Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(2): 1032-1035

Received: 01-01-2020
Accepted: 03-02-2020

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An assessment of factors affecting fish production and its potential in Rajasthan

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Abstract
This study was carried-out to understand the factors affecting fish production and potential in Rajasthan, the investigation was done from the year 2001 to 2017 with the relation to year wise fish production. The annual compound growth rate of fish production in last 17 years is 7.98%, whereas the average growth rate is 12.34%. Data shows that there is large number of untapped natural fisheries resource are available in the states which need to be utilized for welfare of the farmers/fishers. Variables namely 'fish seed production, number of seed hatchery, available water area' in the districts correlated and regressed with fish production. Factors like as, 'fish seed production and supply' and the 'number of fish seed hatchery in state' was found to be affecting fish production. These factors depicted a significant relationship with fish production. Henceforth, the government must redesign the organizational structure to increase the seed production and No. of hatcheries (including both public and private sectors) in the state.

Keywords: Fish production, seed production, fisheries, factors affecting, potential

1. Introduction
Rajasthan is the largest state of India constituting of 10.4 per cent of the country geographical area. Rajasthan is a landlocked border state of India, sharing the country's frontier with Pakistan in the west and northwest. Rajasthan has the vast and significant amount of water resources in the form of reservoirs, ponds and tanks, rivers, canals and waterlogged areas with huge but largely underutilized and untapped potential for fish production and livelihood development [1, 8]. Freshwater, as well as saline water resources are available in the state, among which 4.23 lakh ha freshwater area excluding 30000 ha area as rivers and canal system, 80000 ha waterlogged and 1.80 lakh ha salt affected/ land saline area at full tank level [1]. Particularly Bhilwara, Sri Ganganagar, Banswara, Chittorgarh, Tonk, Ajmer, and Udaipur district have more than 25,000 ha each of FTL (Full Tank Level) area comprise 67% of total resource area. Based on resource characteristics and their potential for fisheries development, districts were grouped into three categories. There are 9 Districts with Higher Potential namely Banswara, Dungarpur, Chittorgarh, Bhilwara, Udaipur, Sirohi, Jhalawar, Kota and Ganganagar which has 60 percent total Effective Water Spread Area (EWSA) and 45 percent of total water bodies [8, 10]. There are 14 districts with moderate potential namely Bharatpur, Dholpur, Alwar, Karauli, Sawai Madhopur, Dausa, Rajasmand, Pali, Tonk, Ajmer, Jaipur Bundi, Baran and Hanumangarh having 35 percent of total EWSA and 39 percent total water bodies. There are 9 districts with less potential like Jhunjhunu, Jalore, Sikar, Churu, Barmer, Nagaur, Bikaner, Jodhpur, Jaisalmer having only 5.5 percent of total EWSA and 17 percent of total water bodies [6-8, 12].

Resource wise average productivity per ha area is 56 kg for the large reservoir, 176 kg for the small and medium reservoir [1]. Productivity from the reservoir is above the national average, while the productivity of small water bodies is far less than the national average with 286 kg for large tanks, 1125 kg for medium tanks and ponds, 1675 kg for small tanks, ponds and 2050 kg for ponds of water-logged areas. From limnological and productivity point of view, water circulation is almost continuous round the year (Polymictic), this obviously helps in rapid turnover of nutrients, thereby resulting in higher biological productivity [11, 15].

The fish production has grown with an compound and annual growth rate of respectively 7.98% and12.33% in the last 17 years, fish production was 54,035 tons in 2017-18 [2, 4, 8].

Around 50,000 farmers/ fishers are engaged in direct and indirect fisheries-related activities.

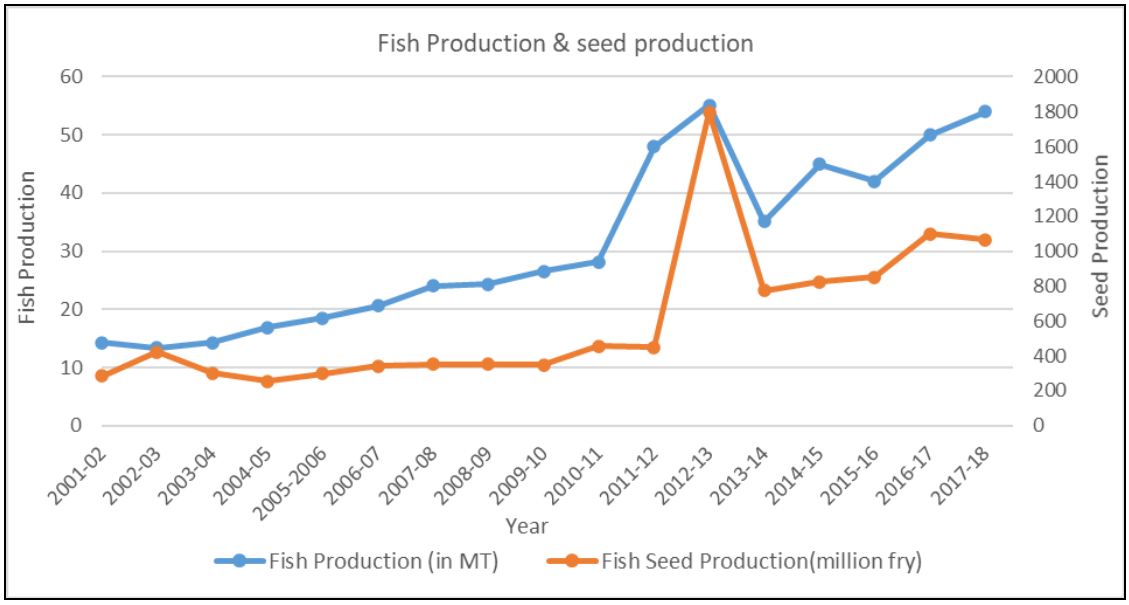
Only 35-40 per cent of the total water areas full tank level (FTL) utilized for fish culture with an average productivity of 208 kg/ha, shows the potential for further development of capture and culture fisheries in Rajasthan [10]. Inline of the earlier reported study, the present study was aimed to assess the factors affecting fish production and its potential in Rajasthan.

2. Materials and Methods

The data employed in this study were collected from each primary and secondary source. The primary data were collected from department official, co-operative president's, members and Rajasthan Tribal Area Development Cooperative Federation Ltd. Udaipur, the relevant secondary data were collected from various journals, magazines, reports of the state fisheries departments, perspective plan and strategies for fisheries development in Rajasthan conducted by ICAR-Central Institute of Fisheries Education (2009) and analyzed with appropriates statistical tools [8]. The core focus was to know the present scenario of fisheries, to gain an understanding of the factors affecting fish production and potential to fish production, to find the factors affecting fish production, some variables such as, (Seed production, available water area, no. of hatcheries) were selected and it was correlated and regressed with fish production.

3. Results and Discussion

The fish production trend was based on the data pertaining from the period of 2001-02 to 2017-18, Fish production in the state has an increasing trend with increasing rate. Though the growth rate was miserable in the year 2013-14, where small tanks and ponds dried due to less rainfall in the state. In the last 17 years' fish production has increased with the annual compound growth rate 7.98 % and 12.34 per cent average growth rate, the above figure shows that association between fish production and fish seed production, from the year 2012 fish production has increased with the increased seed supply in the state. Mostly the fish production comes from the capture fisheries, excluding few fish farms in districts namely Bharatpur, Udaipur, Banswara, Dungarpur, Hanumangrah. Whether a water body is utilized for fish culture or not mainly depend on the lease status, mostly large reservoirs were given on lease because of availability of water throughout the year, and mostly state focus on the fisheries resources to generate revenue not for the livelihood sources or welfare of the local people. Fish culture practices in Rajasthan do not follow the established scientific management practices except in a few cases of Dist, Banswara, Bharatpur [8].



(Source DoF, Rajasthan, 2017 and DoF report GoI, New Delhi, 2018-19)

Fig 1: Fish production & growth rate trend of Rajasthan

The correlation matrix among the different variables such as available water area, seed production, and no. of fish seed hatcheries available in the districts, was having association ship. Fish production was associated with an available water area, seed production, no. of hatcheries available. Which means when available water area, seed production, no. of hatcheries available will increase the fish production of the state would increase considerably. Seed production was having a correlation with available water area for fisheries in districts. This may be due to the availability of more water area in districts the more no of natural spawning ground or seed collection site would increase such as perennial bunds, seasonal bunds. Closer analysis with a different variable the seed production and the available no. of seed production hatchery were having a highly significant correlation (Table 1).

Table 1: Correlation matrix

Association of variables with fish production				
Pearson correlation	**X1**	**X2**	**X3**	**X4**
X1	1			
X2	.512**	1		
X3	.715**	.768**	1	
X4	.731**	.355	.619**	1
**Correlation is significant at the 0.01 level (2-tailed).				
X1 = Fish production, X2 =Available water area, X3 =Seed production, X4 = No. of hatcheries				

4. Regression model

4.1. Model Summary

Table 2: Model summary of regression model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.805[a]	.684	.609	530.936
a. Predictors: (Constant), X4, X2, X3				

4.2. Coefficients[a]

Table 3: Cofficients values of regression model

Model		Standardized Coefficients Beta	T	Sig.
1	(Constant)		1.963	.060
	X2	.048	.259	.798
	X3	.383	1.754	.091
	X4	.477	3.189	.004
X1 = Fish production, X2 =Available water area, X3 =Seed production, X4 = No. of hatcheries				

Closer analysis of the variables by applying correlation regression (Table 2) of parameters such as seed production and no. of seed production hatcheries was found as the highly affecting component to fish production of the state. This was due to the non-availability of fish seed at the right time and good quality seed, fish seed demand in the state 1216 million fry every year [10]. The total average seed supply is only 40 per cent of the estimated seed requirement in the state. Rajasthan has a huge deficit of fish seed at present only 25 per cent of the present seed supply is met within Rajasthan, with as much as 75 per cent of its total seed supply met by imports from other States. Further, there are 2 government hatcheries/seed farms exist in the state, and seed farms spread across the 16 districts in the State, while another two are owned by DOF but leased out to private parties on contract, only 10 farms/hatcheries are functional. Out of 28 farms, only 11 have hatchery facility (with spawn production capacity of 150 million) while the rest have only rearing space though in some hapa breeding is claimed to be practiced. The total production capacity of all hatcheries and seed farms with DOF is 86 million fries [1, 8, 10].

Availability of water resource in the state was found not significant with fish production, this was due to the vast no of water bodies were available, but only 35-40% of the water bodies were utilized to fisheries [4, 10]. With these factors, some other factors like as no. of the cadre's staff in the fisheries department. For a technical department, the very low proportion of technical cadre that too with 39% vacancy is a matter of serious concern [8]. This is hugely inadequate compared to the extent of resources and the developmental challenges. Some other types of problems were also seen like as, water availability to maintain a minimum level of water in the ponds for the fish during the lean months. The financial capital was another major problem in most of the sites. There is no effective fishermen's association in for the improvement of this kind of activities. There is no proper leasing policy to increase production. Lacks of infrastructure development were observed like cold storage, marketing structure, roads, transportation, labor etc.

5. Conclusion

To increase the area under fish culture the government should collaborate with FFDA (Fish Farmers Development Agency) or MNREGA (Mahatma Gandhi National Rural Employment Gurantee Act) and other pluralistic extension services provider organization Government organization, Non-government and private organization. The fisheries development programs should strengthen aquaculture extension and market-led extension in the state. Henceforth, to cater these problems the government should redesign the organizational structure of the fisheries sector accordingly. Development of hygienic and modern fish markets in all districts having high and moderate potential for fisheries. Encourage setting up of ice plants /cold storage plants in the private sector through subsidies for year-round availability. Empowerment: awareness generation, training, and capacity building. Training programs of 5-10 days each in the following areas for different Districts groups of carefully identified farmers/fishers, both on-site and off-site.

6. Acknowledgements

This study was accompanied with the fellowship of ICAR-Central Institute of Fisheries Education (CIFE), Mumbai. Therefore, the authors would like to acknowledge Dr. Gopal Krishna, Director, CIFE, for facilitating this work. The author also thanks to Director, and officials of department of fisheries, Rajasthan, are acknowledged for enabling collaboration and supporting in this study.

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