

traditional method of growing fish outdoors in open ponds and raceways in a controlled environment. Recirculating systems filter and clean the water by recycling it back to fish culture tanks. The technology is based on the use of mechanical and biological filters is used for species grown in aquaculture (Jham et al., 2024). The reconditioned water circulates through the system and less than 10% of the total water volume of the system is replaced daily in recirculation system. The management of recirculating systems relies heavily on the quantity and quality of feed and filtration system used to remove metabolic wastes, excess nutrients, and solids from the water and provide good water quality. It encourages farmers and entrepreneurs and to facilitate fish production in urban and semi-urban areas where land and water resources are limited. In backyard Recirculation Aquaculture Systems is promoted RAS minimizes the risk of disease and promotes a healthier and more resilient aquaculture system keeping environmental conditions stable with increased production yields. The challenges reflects a significant challenge in agriculture, where high initial investment acts as a major barrier to economic viability and accessibility for small-scale farmers (Sedyaaw et al., 2025). RAS systems have been successfully implemented to produce various fish species, including Atlantic salmon, Arctic charr, rainbow trout, yellowtail king fish, the European seabass, and gilthead seabream (Supra Subhadarsani, 2024). H<sub>2</sub>S-poisoning as a health hazard. RAS system can lead to both fish and other culture species. The RAS can assess adverse weather, unfavorable temperature conditions, external pollution and predation that can help achieve aquaculture production from limited waterbody (Shruti Gupta et al., 2024).

### 13 Introduction of Livestock and Organic Aquaculture

Here is the corrected portion of your manuscript. I have addressed the reviewer's comments by refining the academic language, improving the technical flow, and ensuring the distinction between integrated and organic systems is clear, while maintaining your original references, species names, and paragraph length. Livestock-fish farming is an integrated system that combines fish cultivation with livestock and poultry, allowing wastes from one component to serve as inputs for another. This synergistic approach is widely practiced across Indian states, including Tamil Nadu, Assam, Bihar, Andhra Pradesh, Tripura, Orissa, Karnataka, Kerala, and Uttar Pradesh. Currently, India supports approximately 17% of the global livestock population on only 2% of the world's geographical area, creating immense pressure on land resources and necessitating the integration of crops and livestock. This integration is mutually beneficial; animal manure serves as a potent natural fertilizer that enhances aquatic productivity while maintaining soil fertility. The diversity of species produced in these systems includes finfish, shellfish, mollusks, and aquatic plants.

While some species and production systems are difficult to adapt to strictly traditional "organic" frameworks, integrated farming shares a close relationship with organic aquaculture principles. This synergy is highly popular in Europe, where certified organic salmon, carp, and trout are cultivated and marketed. Similarly, mussels, tiger shrimp, white shrimp, and tilapia are cultured in diverse regions such as Vietnam, Peru, Ecuador, Chile, New Zealand, and Israel. These certified organic products have gained universal acceptance by addressing consumer health concerns (Dube and Chanu, 2012). Integrated crop-livestock-fish farming systems promote agricultural growth and environmental equilibrium by optimizing resource utilization and improving ecosystem services (Regar et al., 2022).

Poultry-fish farming is increasingly accepted and popular among farmers within integrated models. This practice involves raising birds such as chicken, ducks, and geese simultaneously with fish. The system significantly benefits aquaculture by utilizing poultry waste as a direct or indirect nutrient source, which reduces the dependency and cost associated with conventional fish meals. Consequently, this resource efficiency enhances the profit margins for small-scale and commercial producers (Gabriel et al., 2007). By recycling on-farm nutrients, these integrated models represent a sustainable pathway toward increasing food production while maintaining the ecological integrity of the farming environment.

### 14 Strategy for Higher Growth Rate

The development of coldwater fishery resources holds immense potential for generating rural income and providing food security to economically underprivileged populations in Indian upland regions. This is achieved