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Trend analysis of fish production in Uttar Pradesh, India

Ashish Kumar Maurya, AD Upadhyay, Laxmi Prasad and Shakila Khan

Abstract

Uttar Pradesh is India's most populous state with enough fisheries resources in the form of community ponds, tanks with dominance of rivers and manmade reservoirs. Fish production in the state was only 0.62 million tonnes (2016-17). In this study fisheries resources of the state, trend of fish seed and fish production and their inter relationship were analysed. The study revealed that out of total available aquaculture resources of the state, only 48.97 percent were utilized for fish production and remaining 41.03% were unutilized. It indicates possibility of horizontal expansion in fish production. Further during 2001-02 to 2016-17 Average Annual Growth Rate (AAGR) in fish seed production and fish production was 7.67 % and 7.56 % respectively. The variability in production was about 32 %. The second order polynomial function in fish seed production ($y = 6.524x^2 - 42.87x + 1041$) and fish production ($y = 0.937x^2 + 5.212x + 219.5$) were best fit. Linear regression line of fish production on seed production ($y = 0.249x + 29.88$) indicates the fact that with increase of one million fry, fish production increases @ 0.249 thousand tonnes. A strong significant relation between two variables ($r = 0.9223$) justifying the advocacy of quality seed production for enhanced sustainable fish production in the state.

Keywords: Uttar Pradesh, fish production, seed production, trend analysis, growth rate

1. Introduction

The fishery industry of India valued at over 15 billion US\$, has emerged as a significant high value contributor to Indian agriculture as well as a key enabler of diversified agriculture. The industry is a substantial foreign exchange earner, with exports of over USD 5 billion annually, and provides employment to more than 15 million people, directly or indirectly ^[1]. The annual per capita consumption of fish in India is 9.0 Kg ^[2]. Doubling aquaculture production could significantly contribute to meeting global animal protein demand in 2050. However, such a high level of growth could also lead to large environmental impacts unless measures are taken to improve the sector's performance. Furthermore, the aquaculture industry faces looming constraints of land, water, feed, and energy which may limit its growth potential ^[3]. The aquaculture has been recognized as an important component of rural development strategies aimed at improving food supply and generating more income for poor farming households ^[4]. The state of Uttar Pradesh with 166 million people is the home of one-sixth of the nation's population and almost one fifth of the country's poor, and it ranks below the national average in respect of economic and social indicators. It has been reported that nearly 55% of the fishing community is engaged in capture fisheries ^[5]. In view of the significance to improve socio-economic condition fisherman community and to achieve sustainable utilization of resources for fisheries development, optimum production of fish from water bodies, employment generation, availability of protein rich food, appropriate planning for conservation and management strategies are of utmost importance ^[5]. Demand of fish in Uttar Pradesh is 15 lakh metric tonnes (15kg/ capita/ year for 54% fish eating population of the State) against the total production of 4.9 lakh metric tonnes ^[6]. Hence fishery is one of the most promising allied sectors in agriculture for enhancing income, employment, nutritional security and revenue of the state. Keeping the importance of the development of fishery in the state, a study on diagnostic analysis of fish production in Uttar Pradesh India has been attempted in this study.

2. Methodology

The study was based on secondary data collected from various sources including Fisheries Statistics 2014 published by DAHD, GOI, Annual report of Directorate of Fisheries Government of Uttar Pradesh, Official website of the Directorate of Fisheries, Uttar Pradesh.

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The pertaining to the fisheries resources, resource wise fish production productivity and time series data of fish seed and fish production was compiled for the period of 2000-01 to 2016-17. The annual growth rate, graphical, trend analysis, scattered plot were developed using MS excel.

3. Results and Discussion

3.1 Fisheries Resources

Though Uttar Pradesh is landlocked state, but it is blessed with enormous freshwater aquaculture (1.78408 Lakh ha) and

other fisheries resources (5.66 Lakh ha) (Table-1), still only 48.97 percent of total aquaculture resources were utilized for fish production and remaining 41.03% resources were reported to be unutilized. It is revealed from the table that inspite of highest reported average yield and 53% contribution in total fish production of the state, 56% of the community ponds still remains unutilized in the state. The utilization of this untapped resource can be double the aquaculture production in the state.

Table 1: Fisheries and aquaculture resources in the state and status of their utilization

Resource	Area (Lakh ha)	Utilization (Lakh ha)	Yield (Tonnes/ha/year)	Production (lakh tonnes)
A)Aquaculture				
Community ponds	1.61	0.70000(43.48%)	3.2700	2.289
Private ponds	0.12042	0.12000	2.0000	0.240
DOF	0.0138	0.01380	2.3000	0.032
Irrigation	0.02422	0.02422	2.2000	0.053
Local bodies	0.01564	0.01564	2.2000	0.034
Total (A)	1.78408	0.87366 (48.97%)	3.0309	2.648
B)Fisheries				
Reservoir	1.57	1.49	0.0150	0.010
Lakes	1.33	1.33	0.3650	0.485
Ox-bow lakes	0.51	0.51	0.4250	0.218
Water logged areas	1.64	1.64	0.3600	0.590
Riverine wetlands	0.61	0.61	0.3650	0.223
River	25000 km	25000 km	0.460	0.115
Canal	>45,000 km	45000 km	0.035	0.016
Total (B)	5.66	5.58		1.658
Total (A+B)	7.44408	6.45366		4.306

Source: Vision document of Department of Fisheries, Govt. of Uttar Pradesh (2013)

3.2 Growth in Fish Seed and Fish Production: The secondary data for the period 2000-01 to 2016-17 for fish seed and fish production were analyzed to visualize the growth and trends in the state (Table. 1). It was found that during last seventeen years the Average Annual Growth Rate (AAGR) in fish production was 7.56 percent whereas in growth of seed production was 7.67 percent. However the

variability in seed production (32.12%) was found to be slightly higher than the fish production (31.96%) in the state. The second order polynomial function was found to be best fit to explain the growth pattern in fish seed production ($y = 6.524x^2 - 42.87x + 1041$) and fish production ($y = 0.937x^2 + 5.212x + 219.5$) in Uttar Pradesh (Fig.1 and Fig. 2).

Table 2: Average annual growth rate of fish seed and fish production in U. P.

Year	No. of Fish Seeds Produced (million fry)	Annual Growth Rate	Inland Fish Production (000'Tonnes)	Annual Growth Rate
2000-01	882.81		208.3	
2001-02	959.22	8.66	225.4	8.21
2002-03	975.44	1.69	249.8	10.83
2003-04	1053.58	8.01	267.0	6.89
2004-05	1037.32	-1.54	277.07	3.77
2005-06	1085.75	4.67	289.58	4.52
2006-07	1091.56	0.54	306.73	5.92
2007-08	1182.99	8.38	325.95	6.27
2008-09	1304.18	10.24	349.27	7.15
2009-10	1147.48	-12.02	392.93	12.50
2010-11	1302.26	13.49	417.45	6.24
2011-12	1476.40	13.37	329.72	-21.02
2012-13	1595.11	8.04	449.75	36.40
2013-14	1637.76	2.67	464.48	3.28
2014-15	1661.54	1.45	493.189	6.18
2015-16	1765.32	6.25	537.936	9.07
2016-17	2627.24	48.83	617.694	14.83
Average Annual Growth Rate(AAGR)		7.67		7.56
CV (%)		32.12		31.96

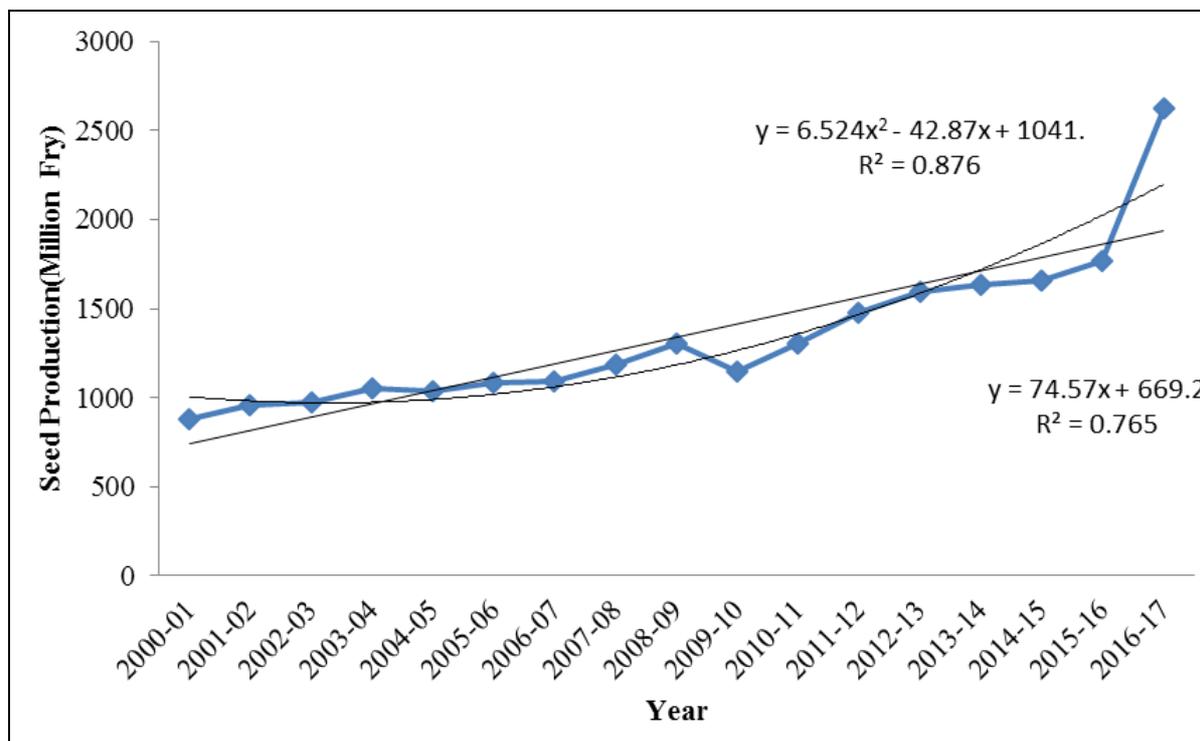


Fig 1: Trend of Seed Production in U. P.

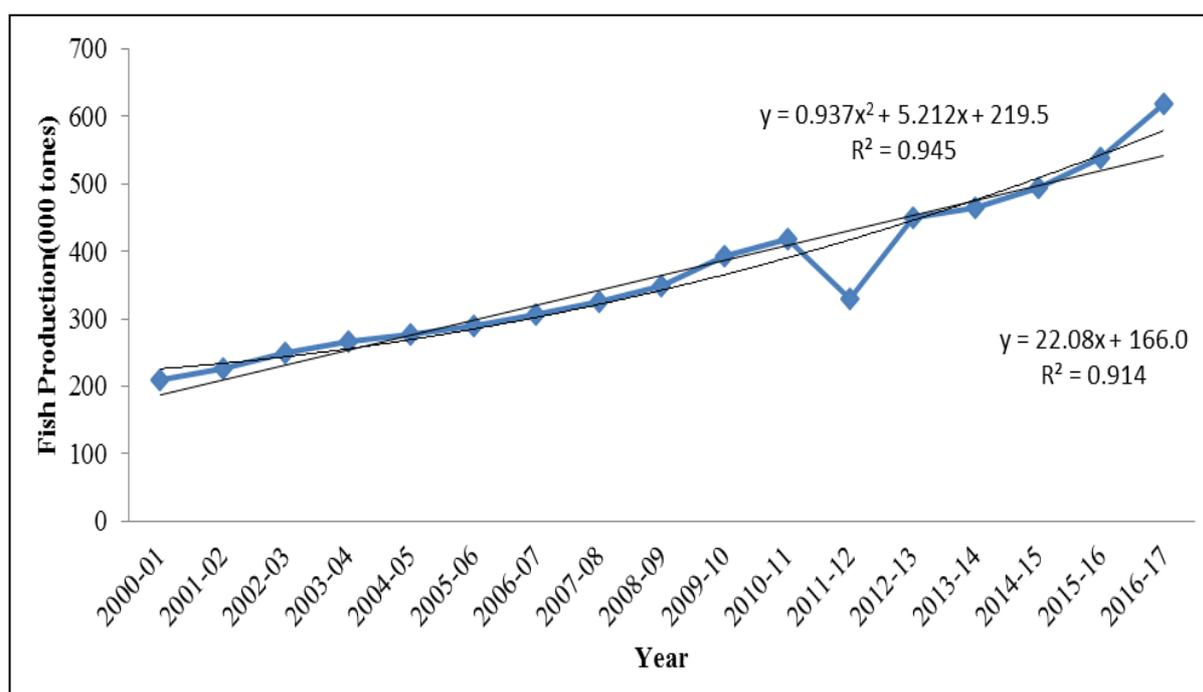


Fig 2: Trend of Fish Production in U. P.

3.3 Relationship between Fish Seed and Fish Production:

The time series data on fish seed and fish production was further analyzed to explore the relationship between the seed production and fish production the state the obtained result is presented in figure 3. The correlation coefficients for these two variables was worked out to be 0.9223, indicating close association between the variables. Further the estimated linear

regression line of fish production on seed production ($y = 0.249x + 29.88$) indicates the fact that with increase of one million fry, fish production increases @ 0.249 thousand tonnes. However R^2 value for non linear function with second order ($y = -0.000x^2 + 0.612x - 243.2$) was relatively higher than the linear function showing a very good fit of the empirical data.

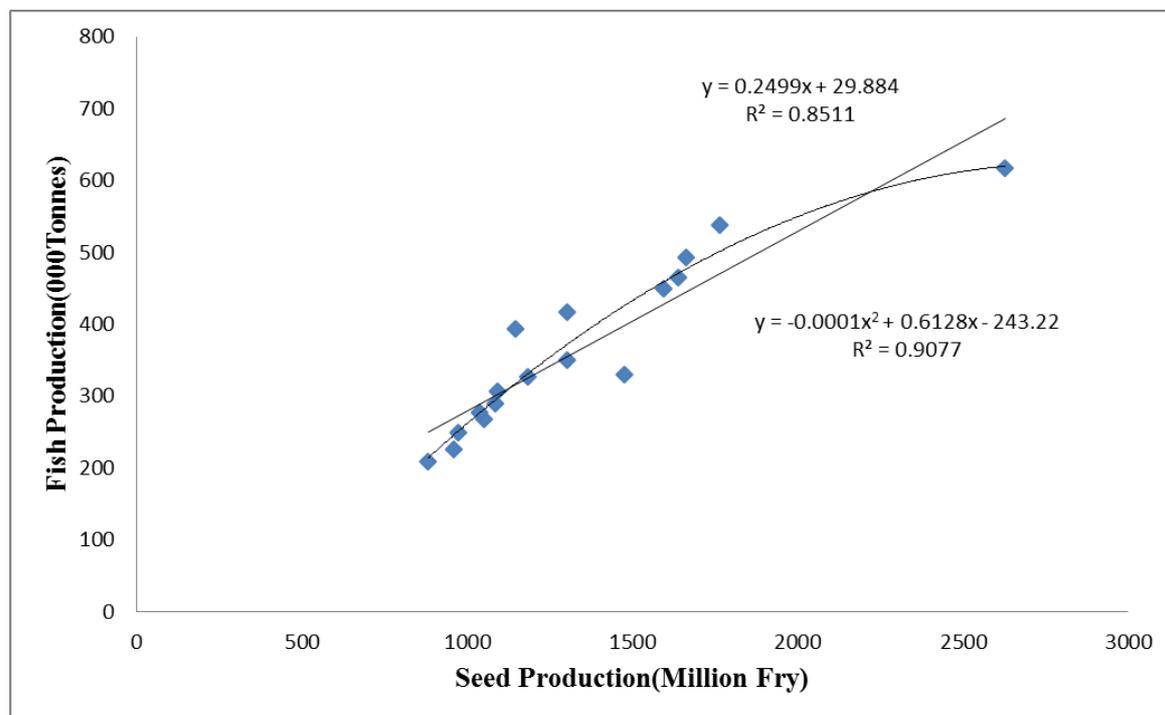


Fig 3: Relationship between Seed Production and Fish Production in U. P.

4. Discussion

Uttar Pradesh has a vast area of freshwater resources in terms of network of rivers and canals, flood plain wetlands, reservoirs, ponds and tanks which offer great potential for culture as well as capture fisheries [7]. The state ranks third in the inland fish production after Andhra Pradesh and West Bengal contributing 7.57% in the inland fish production from India [8]. Andhra Pradesh being the highest inland fish producing state contribute 25.75% in the total inland fish production of the country [8]. The reason behind the less fish production in Uttar Pradesh compared to the top states may be attributed to the non-availability of quality fish seeds, feeds, non-scientific fish farming practices, culture of only few selected species and less subsidy for fish farming. Non-availability of quality seed creates greater problems for the development of freshwater aquaculture [9]. Misra [10] and Bhaumick *et al.* [11] also found that inadequate or no finance is the most important constraint perceived by fish farmers. The analysis of fisheries resources, seed and fish production revealed that in the state available aquatic resources in the state, particularly community ponds are not properly being utilized for fish production. Many a time, the stress is also caused by overuse of resources and unchecked land use practices, which have resulted in unsafe drinking water, eutrophication, algal blooms, loss of habitat, fish kills and a host of other human health and natural resource problems. Whereas several research studies indicated that the community-led rehabilitation of the pond with the facilitation of external agencies showed some direct changes in quantitative indicators such as water availability, cropping intensity, crop productivity and income. Rehabilitation has increased the availability of pond water in the post-monsoon season, mainly in the winter season [12]. The development of community ponds involving Community Based Organization (CBO) and external supports will help in utilizing these ponds for fish production as well as several other uses. Further, the average fish productivity of the aquaculture water resources was 3.0309 kg ha⁻¹ and reservoirs only 15 kg ha⁻¹ as against the national average of fish productivity reservoir was 20 kg

ha⁻¹. Fish feed and seed are the essential inputs for fish farm production. The study conducted in different states of NE region of the country by Roy and Upadhyay [13] has identified that the seed production is one of the important factor which determine the level of fish production in north eastern states. The time series data on fish seed and fish production for last seventeen years were analyzed to verify this hypothesis in case of Uttar Pradesh. The obtained results indicated that the fish production was increasing function of seed production. Hence, it is necessary to develop state owned hatcheries and private hatcheries along with supply chain for fish seed in the state so that utilization of aquatic resources as well as average productivity of fisheries resources can be increased.

5. Conclusion

Based on our results it can be concluded that the production trend of Fish Seed and Fish in Uttar Pradesh is increasing year by year. The relationship between fish seed production and fish production is strong and closely related. To make Uttar Pradesh leading inland fish producing state it is very much essential to establish hatcheries for production of quality fish seeds in good quantity, to establish feed manufacturing units for obtaining good quality feed, increase in subsidies so that farmers can shift towards fish farming and proper marketing system to get more profit. Culture of the fishes with higher growth rate and adaptation to the environment will also help in increasing the fish production of the state. It is felt that there is significant decline if fish production from rivers as a result of growth overfishing, destructive fishing, degradation and loss of natural habitats, entry of exotics and overall poor state of governance. Strict enforcement of rules and regulation is very much necessary for the sustainable exploitation of rivers.

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