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# Growth and yield performance of fishes under poly culture system in dryland area of Bundelkhand, U.P. An on farm trial

**Kamla Shankar Shukla, CM Tripathi and Manoj Kumar**

**Abstract**
KVK, Chitrakoot conducted an on farm trial on assessment of fish growth and yield under poly culture system and compared with monoculture in Chitrakoot. The monoculture of Catla (T -1) conducted at two farmers pond and composite fish culture Catla, Rohu, Mrigal (T-2) was conducted at two farmers pond for the period of 270 days from August to April 2017. The stocking density of fingerling was 10000/ha with individual weight of catla of 1.5 gm and average weight of IMC (Rohu, catla, Nain) was 1.1gm at the time of stocking. The fishes were feded with Rice bran and oil cake occasionally. The result revealed that monoculture of catla (T-1) gave the yield of 1371.13 kg /ha with average individual weight of 457.5 gm and composite fish culture IMC (T-2) gave the total yield of 1462.59 kg/ha with average individual weight of 487.12 gm in said period of time with 500 kg cow dung application on monthly basis. The benefit cost ratio of T-1 was 2.42 and T-2 was 2.52.

**Keywords:** Poly culture, mono culture, yield, growth, duration

## 1. Introduction
Fish farming is a traditional occupation of rural population in bundelkhand and now this enterprise gaining popularity as income generating occupation. Against the backdrop of declining fish catches from natural waters in India and increasing malnutrition, this is excellent opportunities to augment aquaculture development in rural areas, where large number of seasonal ponds available so far that remains un utilized or underutilized. Fresh water resources (e.g. villages ponds) are gradually declining due to humans activities and urbanization. Fishing activities have also created negative impacts on water resources and health of fishes (Singh, P. & S. Khan 2014) [1]. The farming system of district is mostly rain fed. On an average the district received annual rainfall up to 650 mm/year in last 5 years and it was observed that number of rainy days also declining from 60 days/ year to 31 days in said period of time. The average 20 years data reveals that the average rainfall varies between 939.5 mm (Mau) and 1059.2 mm. (Karvi). Average number of rainy days is 47.1. The climate of the district is sub-tropical. The monthly precipitation index (P.E.) i.e. 46.058. To mitigate this drought situation almost every village of the district having more than one large pond and several small water bodies for water storage, which remains unutilized or underutilized for fish culture. The fish farming is one of the most profitable enterprises from ancient that is able to generate employment, income and livelihood security as well as helps in reducing malnutrition in women and child. These water bodies are not been utilized properly for fish production due to non-availability of good quality seed and lack of awareness and knowledge. One of the major problems of the district is relatively short period of water storage in water bodies. In that area, where water availability is very short period of time like 6-8 month period and source of water is rain water the appropriate and suitable fish culture system provides an opportunity for fish cultivation in these ponds which has water for lesser period and makes them profitable. For efficient utilization of different strata of a pond, three or more species need to be stocked. In current fish culture set up three Indian carps Catla catla, Labeo rohita, Cirrhinus mrigala and two Chinese carps, silver and grass carp are considered the best combination (Rahman *et al*., 2006) [2]. Most of the community village ponds mainly used to irrigate the agriculture fields besides using it for live stock. Inland fish cultivation by composite fish culture would be a profitable venture in these village ponds which attains marketable weight within 6-8 months in the main pond/tank rather than monoculture. The skill development of farmers are more beneficial and technologies will quickly adopted by them through learning by doing and seeing

by believing concept. It is a well-known fact that improvements in efficiency are more cost effective than introducing a new technology (intensive fish culture), the farmers are not efficient in the use of the existing technology (Krishnan, M. & P.S. Birthal 2002) [3].

## 2. Objective

The objective of the trial is to convert uneconomical fish farming system to economic ones through composite fish farming by adopting the recent technology of composite fish culture in rainfed ponds of Chitrakoot district.

- To bring the available water resources under fish culture system
- Develop income opportunity
- Create interest among entrepreneurs for employment generation

## 3. Material and Methods

From the water harvesting structures in rainfed area of bundelkhand, farmers can get an additional income from short duration ponds and generate extra employment as well as livelihood security by adopting different fish farming systems. An on farm trial was conducted by KVK, Chitrakoot on 04 farmer field having the water storage facility up to 9 month at 2 different locations in Chitrakoot district. 02 treatments and two replications were designed to conduct the trial at arwara village of manikpur block. The area taken for trial was varied from pond to pond that is ranging in between 0.15 to 0.20 ha. The water depth at the time of stocking was falling in between 2.0 to 2.5 meter. The water retention period was on an average 270 days. The ponds were well prepared before stocking with cow dung and lime @ 5000 kg/ha and 200 kg/ha respectively. Monoculture of catla and poly culture of IMC was stocked to these ponds. Treatment "T-1" ponds were stocked with catla fingerling having an average individual weight of 1.5 gm, Treatment "T-2" ponds were stocked with catla, Rohu, Nain Fingerlings having an average weight of 1.1 gm with stocking density of 10000/ha each. Lime application @200 kg/hectare as per test of soil and water $P^H$. The stocked fishes are occasionally feded with Rice bran and Mustard oil cake by broadcasting method. The farmers were advised to apply cow dung at 500 kg/h on monthly basis.

## 4. Result and Discussion

The principles of poly culture involve when compatible species of different feeding habits are cultured in the same pond, all the available food are utilized without affecting to another. India offers a huge potential for freshwater aquaculture development as it is blessed with extensive river and canal system of about 195.210 km, consisting of 14 major rivers, 44 medium rivers and numerous small rivers and streams. In addition, pond and tank resources are estimated at 2.36 mha (FAO. 2014, Handbook of Fisheries and Aquaculture, 2014) [4, 5]. It is stated that there are many fish culture technologies available of which composite fish culture system is the most sustainable fish culture practice in India. Fish production obtained by combined culture of IMC and exotic carps was 2.06 tonnes/ha/yr (Hussain *et al*, 2013) [6].

The trial conducted by KVK, Chitrakoot was kept stocking density @ 10000/ha with individual average weight of fingerling was 1.5 gm and 1.1 gm respectively in T-1 and T-2 at the time of stocking in well manured pond @ 5000kg/h with cowdung. A pond having average water depth of 2.0-3.0 m may be stocked at the rate of 5,000 fingerlings/ha (Sinha VRP, *et al.*, 1985) [7]. However, it is advocated 6,000-12,000 fingerlings/ha in pond having an average water depth of 2.5 m (Rahman *et al*., 2006) [8]. The growth performance of catla in monoculture system (T-1) was recorded by KVK, Chitrakoot during 2016-17 and it was observed that during 270 days culture period. The average individual weight attained by fishes under monoculture system of catla (*Catla catla*) was 457.5gm whereas under poly culture of IMC (Rohu (*Labeo rohita*), Catla (*Catla catla*), Nain (*Cirrhinus mrigla*)) 3 spp system the average fish growth was 487.81 gm/ individual. The yield data was also gathered from all locations and it was found that in monoculture system of catla farmers were obtained 1371.125 kg/ha yield and under poly culture of catla, rohu and nain yield was 1462.68 kg /ha during 270 days period. (Sinha, V.R.P., 1979) [9] reported that fish production (Indian and Chinese carp poly culture) in fresh water ponds in India to be 1053 Kg/ha/yr with no fertilizer or feed inputs, 1398-2303 Kg/ha/yr with organic and inorganic fertilizer inputs 3314-4000 Kg/ha/yr with supplementary feed inputs (mixture of rice bran oil cake; 1:1) and 4244-5506 Kg/ha/yr with both fertilizer and supplementary feed inputs. The Yield of poly culture trial was recorded higher than monoculture system. While production of 4–5 tonnes under carp polyculture is quite common, farmers of several regions are able to produce 8–12 tonnes/ha/year. (ICAR, 2013) [10].

Stocking two or more complimentary fish species can increase the maximum standing crop of a pond by allowing a wide range of available food items and the pond volume to be utilized (Hussein, 2012) [11]. The tri monthly weight increments were also recorded by sampling of 30 fish from each farmer field at 90 day, 180 days and 270 days interval. The weight increment was 106.25, 59.68, & 289.7 gm from monoculture (T-1) system whereas in poly culture system the growth increment was 91.8, 37.22 and 367.685 gm at every 90 days interval.

## 5. Economic analysis

A simple economic analysis was carried out to estimate the net profit generated from these culture system. The cost of different inputs was based on the whole sale retail market price available during the year. The lease cost and owner man power is not included in the total cost. The average selling price of fish was Rs. 50/-per Kg. The income and expenditure was also calculated to get the net income and BC ratio of each culture system. Over the years, composite fish culture has been established itself as a proven technology aimed for obtaining higher yield and return from unit area (Hussein, 2012) [11]. The result revealed that the cost of production of monoculture system of catla (T-1) was Rs.28300/- and Rs. 29000/- per ha in poly culture system whereas the gross income was obtained Rs. 68556/- and Rs. 73134/- per ha in T-1 and T-2. The net income was Rs. 40256/- and Rs. 44134/- with B:C ratio of 2.42 and 2.52 from T-1 and T-2 respectively.

**Table 1:** Performance of growth and yield

| Treatment | Stocking density | Average Initial length (MM) | Average Initial Weight (Gm) | Average weight at 90 days (Gm) | Average weight at 180 days (Gm) | Average weight at 270 Days (Gm) | Average Yield Kg/ha |
|---|---|---|---|---|---|---|---|
| T-1 | 10000/ha | 50 | 1.5 | 108.125 | 167.8 | 457.5 | 1371.125 |
| T-2 | | 49 | 1.1 | 92.9 | 130.125 | 487.81 | 1462.68 |

**Table 2:** Tri monthly growth increments

| Treatment | Average Initial Weight (Gm) | Average weight at 90 days (Gm) | Average weight at 180 days (Gm) | Average weight at 270 Days (Gm) |
|---|---|---|---|---|
| T-1 | 1.5 | 106.625 | 61.175 | 289.7 |
| T-2 | 1.1 | 91.8 | 113.25 | 357.685 |

**Table 3:** Economics of Fish culture System

| Treatments | Cost of Production/ha (Rs) | Gross Income/ha (Rs) | Net income /ha (Rs) | Benefit cost ratio |
|---|---|---|---|---|
| Monoculture of Catla | 28300 | 68556 | 40256 | 2.42 |
| Poly culture of IMC | 29000 | 73134 | 44134 | 2.52 |

Stocking of fish seed

Catch of *Catla* in T-1

## 6. Conclusion

It is concluded that the appropriate technology based fish farming can be an important practice for improving livelihood, income and yield for fish farmers having small and seasonal ponds. Fish farming techniques varies from one area to another in terms of production, growth and values. Fish farming has a great capacity of improving nutritious food, enhancing food security, creating more employment opportunity and income for the unemployed population in the locality. Farmer of these areas should adopt poly culture system instead of monoculture to utilize all available space, food and resources. So farmers are advised to adopt composite fish culture IMC to get maximum yield and growth in Chitrakoot.

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