

## A STUDY ON TREND AND GROWTH ANALYSIS OF TOTAL FISH PRODUCTION IN MADHYA PRADESH, INDIA

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### ABSTRACT

*The fish production in the MP state increased to double in the past five years as fish production, which stood at 1,43,419 tones in 2017-2018, has grown to 2,93,008 tones in 2021-22 according to the Fisherman Welfare & Fisheries Development Department of M.P. The Fish Production data in Madhya Pradesh is updated yearly, averaging 80.290 Ton from Mar 1999 to 2022, with 24 observations. The purpose of writing this paper was to investigate the trend in fish production (in thousand metric Tons) from 1999 to 2022 in M.P., India. In present study for growth analysis eleven deterministic time series models were considered and the best fitted model has been selected on the basis of coefficient of determination ( $R^2$ ) which was used for prediction purpose. The magnitude of instability in fish production was determined by computing the coefficient of variation (C.V) which in our study was 54.00 and CAGR was 10.942%. The growth rates in fish production showed fluctuations. The fish production (in thousand metric Tons) forecasts using MINITAB software on the basis of best fitted model from the data time period 2009 to 2022 were 288.928, 325.638, 367.012, 413.643, 466.199, 525.432, 592.191 and 667.432. The forecasting of fish production is important as it would enable government, scientists working in different fields to plan and prepare their activities in an optimal way to meet the increasing fish demand in the study area.*

**KEYWORDS:** Madhya Pradesh, Total fish production, Growth model, Instability and Forecasting

### INTRODUCTION AND REVIEW OF LITERATURE

Fisheries in Madhya Pradesh play a significant role in the state's economy, livelihoods, and food security. With diverse aquatic resources like rivers, lakes, reservoirs, and ponds, Madhya Pradesh offers favorable conditions for fish breeding and growth. Commercially viable fish species such as Catla, Rohu, Mrigal, Tilapia, and Common Carp are found in these water bodies. The state government has taken initiatives like establishing fish seed farms, feed mills, and markets to promote fisheries development. Fisheries provide employment and income opportunities,

particularly in rural areas, contributing to poverty alleviation and rural development. However, challenges such as illegal fishing and habitat degradation exist. Sustainable fisheries management and conservation efforts are essential. The future prospects of fisheries in Madhya Pradesh are promising, with opportunities for value addition, processing, and export. Continued support and investment are crucial for the growth and development of this sector.

Statistical models, considered as the backbone of statistics are the latest innovations. In the literature, we found various types of statistical models (e.g., Johnson & Kotz, 1970; Hogg & Crag, 1970; Lawless, 1982) discussed in detail. Forecasting plays crucial role in decision making as well as in planning and vast literature is available on forecasting (e.g., Chambers, Mullick & Smith, 1971; Fildes, 1989; Yokum, & Armstrong, 1995; Collopy, Adya & Armstrong, 2001).

In India the fisheries industry is recognised as sunrise sector, grown at faster rate than the agriculture as well as animal industries (Kumar et al 2006). Fisheries resources are distributed across many ecosystems. With a rising population and increased demand for fish protein, the requirement for sustainable aquatic resource development is more important than ever. A considerable part of the country's economically underprivileged population relies for livelihood on the industry. Fisheries sector is recognized as an important source of revenue and occupation, as well as a source of affordable and healthy food, besides foreign exchange earner as reported in literature (Ayyappan and Krishnan 2004). The fisheries sector in India has grown in prominence as a result of shifting demographic patterns, increasing market factors, and technical advancements. It is experiencing fast transition, and governmental support, production techniques, public investment in infrastructure, and fisheries research and extension have all importantly contributed to enhanced fish output. Around 50 million people worldwide rely on fishing for all or most of their family income, with another 150 million reliant on fish processing and the fleet servicing sector. Worldwide on 2.5 million small-scale fishing vessels, accounting for 50% of global fish catch, more than 10 million people work (FAO, 2001). India is the third largest fish producer, second largest aquaculture fish producer and accounts for around 7% of fish output globally. Further, world's more than 10% of the fish biodiversity is witnessed in India and it is one of the 17 mega biodiversity-rich countries of the world. Approximately 14 million people in India are employed in the fishing sector, either directly or indirectly (NCAP, 2008). It generates around 1.5 percent of overall GDP (Gross Domestic Product) and approximately 5.2 percent of agricultural GDP. Inland fisheries in India have shown tremendous development in the last ten years, with total inland fish output growing from 2.84 million t in 2000–01 to 4.86 million t in 2009-10, with a 70 percent increase (Indiastat, 2011). With a total population of around 14.5 million fishermen and abundant marine and inland water resources, fisheries and aquaculture are vital sectors in terms of employment, livelihood, and food security. Fish products are also a significant commodity in international trade.

Improvements in craft, gear, and farming methods have occurred in Indian fisheries and aquaculture during the last few decades. The national and state governments have been paying close attention to the development of necessary harvest and post-harvest infrastructure. All of this has resulted in consistent development. The development of carp polyculture technology, particularly from the mid-1980s, has entirely changed the traditional backyard hobby into a thriving commercial enterprise. By 1980, India's fish production was 2.4 million tonnes by 2000, it had increased to 5.65 million tonnes, and it reached to 14.16 million tonnes by 2020. (Fisheries statistics, 2020). In India, Andhra Pradesh is the largest fish producer state, followed by West Bengal state and Gujarat state. 70% of overall fish output comes from the inland sector, with cultural fisheries accounting for the remaining 50%. More than 50 distinct varieties of fish and shellfish items are shipped to 75 different nations worldwide. Fish and fish products are

now India's largest agricultural export category, accounting for 14.16 million tonnes and Rs. 45,106.89 crore in value. This accounts for over 10% of total exports and almost 20% of agricultural exports, and contributes about 0.91 percent of India's GDP and 5.23 percent of its agricultural GVA. The fish industry is estimated to reach 26.6 million metric tones by 2026 in India. In India, both domestic consumption and export of fish have increased significantly in recent years. Further, fish consumption per capita has also increased steadily over the previous few years in India. A variety of reasons are responsible for increasing fish consumption in India such as changes in lifestyle, rising meat costs, reputation of fish as a nutritious diet with high quantities of digestible protein, PUFA, and cholesterol-lowering capabilities. The global *seafood industry* is the most diverse protein *industry* in the world and the most common *market drivers* are consumer demand, government policies, and demand. (a) Market Drivers: (i) Rising Per Capita Consumption: Over the last few decades, per capita consumption of fish has steadily increased. We anticipate that consumption of fish will continue to rise in the future years as a result of rising disposable incomes and changing dietary preferences. (ii) Increased Access to Processed Fish: The expansion of the organised food retail industry is likely to improve consumer access to processed fish, notably canned and frozen fish products. This is anticipated to have a beneficial influence on market growth (iii) Increasing consciousness of the Health Benefits of Fish: The Indian market for health and wellness foods is currently seeing rapid expansion. As previously said, fish is regarded as a healthy diet since it contains high quantities of digestible protein, PUFA, and cholesterol-lowering capabilities. In the future years, increased awareness of fish as a food linked with health and wellbeing is predicted to have a favourable influence on its consumption. (iv) Export Growth: India is also developing as a significant exporter of fish, with export values growing at double-digit rates. Currently, the country is a major provider of frozen shrimp and frozen fish to a variety of worldwide markets. (b) Market summary: The market has been divided into four categories: inland fishes, sea fishes, shrimps, and scampi. The Inland fishes currently dominate the market, accounting for the largest share. The market has been classified as fresh, frozen, canned, and others according on the product type. It has been divided into two segments based on distribution channel: retail and institutional sales. The market has been further divided into organised and unorganised sectors based on sector. It has also been divided into several states. The competitive landscape of the market has also been explored in the study, as have the profiles of prominent players. The present study was carried out with the objective to examine trend in fish production and forecast the fish production in M.P., India.

## METHODOLOGY

We know from basic statistics all statistical methods are based on some assumptions depending on pattern of data that existing pattern of phenomenon will continue in future. There are many forecasting methods like moving averages, weighted moving average, exponential smoothing, regression analysis method. We know forecasting techniques plays an important role in decision-making and planning. In the present study, secondary data gathered from published sources e.g., digest of statistics, internet etc. was used. To examine trend, we use various statistical models for the fish production data (1999-2022) and on the basis of best fitted models forecasting was made. It is important to mention that we can use ARIMA, moving average techniques also for forecasting purpose. To recognize the best fitted model  $R^2$ , RSME, BIC, AIC, MAPPE and MAE are generally used. In this study we use  $R^2$  and for instability we follow Cuddy Della Valle (1978).

## RESULT AND DISCUSSION

The data presented in Figure 1, shows the trend in fish production during 2009 to 2022. It is clearly observed that

there is an increasing trend in fish production in M.P., India.



The data shown in Table 1, presents the results obtained by fitting various models to the total fish production in M.P., India data (2009 to 2022). It has been observed that the best fitted trend is with  $R^2=0.985$  and we can use it for forecasting purpose.

**Table 1: Model Summary and Parameter Estimates. Fish production (Using SPSS software)**

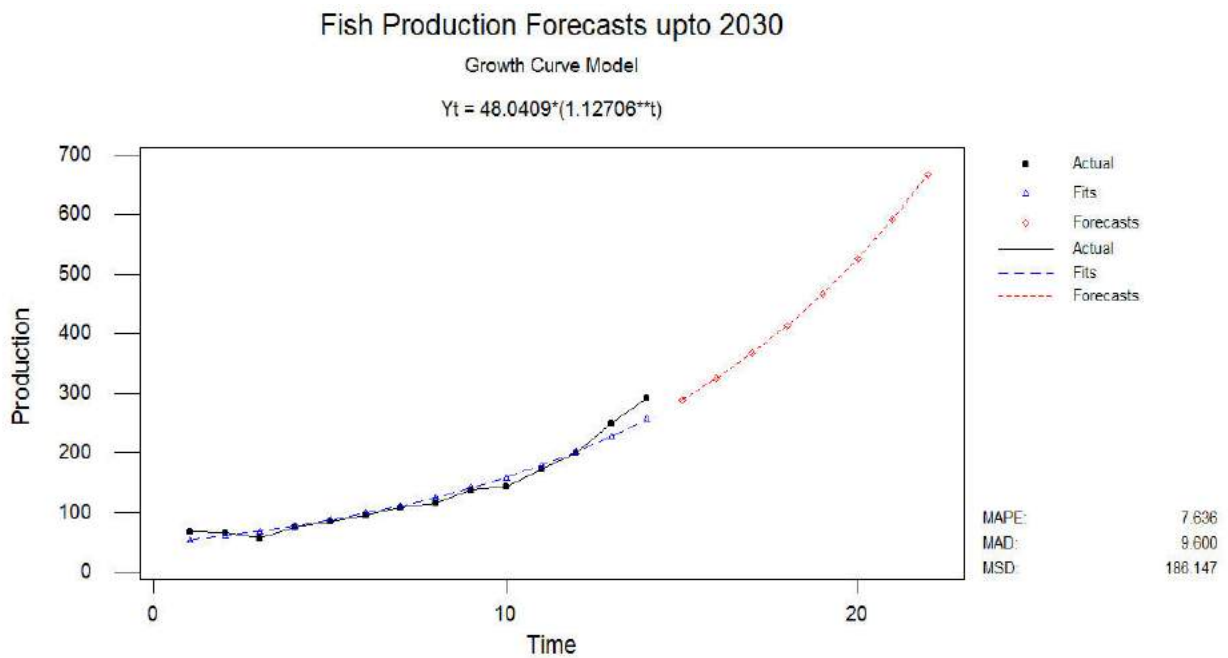
Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.873	82.259	1	12	.000	-3.233E4	16.106		
Logarithmic	.872	81.851	1	12	.000	-2.468E5	3.245E4		
Inverse	.872	81.445	1	12	.000	3.257E4	-6.538E7		
Quadratic	.873	82.670	1	12	.000	-1.610E4	.000	.004	
Cubic	.874	83.084	1	12	.000	-1.069E4	.000	.000	1.322E-6
Compound	.956	263.107	1	12	.000	2.374E-103	1.127		
Power	.956	261.478	1	12	.000	.000	241.037		
S	.956	259.859	1	12	.000	245.773	-4.857E5		
Growth	.956	263.107	1	12	.000	-236.302	.120		
Exponential	.956	263.107	1	12	.000	2.374E-103	.120		
Logistic	.956	263.107	1	12	.000	4.212E102	.887		

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S	.956	259.859	1	12	.000	245.773	-4.857E5		
Growth	.956	263.107	1	12	.000	-236.302	.120		
Exponential	.956	263.107	1	12	.000	2.374E-103	.120		

The independent variable is Year.

### Trend Analysis

The graph below shows the trend and forecasting of Fish production in M.P., India.



**Table 2: Forecast of Fish Production in M.P., India**

Year	2023	2024	2025	2026	2027	2028	2029	2030
Fish Production in Madhya Pradesh (th mt)	288.928	325.638	367.012	413.643	466.199	525.432	592.191	667.432

## CONCLUSION

The global fish production in 2023 is estimated more than 185 million tons and China, largest fish producer in world alone contributes one-third of the world's fish production. Indonesia is the second-largest and India which produced 175.45 lakh tonnes in 2023 is the third fish in the world. The long coastline and support of government for the fishing and aquaculture industries is responsible for the large fish production in these countries. In India the demand of fish is tremendously increasing each year due to health benefits of fish. In view of the increasing demand for fish, current study was carried out using fish production time series data of M.P., India to forecast fish production for the next 8 years. The results of our study showed that there is an increasing trend in fish production. The forecasted data based on statistical models showed that the fish production rate would increase. Fish Production in Madhya Pradesh data was reported at 293.000 Ton th in 2022 with an increase from 249.000 Ton th for 2021. The Fish Production in Madhya Pradesh data is updated yearly, averaging 80.290 Ton th from Mar 1999 to 2022, with 24 annual observations. The forecasts were 288.928, 325.638, 367.012, 413.643, 466.199, 525.432, 592.191 and 667.432. We know forecasting of fish production is important as it would enable government, various organizations linked with fishery and scientists working in different fields to plan and prepare their activities in an optimal way to meet the increasing fish demand. It is expected government of India will implement fish policies and strategies to increase its production.

## Suggestions

In order to get more benefits from fish industry, efforts should be made by the Government to encourage fishers by providing them economical, social and technical support

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