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Poultry Cum Fish Culture: Maximizing Farm Return with A Smart Integration Strategy

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Abstract

Integrated poultry-fish farming presents a cost-effective and sustainable solution for enhancing farm productivity and profitability. This system allows farmers to significantly reduce feed costs by utilizing poultry waste primarily bird droppings as a nutrient source for fish. The droppings, though potentially carrying pathogenic or antibiotic-resistant bacteria, serve as organic manure that promotes the growth of natural fish food organisms in ponds. The integration creates a mutually beneficial recycling loop, improving nutrient utilization while reducing dependency on commercial fertilizers and supplementary fish feed. This method not only minimizes input costs but also addresses environmental concerns through effective on farm waste recycling. Furthermore, integrated poultry-fish systems contribute to rural development by generating additional income, promoting livelihood security, and empowering women through inclusive agricultural participation. The overall outcomes demonstrate that integrated pond management, combining fish and poultry farming, is a viable model for sustainable agricultural development, particularly for resource-poor rural households. The results validate the efficacy of integrated fish-cum-poultry farming as a profitable and ecologically sound venture, offering long-term solutions to issues related to food security, environmental sustainability, and rural employment.
Keywords: Poultry, Fish, Culture, Farmer, Integration

Introduction

Integrated agriculture-aquaculture has a rich history of over 1500 years, particularly in Asia and India. The fundamental principle behind this integrated farming system is the concept that *"there is no waste"*, meaning that the output (or waste) of one component can be repurposed as an input for another (Kalita & Borah, 2023). This system maximizes resource utilization while promoting ecological sustainability. In India, poultry farming is gaining significant attention due to improved scientific management practices. With the introduction of superior breeds, strains, and varieties, poultry farming has evolved into a popular rural enterprise across many states, including Andhra Pradesh, Bihar, Haryana, Kerala, Maharashtra, Uttar Pradesh, West Bengal, Tamil Nadu, and Odisha (Tanu Agritech Portal, 2015; Bharali *et al*., 2020).

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The integration of aquaculture with livestock, particularly poultry, offers multiple benefits:

- High-quality protein food production
- Efficient recycling of farm waste
- Resource optimization
- Income diversification
- Employment generation

This farming model is recognized by the **Food and Agriculture Organization (FAO)** for its contribution to sustainable development (Endebu *et al*., 2016; Gabriel *et al.,* 2007).

Poultry-fish farming involves the simultaneous rearing of birds such as chickens, ducks, and geese alongside fish. The manure from poultry acts as an organic fertilizer in fish ponds, enhancing plankton production which serves as natural fish feed. This reduces dependence on commercial feed, thus minimizing input costs and enhancing profitability (Gabriel *et al*., 2007). Modern agriculture increasingly seeks sustainable innovations that boost productivity while minimizing environmental impact. The integration of broiler or layer poultry farming with aquaculture helps reduce the cost of fertilizers and fish feed. Poultry can be raised directly over or adjacent to fish ponds, using systems like **LIVI A-type layer cages**. These cages are designed to facilitate efficient waste collection and pond fertilization. Their benefits include:

- Enhanced nutrient recycling
- Natural pest control
- Better land and water use efficiency
- Increased farm income through diversified production

This integrated system not only supports ecological farming practices but also aligns with the goals of sustainable rural development in India.

Comon Design Principles in Integrated Poultry-Fish Farming Systems

According to **Adeyemi, 2022**, integrated poultry-fish farming systems typically follow one of the following design models:

1. **Agro-Aquaculture Integration (rice-poultry-fish system)**

   This system combines poultry-fish farming with agricultural crop production (such as rice), creating a diversified farming model that can improve overall income stability. While economically beneficial, such a system requires complex and careful management due to its multi-component nature.

2. **Cage-Cage Poultry-Fish Farming**

   In this design, both poultry and fish are confined poultry in coops and fish in cages placed within a larger aquatic system. This method simplifies certain aspects of farm management. However, it poses the risk of fish loss if cage integrity fails, particularly in open or natural water bodies.

3. **Pond-Based Poultry-Fish Farming**

   In this setup, poultry housing is either directly over the pond or near it, allowing poultry waste to enter the pond system either by design (manual collection) or naturally (birds swimming in the pond). This method helps in recycling nutrients but requires strict monitoring to avoid water quality deterioration.

Integrated Fish and Poultry Farming: Key Practices (Singh, 2018)

Integrated fish-poultry farming systems can broadly be categorized into two interlinked components:

1. **Poultry Husbandry Practices**
2. **Fish Culture Practices**

1. Poultry Husbandry Practices

Both *broilers* (raised for meat) and *layers* (raised for eggs) can be effectively integrated into fish-poultry farming systems.

- **Chick Rearing**: One-day-old chicks are initially raised to the pullet stage, after which layers are housed in cages.
- **Housing System**: Battery cage systems are commonly used in intensive production. These cages are typically placed near or above fish ponds.
  - The floor is cemented and sloped to allow eggs to roll forward for easy collection.
  - Cages are made of galvanized wire and set on trays to collect poultry droppings, which serve as manure for the pond.
- **Space Requirements**:
  - For *layers*, each bird requires about **30 cm²** of floor space.
  - For *broilers*, **15–20 cm²** is generally sufficient.
  - A typical cage dimension is **20 × 30 × 40 cm** per bird.

2. Fish Culture Practices: Fish ponds are stocked with compatible species such as *catla*, *silver carp*, *common carp*, *murrels*, *tilapia*, and *giant freshwater prawns*. The fish feed on natural pond productivity enhanced by poultry droppings.

- **Short-Term Culture (4 months)**:
    - A pond of 1 hectare can be stocked with **5000 giant freshwater prawns** and **1500 silver carp.**
    - After four months, harvests typically include:
        - **600 kg** of prawns
        - **600 kg** of fish
        - **250 culled birds**
- **Long-Term Culture (12 months)**:
    - Stocking density: **5000–6000 fingerlings per hectare** (*catla*, *silver carp*, *common carp*, *grass carp*)
    - At the end of the year, average yields include:
        - **3900 kg of fish per hectare**
        - **42,000 eggs**
        - **200 culled birds**

Economic analysis:

An integrated model of fish-cum-poultry farming was studied in 2022 using 1 hectare (ha) of pond area for composite carp culture and 1,000 White Leghorn poultry birds, housed in a 24 × 36 ft shed constructed directly over the fish pond. This design allowed efficient recycling of poultry droppings into the aquatic system, serving as organic manure and fish feed. The results of the study revealed a net annual profit of approximately ₹6.78 lakh, demonstrating the significant income-generating potential of the integrated model. The poultry droppings served as the sole nutrient input for fish production, yielding an average fish output of 6.3 tonnes per hectare per year. An economic analysis of this model indicated a return on total expense of 49.67%, with a monthly average net income of ₹56,500. These figures underscore the sustainability and profitability of this low-input, high-output integrated farming approach (Kaur & Tanwar, 2023).

Similarly, Misra *et al.* (2019) evaluated the utility of integrated fish-cum-poultry systems in Arunachal Pradesh as a tool for self-employment and rural development. Their findings showed that the cost-benefit ratio of the integrated system was significantly higher compared to traditional standalone farming practices. The study concluded that such models are particularly beneficial for small and marginal farmers, offering a sustainable pathway to improve household income and food security. These findings collectively highlight the economic and ecological advantages of integrated fish and poultry farming. Beyond

profitability, the model also supports waste recycling, nutrient optimization, and sustainable resource use, making it a promising practice for climate-resilient agriculture and rural livelihood enhancement in India.

Economics of Fish-cum-Poultry Farming (Sahoo and Bardhan, 2025)

A. Expenditure Detail

S. No.	Particulars	Amount (₹)
1	Construction of pond & water supply channel	25,000
2	Electricity & water charges	60,000
3	Construction of poultry shed (Depreciated cost)	15,000
4	600 Chicks	9,000
5	23,000 kg Poultry Feed (@ ₹30/kg)	3,00,000
6	Medicines for fish & poultry	50,000
7	Fishing, sale of poultry birds & labour	40,000
	Total Expenditure (A)	**₹ 4,99,000**

B. Income Details

S. No.	Particulars	Amount (₹)
1	Sale of Fish, 6,000 kg, ₹150/kg	9,00,000
2	Sale of Eggs 1,19,000 eggs, ₹5/egg	5,95,000
3	Sale of 500 kg Poultry Birds	1,00,000
	Total Income (B)	**₹ 15,95,000**

C. Net Profit

Description	Amount (₹)
Total Expenses (A)	4,99,000
Total Income (B)	15,95,000
Net Profit	**₹ 10,96,000**

The economic analysis of the integrated fish-cum-poultry farming system by **Sahoo and Bardhan** reveals a highly profitable model. With a total expenditure of ₹4.99 lakh and total income of ₹15.95 lakh, the system yields a **net profit of ₹10.96 lakh annually**. Major costs include poultry feed and utilities, while significant income is generated from the sale of

fish, eggs, and poultry birds. This integration significantly enhances resource efficiency and profitability.

Advantages and disadvantages of fish-cum- poultry culture:

Advantages:

- Chicken manure is a very efficient fertiliser, so no chemical fertiliser is needed for fertilising the pond water. This cuts down the expenditure of rearing fishes.
- No supplementary fish feed is required.
- The purchase and feeding cost per bird is low.
- Chicks are readily available and their productivity can be improved with simple and cheap management.

Disadvantages:

- Chicks should be examined from time to time and diseased one should be isolated, otherwise they will destroy the entire stock.
- Sufficient time should be given from one stocking of chicks to the next for renovation of the house and disinfecting it.

Conclusion

The results demonstrate the efficacy of integrated fish-cum-poultry farming as a profitable venture for farmers. Additionally, this system effectively addresses issues of sustainability and livelihood security. As a comprehensive model, it offers a promising solution for resource-poor rural communities by combining nutritional security with sustainable livelihood opportunities. Overall, integrated pond management involving both fish and poultry presents an excellent approach to achieving sustainable production, enhancing income generation, and creating employment opportunities for economically disadvantaged rural households.

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