**Assessment of Fish Seed Production and Its Correlation with Fish Yield in Rajasthan, India**

**Abstract**

The water resources of Rajasthan exist in the form of reservoirs, lakes, rivers, canals etc., which are used for fisheries purposes and contribute huge amounts of fish production. The potential of these water bodies could be exploited by the application of appropriate farming practices and justified inputs. In this study, the relationship between fish farming input i.e. fish seed production and fish production of the state for the last 25 years 2000-2001 to 2024-25 is evaluated. The secondary data for the present study was collected from various sources including Annual report (2025) published by Directorate of Fisheries (Government of Rajasthan) and Handbook on Fisheries Statistics (2024) published by Department of Fisheries (Government of India). The result indicated that in the initial years of the study 2000-2001 fish production (12,141 metric tons) and fish seed production (231.00 million fry) were relatively low while in 2024-2025, these were subsequently high 1, 01,108 metric tons and 14, 50.00 million fry. The relationship between the variables (fish seed production and fish production) shows linear straight line and the correlation coefficient (R2) was 0.910 thus shows a significant positive relationship. The linear equation (Y = 57.685 X - 645.370) and the regression coefficient (b) showed that one million fry can increase of 57.685 metric tons of fish production. The data analysis and results also revealed that the produced fish seed quantity neither fulfils the demand of the fish farmers nor is sufficient to adequately stock the water bodies of the state. The requirement of quantity of quality fish seed could be fulfilled by the development of fish hatcheries by state government or by promoting the established private hatcheries. It is also suggested to develop the appropriate supply chain for fish seed for better utilization of water resources in the state as well as for enhancing the fish production and productivity of available fisheries resources. Therefore, it is advised to establish more functional hatcheries or strengthen the existing hatcheries (government sector or private sectors), which may help to increase the seed production for the optimum utilization of the water bodies and encourage the fish farming in the state.

**Keywords:** Fish production, fish seed production, growth rate and Rajasthan waters

**1.0 INTRODUCTION**

“Agricultural production, including aquaculture, is profoundly influenced by a combination of climatic, production, and socioeconomic factors. These variables interact to impact yield, productivity, and the livelihoods of smallholder farmers. Climatic elements such as rainfall, temperature, cloud cover, winds, drought, and ice cover play crucial roles in aquaculture, directly affecting fish growth, reproduction, and overall farm productivity” (Ssekyanzi et al., 2025). Fish seed is the primary requirement for modern aquaculture, which was developed by research and entrepreneurial inputs over the years. Demand for quality fish seed is never fulfilled by the suppliers because farmers always require good quality seed for the fish seed production sector, which is expected to expand enormously. The fish seed requirement for fish farming ensures the better utilization and fully utilizes the growth potential of water resources (Roy and Upadhyay, 2014 and Maurya *et al*., 2018). Stocking is a powerful tool to manage the water body and fish seed stocking a practice carried out by most of countries to enhance fish production. However, the stocking of the fish seed is either not in sufficient quantity or not following the scientific method for stocking. Hence, there is a need to quantify the fish seed that is required to be stocked in these water bodies Welcomme (1977).  “Small fish seeds are very prone to predation and other natural mortality. However, obtaining large-size fish seeds is challenging and costly. Data on fish stocking and fish yield patterns must be carefully examined to assess the effectiveness of culture-based fisheries or fish seed stocking for enhancing fish yield in wetlands” (Lianthuamluaia et al., 2024).

The fishery resources of the state include 15,838 numbers of water bodies including reservoirs, ponds and tanks covering an area of 4.24 lakh ha, excluding rivers and canals  with 0.30 lakh ha and water logged area of 0.80 lakh ha respectively (Jhajhria, 2017; Ujjania et al., 2025). These existing water resources in the state play an important role in becoming a distinguished fish-producing state of the country. “Better utilization of resources for fisheries development, optimum fish production and productivity from available aquatic resources, employment generation, availability of protein-rich food, and appropriate planning for conservation and management strategies are of utmost importance” (Miller, 2009, Lakra, 2010 and Gogoi, 2015). Insufficient quantity and good quality fish seed, feed, poor fish market, traditional culture systems and improper disease diagnosis, low technical knowledge and inadequate extension services are the main constraints for the better resource uses, fish farming and fish production (Ujjania et al., 2025).

The scientific records on management practices of fish culture in the state are elusive and inadequate which influence the proper utilization of water resources and fish production in the state. The water quality of resources with other scientific inputs, including fish seed, helps to increase the fish production and productivity (Yadav, 2017 and Ujjania et al., 2019). “The fish farming activities face impending constraints of land, water, feed, seed and energy inputs, which may limit its growth potential” (Richard *et al*., 2014). “The produced fish seed is not sufficient to stock in the water resources of the state” (Anon, 2018) and fish production of the state is adversely affected (Ananthan et al., 2010 and Ujjania et al. 2019).

In view of the importance of water resources for fisheries development in the state, analysis of available data pertaining to fish seed production in relation to fish production have been conducted in this manuscript.

**2.0 MATERIALS AND METHODS**

**2.1 Available Fisheries Resources:**

Rajasthan is the largest state of the country constituting 10.4 per cent of total geographical area and 5.67 per cent of total population. It is the landlocked state and blessed with various water resources covering (3.36 lakh ha area is covered by the large and medium reservoirs and 0.94 lakh ha area is covered by the small reservoirs). The rivers and canals (5,290 km) cover a combined water spread of 30,000 ha. Beside these water logged areas (80,000 hectare) and Salt affected area (1.80 Lakh hectare) also exist in the state for fisheries related activities.

**2.2 Data collection and analysis**

The secondary data for the present study was collected from various sources including Annual report (2025) published by Directorate of Fisheries (Government of Rajasthan) and Handbook on Fisheries Statistics (2024) published by Department of Fisheries (Government of India).  The data of fish seed production and fish production were compiled for the period of 2000-2001 to 2024-2025. The statistical data analysis for overview and interrelation with graphical presentation were computed by MS Excel (2013).

**3.0 RESULTS AND DISCUSSION**

**3.1 Overview on fish and fish seed production**

The fish production data were compiled for the last 25 years 2000-2001 to 2024-25 and results clearly reveal the increasing growth trends of fish and fish seed production in the state. The result shows that during 2000-2001, fish production and fish seed production were relatively low at 12,141 metric ton and 231.00 million fry, respectively, whereas subsequently in 2024-2025 it was attained maxima of 1,01,108 metric ton and 14,50.00 million fry with an average of 40,714 metric ton and 716 million fry respectively (Fig. 1).

**3.2 Interrelationship of fish and fish seed production**

The data on fish and fish seed production of the state were further used to establish the relationship in the variables namely fish production and fish seed production. The linear regression showed a straight line and correlation coefficient (R2=0.910) was indicating close, strong and positive relationship among these variables (Fig. 2). In the linear equation (Y = 57.685 X - 645.370) the regression coefficient (b) depicted that stocking one million fry can increase of 57.685 metric ton of fish production (Fig. 2).

In the present scenario of fish production 101108 metric tons and fish seed production of 1450.00 million fry against fish production potential of 1.35 lakh metric tons Ananthan et al. (2010). Similar findings regarding fish and fish seed production of the state were described by Ujjania et al (2025), Ujjania and Ujjania (2025) and Ujjania et al. (2025a). Although the state is endowed with massive water resources but trailing in fish production, which may be attributed to the unavailability of quality fish seeds in desired quantity, quality feeds, extensive fish farming practices and culture of only a few selected species (Ujjania et al., 2019). Saini (2017) reported that the non-availability of fish seed at the required time and quality of seed affects the fish production. The fish productivity 283 kg/ha/yr reported from Srilanka and 250 kg/ha/yr in small reservoirs of Thailand (Sreenivasan, 2001) while as compared to these reports the average fish productivity of the state is 56 kg/ha in large reservoir, 176 kg/ha in the small and medium reservoir of Rajasthan is reported by Yadav et al. (2020). The state facing a huge deficit of fish seed and only 25 % of the present seed supply is met within the state, whereas 75 % seed supply is met by imports from other states (Ananthan et al., 2010 and Yadav et al., 2020). The total fish seed demand in the state is estimated to be 1216 million fry every year while average seed supply is only 40 % of the estimated seed requirement. Roy and Upadhyay (2014) reported that “seed production is one of the important factor to determine the level of fish production in different states of NE region. Similarly, the present findings also indicated that seed production is one of the important factors for increasing fish production. This is well evident from analysis of the data for last twenty-five years”. Singh and Ahmad (2003) also described that the availability of poor-quality fish seed creates problems for the development of freshwater fish farming.

The findings regarding the importance of fish seed and the relationship between fish seed production and fish production revealed that fish seed produced or stocked in the water bodies of the state is not sufficient. Similar findings were reported from Uttar Pradesh by Maurya et al. (2018) and from Rajasthan by Ujjania et al. (2019) and Yadav et al. (2020). The strong significant relation (R=0.97) between two variables i.e. fish seed production and fish production (Roy et al., 2015). The requirement of quantity of quality fish seed could be fulfilled by the development of fish hatcheries by the state government or by promoting the established private hatcheries. It is also suggested to develop the appropriate supply chain for fish seed for better utilization of water resources in the state as well as for enhancing the fish production and productivity of available fisheries resources.

**4.0 CONCLUSION**

The water resources of Rajasthan are very productive and have potential for good fish production but it is limited by the necessary fish farming inputs especially fish seed. The fish seed produced by the state is neither sufficient to stock the water body nor fulfil the demand of fish farmers. It can be concluded that there is fish seed production and fish production are certainly interrelated. Moreover, the relationship between fish seed production and fish production is linear and significant to indicating that fish production of the state can be increased by the supply of good quality and quantity of fish seed. The fulfilment of seed requirement is only possible by establishing hatcheries in the government as well as the private sectors or strengthening the existing hatcheries. Furthermore, it is experienced that advanced fish farming practices with desirable quality and quantity of seed could be helpful to enhance the fish production in multiple folds and double the income of fish farmers in the state.

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Figure 1. Fish and fish seed production in Rajasthan

Figure 2. Interrelationship between fish production and fish seed production