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# Semi-Intensive carp culture as a sustainable livelihood strategy for tribal farmers in Alluri Sitaramaraju District, Andhra Pradesh

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**Abstract**

The study was conducted from March 2022 to March 2025 at KVK, Pandirimamidi, Rampachodavaram, in the tribal mandals of Rampachodavaram and Gangavaram, Alluri Sitarama Raju District, Andhra Pradesh. Semi-intensive carp polyculture was practiced using Indian Major Carps (*Catla catla, Labeo rohita, Cirrhinus mrigala*) along with exotic carps (*Ctenopharyngodon idella* and *Cyprinus carpio*) in underutilized ponds to enhance tribal livelihoods. Scientific management practices were followed, and organic manures and pelleted feeds were applied to improve productivity.

The pond yield ranged from 810 to 2680 kg pond$^{-1}$, generating a gross income of Rs. 97,200 to Rs. 3,21,600 at an average market price of Rs. 120 kg$^{-1}$. The variation in yield was associated with pond size and management efficiency. The findings indicated that semi-intensive carp polyculture was suitable for tribal areas and significantly contributed to livelihood and socio-economic improvement.

**Keywords:** Carp polyculture, income generation, technology adoption, tribal villages

## Introduction

Aquaculture has become a major source of animal protein, livelihood security and economic growth globally. Andhra Pradesh has remained a leading contributor to India's aquaculture production, with Indian Major Carps (IMC) contributing nearly 75% of national freshwater fish output due to their wide genetic diversity and adaptability (Behara *et al*., 2022) [2]. However, intensified farming, poor biosecurity, large-scale seed and broodstock movement, pathogenic loads and climate variability have contributed to increased disease incidence (Bondad-Reantaso *et al*., 2005) [3]. Parasitic infections also impose significant ecological and economic losses, accounting for nearly 46% of freshwater aquaculture disease impacts (Devi *et al*., 2023; Mishra *et al*., 2017) [6, 9].

Carp polyculture involving IMC and exotic carps has been widely practiced in Andhra Pradesh since the 1980s, enabling efficient utilization of pond ecological niches and improving productivity (Reddy *et al*., 2017). Although Alluri Sitarama Raju District is progressive in inland aquaculture, many upland tribal regions still underutilize available water resources. A survey conducted by KVK, Pandirimamidi (Dr. Y.S.R. Horticultural University) in 2023 revealed that several tribal ponds remained uncultivated despite suitable rainfall and resource availability (Rao, 2013) [13]. To enhance livelihood opportunities, KVK introduced fish culture in small water harvesting ponds, promoting scientific resource use and income diversification.

Polyculture systems are resource-efficient, environmentally sustainable, and economically viable, offering higher yields and diverse fish products (FAO, 2020) [7]. The present study aimed to evaluate semi-intensive carp polyculture as a livelihood enhancement strategy for tribal farmers in Alluri Sitarama Raju District, where water resources are predominantly managed by community institutions such as self-help groups and panchayats (Mohapatra and Barik, 2018) [10].

## Materials and Methods

The study was carried out for three years (April 2022-March 2025) at KVK, Pandirimamidi, Rampachodavaram, in the tribal regions of Rampachodavaram and Gangavaram mandals, Alluri Sitarama Raju District, Andhra Pradesh. Inland freshwater ponds in these areas were identified for the introduction of carp polyculture. A total of 45 ponds, each ranging from 0.5 to 1.0 acre in water spread area, were selected. These ponds were previously underutilized and mainly served as seasonal water storage structures for agriculture, being replenished during the monsoon.

Implementation was undertaken under the ICAR-Tribal Sub Plan (TSP) with support from the Department of Fisheries, Government of Andhra Pradesh. Prior to stocking, ponds were cleaned, weeds were removed, and ponds were sun-

dried for approximately 15 days. Agricultural lime was applied at 200 kg ha$^{-1}$ to improve buffering capacity, control pathogenic organisms, and stabilize water pH.

Fingerlings (5-6 inches) of *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, *Ctenopharyngodon idella*, and *Cyprinus carpio* were stocked at a density of 8,000 ha$^{-1}$ without supplementary aeration. Only healthy, uniform-sized, and disease-free fingerlings were used. Stocking was performed during early morning hours, and fish were subjected to a 2% potassium permanganate dip for 1-2 minutes followed by acclimatization before release. The average initial body weights were 58.2 ± 2.02 g (catla), 63.4 ± 1.21 g (grass carp), 68.1 ± 1.25 g (rohu), 70.3 ± 1.55 g (mrigal), and 82.6 ± 1.30 g (common carp). Periodic random sampling using cast nets was carried out to assess growth performance.

Average body weight (ABW) = Sample weight / Number of fish

## Results and Discussion

Semi-intensive carp polyculture involved stocking surface, column and bottom feeders, namely catla, rohu, mrigal and common carp, in a proportion of 30:40:30. Farmers were trained by KVK on Better Management Practices (BMPs) covering feeding strategies, ration regulation, health care, nutrition, and harvesting techniques. Implementation of BMPs enhanced productivity and helped minimize production costs.

Pond colour was used as a visual indicator of fertility, and manuring schedules were adjusted accordingly. Organic manures such as cow dung, poultry litter, goat manure and vermicompost were applied to enhance natural productivity. Continuous fertilization ensured adequate phytoplankton and zooplankton availability. In addition, fish were fed rice bran mixed with 28% protein pelleted feed, and feed quantity was modified monthly based on growth sampling. Partial harvests began after 8-10 months, followed by complete harvest at ten months; ponds were then sun-dried for the next cycle. Highest growth was recorded in catla, followed by grass carp, rohu, mrigal and common carp (Fig. 1).

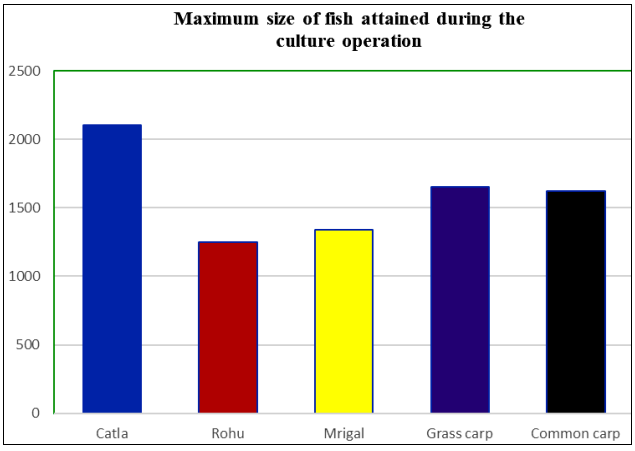


**Fig 1:** Maximum size of fish attained during the culture operation

Superior growth of catla appeared to be related to the abundant zooplankton availability, whereas grass carp benefitted from marginal vegetation. Comparable findings were reported in composite carp culture trials where silver carp and catla recorded rapid growth (Pradeep, 2019) [12]. Routine cast-net sampling was carried out to assess fish health, growth rate and feed adjustments. Partial harvests commenced after eight months and were conducted weekly or fortnightly depending on local demand. Each harvest yielded 200-300 kg of fish, sold at Rs.120 kg$^{-1}$, generating Rs.24,000-Rs.36,000 per harvest.

Overall production ranged between 810 and 2680 kg pond$^{-1}$, corresponding to gross returns of Rs.97,200 to Rs.3,21,600 at an average market price of Rs.120 kg$^{-1}$. Production cost varied between Rs.50-Rs.60 kg$^{-1}$ depending on management efficiency, while net profit ranged from Rs.40,500 to Rs.1,60,800. Similar trends were reported by Das *et al.* (2014) [5], Chakrabarti *et al.* (2014) [4] and Reddy *et al.* (2017). Previous studies also confirmed that fisheries-based farming systems substantially supported tribal livelihoods (Reddy *et al.*, 2019), and in rice-fish systems, common carp was identified as a preferred species (Baruah and Singh, 2018) [1].

## Conclusion

The present study confirmed that semi-intensive carp polyculture in underutilized tribal ponds was effective in improving fish productivity and farm income in Alluri Sitarama Raju District. Implementation of scientific culture practices, suitable species composition, proper fertilization, supplemental feeding and systematic harvesting resulted in appreciable yields (810-2680 kg pond$^{-1}$) and substantial economic gains. Catla and grass carp showed better growth performance under the system, indicating their suitability for such environments. Overall, the intervention enhanced livelihood opportunities while promoting sustainable and productive use of village water resources. Wider dissemination of this model, along with continuous technical support and community participation, is essential for long-term adoption and sustainability in tribal regions.

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