thematic Analysis

- Identification of themes related to risk perception, usage of practices and compliance.

Grounded Theory

- Open coding to capture emergent concepts: Axial coding to relate antibiotic use practices with risks

Content Analysis

- Analysis of regulatory texts and advisory documents to contextualize field narrative.

Methodology

To understand water quality management and bio-security practices and their underlying rationale among shrimp farmers

Data Type

Nature of Information

Data Source

Participants & Documents

Analysis

Tools & techniques

Qualitative Data: Primary Sources

- KII with Shrimp Farmers
- Farm Technicians
- Extension Personnel

Secondary Sources

- Water quality & bio-security guideline:
- ASC MPEDA CAA FAO

Thematic Analysis

- To identify recurring management practices in water quality and biosecurity.

Comparative Analysis

- Comparing approaches across different farms to capture variations in implementation.

Grounded Theory

- Coding to link specific practices with farmers perceived outcomes.

Methodology

To understand the nature and patterns of adoption of sustainability standards in shrimp farming

Data Type

Nature of Information

Data Source

Participants & Documents

Analysis

Tools & techniques

Qualitative Data:

Primary Sources

- Key Information Interviews (KIIs)
- Interviews with exporters and regulators

Secondary Sources

- Compliance & Policy materials:
- *Certification manuals, policy documents and guidelines*

Thematic & Content Analysis

- Analyzing interview data and documents to understand how standards are interpreted.

Comparative Analysis

- Identifying recurring adoption patterns across different farming contexts.

Grounded Theory

- Explaining adoption behaviour and barriers through emergent theoretical concepts.

Methodology

Data Synthesis

Nature of Information

Synthesised Qualitative Findings

From Objectives 1-4 & Stakeholder perceptions on policy gaps and practical needs

Data Source

Participants & Documents

Analysis

Tools & techniques

To propose policy and farm level interventions for improving sustainable and quality compliant shrimp farming in Odisha

Qualitative Data:

Primary Sources

- KII with policy makers
- Extension Officers and Industry Stakeholders

Secondary Sources

- National & International policy frameworks
- *Best practice guidelines*

Integrative Thematic Analysis

- Synthesizing cross-cutting themes from previous objectives.

Comparative Policy Analysis

- Evaluating existing frameworks against local realities.

Interpretive Analysis

- Deriving context-specific recommendations for policy and farm-level interventions.

Scope of the Study

- ❖ The study focuses on sustainable shrimp farming in Odisha with Balasore district as the case area. It examines physical quality attributes, chemical safety concerns, water quality management, bio-security practices and adoption of sustainability standards using qualitative and descriptive analytical approaches.
- ❖ Provides actionable insights for regulators to improve compliance frameworks. Helps in designing effective farm-level interventions that are practical for small and medium-scale farmers.
- ❖ Offers practical strategies for export-oriented quality management, mitigating rejection risks and ensuring long-term market access for Odisha's seafood products.

Relevance of the Study

Why this Research Matters

❖ Filling the Gap

While global framework exist, there is a critical lack of region-specific evidence. This study connects global standards with local realities in Balasore.

❖ Economic Scale

With shrimp being a major export earner for Odisha, addressing quality failures is directly linked to economic sustainability and livelihoods.

❖ Bridging Regional Evidence Gaps

Generates specific evidence on sustainability and quality challenges in Odisha's shrimp farming sector, moving beyond general national-level assumptions to district-level realities.

The Missing Links

❖ Global Vs Regional

While global frameworks (FAO,ASC) define sustainability, Odisha-specific assessments remain limited. Despite being a major shrimp producing state, there is a lack of region-specific sustainability analysis.

❖ Methodological Void

Existing studies predominantly focus on quantitative metrics (residues, water parameters). There is a scarce qualitative evidence on the behavioral drivers – why farmers make specific management decisions.

Research Gap

Key Research Deficiencies

❖ The Implementation Gap

Significant divergence exists between recommended Best Management Practices (BMPs) and actual on-farm realities, particularly in semi-intensive systems with shared water resources.

❖ Behavioral & Decision-Making Insights

Insufficient evidence on farmers risk perceptions, disease management rationale, and decision-making regarding antibiotic and chemical usage.

❖ Policy-Practice Disconnect

Limited integration of governance and compliance realities with on-farm management evidence. How do regulatory constraints actually impact daily farm operations?

References

- Boyd, C. E. (2003). Bottom soil and water quality management in shrimp ponds. *Journal of Applied Aquaculture*, 13(1–2), 11–33.
https://doi.org/10.1300/J028v13n01_02
- Aquaculture Stewardship Council. (2023). *ASC shrimp standard v1.2.1* (Version 1.2.1). Aquaculture Stewardship Council.
https://asc-aqua.org/wp-content/uploads/2023/07/ASC-Shrimp-Standard_v1.2.1.pdf
- Arsene, M. M. J., Davares, A. K. L., Viktorovna, P. I., Andreevna, S. L., Sarra, S., Khelifi, I., & Sergueievna, D. M. (2022). The public health issue of antibiotic residues in food and feed: Causes, consequences, and potential solutions. *Veterinary World*, 15(3), 662–671.
<https://doi.org/10.14202/vetworld.2022.662-671>

References

- Mandal, A., & Duyari, M. (2024). Better management practices (BMPs) for sustainable shrimp farming. *Chronicle of Aquatic Science*, 1(9), 52–56.
<https://chronicleofaquaticscience.in>
- Sahoo, A. K., & Khan, M. A. (2023). Indian marine products exports: Growth, market instability, and forecast analysis. *Educational Administration: Theory and Practice*, 29(4), 1365–1373.
<https://doi.org/10.53555/kuey.v29i4.5238>

THANK YOU

FOR YOUR ATTENTION

Questions & Discussion

I welcome any feedback, questions or suggestions regarding the methodology and conceptual framework presented.