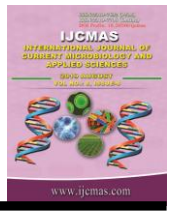
Int.J.Curr.Microbiol.App.Sci (2019) *8*(8): 101-107

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 08 (2019)**
Journal homepage: http://www.ijcmas.com



Original Research Article https://doi.org/10.20546/ijcmas.2019.808.012

Trend Analysis of Inland Fish Production of Tamil Nadu with Special References to Resources and Seed Production

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Keywords

Inland fishery resources, Underutilization, Seed production, Fish production, Relationship

Article Info

Accepted:
04 July 2019
Available Online:
10 August 2019

A B S T R A C T

Inland fishery resources are significantly contributed in fisheries sectors. In this regard, trend of inland fish production of Tamil Nadu was analyzed based on the available resources and utilization and seed production for the last decade. Calculated Average Annual Growth rate of fish seed production and inland fish production were 10.21% and 1.85%, respectively. The linear regression line for inland fish production was indicated that increasing trend for every year (R^2 = 0.673), while fish seed production was negative trend (R^2 = 0.094). Also, the positive relationship was existed between fish seed production and inland fish production of Tamil Nadu, which was proved by R^2 = 0.503. In this regard, Tamil Nadu also has vast inland fishery resources (3.83 lakhs ha.) in the form of ponds, tanks, river, reservoirs and brackish water with potential of the state is 4.5 lakhs tons but the present fish production was 2.15 lakhs tons only (2016-17) due to 46.67% of potential resources were underutilized condition. Moreover, it has significant open water and inland farming resources were 87% and 13%, respectively with the inland fish production of 70.7% and 29.3% respectively, which proved that open water resources were highly contributed in inland fish production, even if considerable areas were underutilized condition while comparing to inland farming area. The study recommends that proper utilization of natural resources may increase the inland fish production of the state.

Introduction

Fish is a major source of cheap animal protein in the world but present issue is availability of fish protein at high risk for the past two decades due to the declined the fish production potential (FAO, 2008). Moreover, increasing population of our country is another reason for fish availability to poor people which may leads to unhealthy nation. Similarly, per capita consumption of fish in Tamil Nadu was 9.8kg per annum, which was lesser than World Health Organization recommended per capita consumption (13kg per annum) (MSF, 2011; Global Data Lab, 2018)). Hence, need to increase the per capita consumption of people by filling the gap between demand and supply. The enhancement of inland fisheries and aquaculture may fulfill the recommended per

capita consumption. Moreover, culture based fisheries and aquaculture is major activities and they are commonly practiced in open water bodies of Tamil Nadu. This activity was highly depending on availability and quality fish seeds (Anon, 2012). Fish seed is the inevitable input in aquaculture. Therefore, the study was attempted to evaluate the relationship between fish seed production and inland fish production based on time series and utilization of potential of inland water bodies in Tamil Nadu.

Materials and Methods

Secondary data were collected from Hand Book of Fishery Statistics published by Government of India and State Fisheries Department. Annual average growth rate and total growth rate was calculated for inland fish production of Tamil Nadu. Additionally, linear regression was done for the study. Trend lines with time series data on fish seed production and inland fish production are fitted for forecasting purposes.

Results and Discussion

Tamil Nadu has vast inland resources with enormous land and water resources (3.83 lakh ha). Moreover, it has open water resources such as reservoirs, brackish water body, short and long seasonal tanks, which have occupied about 87% in total resources. Additionally, FFDA tanks, ponds and tanks, brackish water farming area and derelict water were available at 13% in total inland fishery resources (Table 1).

Short seasonal tank was first highly available inland fishery resources at 41.2% followed by reservoirs (16.16%), long seasonal tanks (15.7%), brackish water fishery area (13.3%) and ponds and tanks (8%). These resources were providing livelihood for 2.2 million fisher folk. Brackish water faming area and derelict water resources are available at > 1% level (Table 1).

Open water resources were highly contributed in fish production of Tamil Nadu (70.7%) when compared to inland culture resources (29.3%) (Table 1). However, there was higher potential area underutilized in open water sources than inland aquaculture area. Hence, the proper utilization and management of the resources may increase the fish production from the inland fishery resources.

Contribution of resources in fish production

In inland resources, 53.38% of potential natural resources were utilized for fish production while 46.62% was underutilized. Figure 1 was revealed that short seasonal tanks, FFDA tanks and brackish water farming resources were 100 percent utilized but ponds and tanks, reservoirs, long seasonal tanks, brackish water fishery and derelict water were underutilized.

In open water, short seasonal tanks were highly contributed in inland fish production at 54% followed by brackish water shrimp farming area (20.9%), long seasonal tanks (9.0%) brackish water fisheries (5%), FFDA tanks (4.95%), pond & tanks (3.2%) and reservoir (2%) (Table 2).

Ponds and tanks were occupied 8.3% of area but utilized only 4.84% (5000 ha) with the fish production of 3.2% in total fish production due to water crisis and the lack of management in fish culture methods. Therefore, the study was proved that efficient utilization of resources may leads to achieve the potential of 1,60,000 tons, which was confirmed by Krishnan (2000), who reported that the potential of pond fish culture in India was 5 tons/ha but in Tamil Nadu achieved production was only 2.5-3.0 t/ha

Figure 1. Inland Fishery Resources and their Utilization in Tamil Nadu

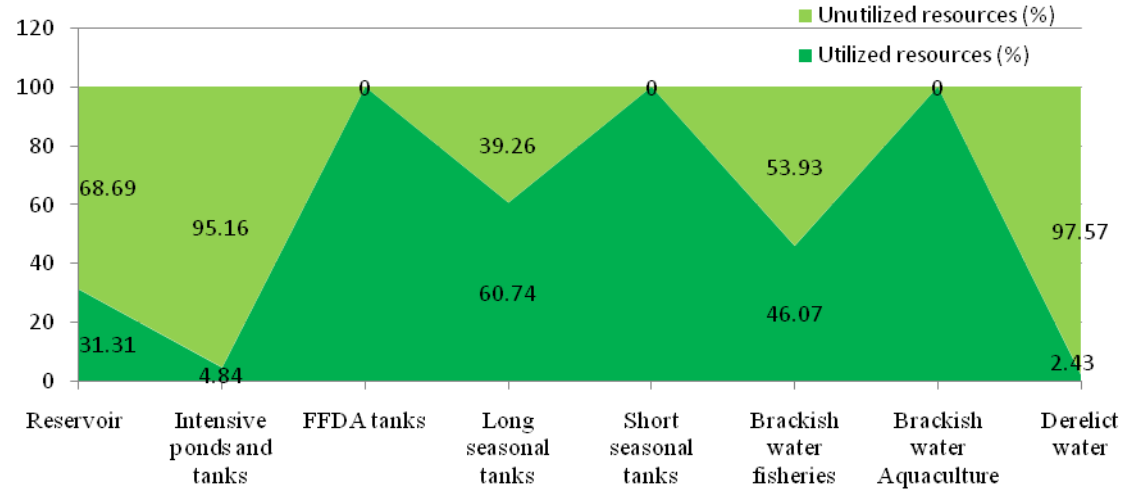


Figure 2. Inland Fish production of Tamil Nadu (tons)

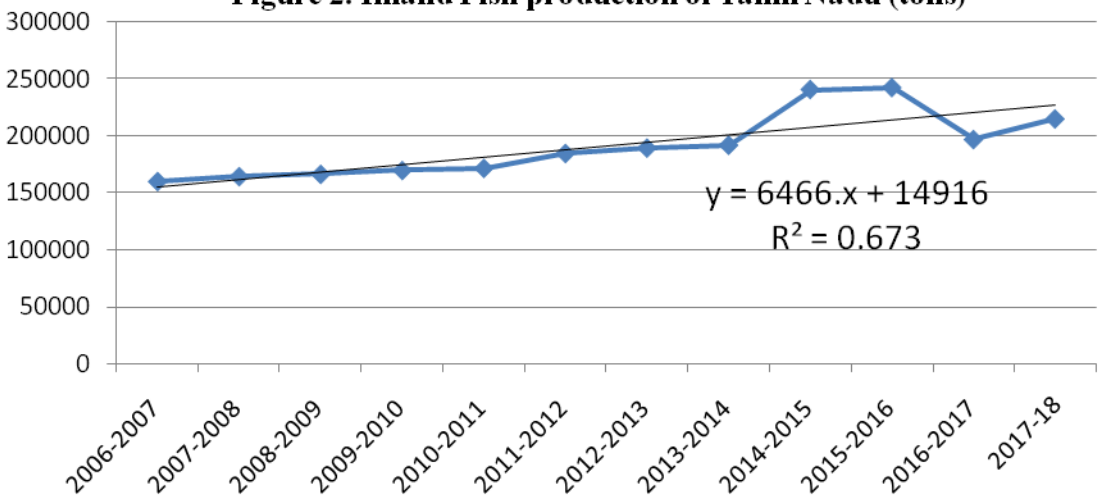
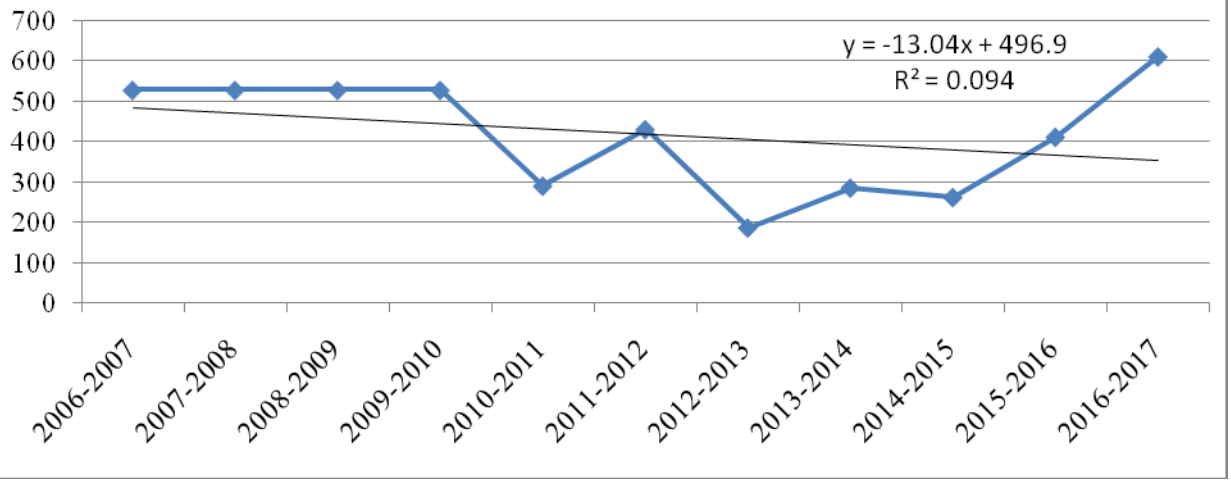


Figure 3. Fish seed production (million fry)



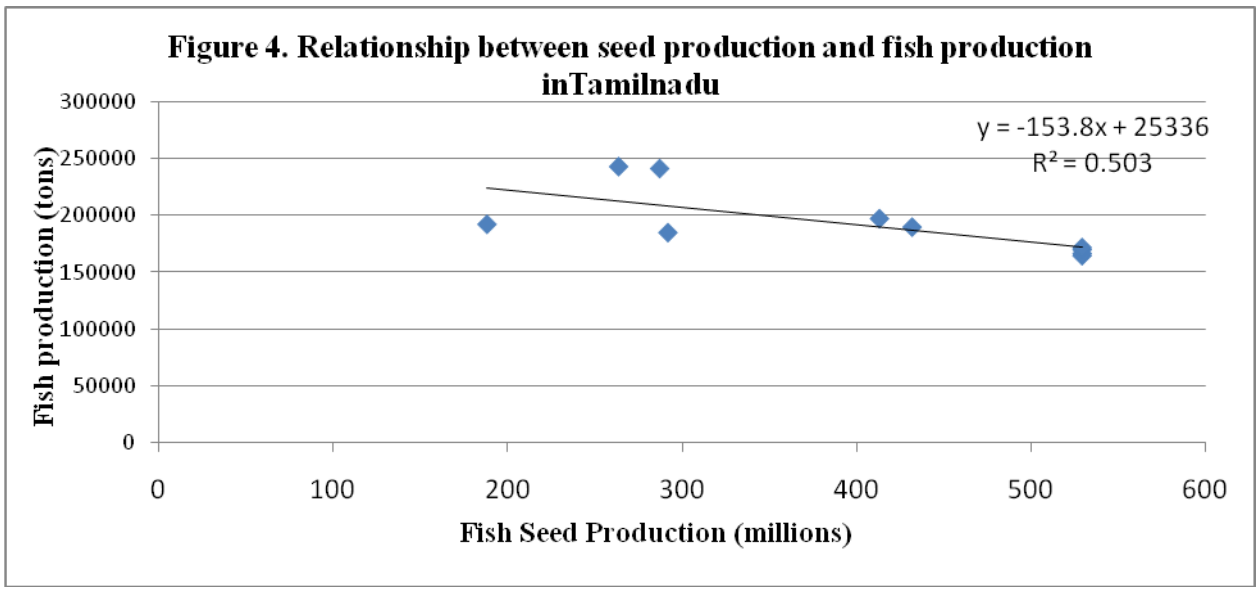


Table.1 Inland fishery resources available and production in Tamil Nadu

S. No.	Resources	Available resources (ha.)	%	Fish production tons (2015-16)	%
1.	Reservoir (250kg/ha)	62,015	16.16	4,854.30	2.00
2.	Brackish water fisheries (0.5t/ha)	52,719	13.73	12,144.191	5.00
3.	Short seasonal tanks	1,58,160	41.2	1,32,518.24	54.64
4.	Long seasonal tanks (0.5t/ha)	60,304	15.72	21,980.161	9.06
5.	**Fisheries (open water)**	**175,038**	**87**	**38,979**	**70.70**
6.	FFDA tanks	5,386	1.41	12,008.33	4.95
7.	Intensive ponds and tanks (5t/ha)	32,000	8.34	7,755.33	3.20
8.	Brackish water farming	6,250	1.62	50,786.27	20.94
9.	Derelict water	7,000	1.82	512.195	0.21
10.	**Aquaculture**	**50,636**	**13**	**71,062**	**29.30**
	Total (Fisheries and Aquculture)	**3,83,834**	100	**2,42,558.95**	100

State Fisheries Department, 2015-16

Table.2 Potential of inland water resources and its status of utilization

S. No.	Resources	Potential of inland fisheries (T)	Utilized potential (%)	Unutilized potential (%)
1.	Reservoir (250kg/ha)	15,504	31.31	68.69
2.	Intensive ponds and tanks (5t/ha)	1,60,000	4.84	95.16
3.	FFDA tanks	12,008	100	0
4.	Long seasonal tanks (0.5t/ha)	36,182.5	60.74	39.26
5.	Short seasonal tanks	1,32,518	100	0
6.	Brackish water area (0.5-3 t/ha)	26,359.5	46.07	53.93
7.	Brackish water area under culture	50,786	100	0
8.	Derelict water (3t/ha)	21,000	2.43	97.57
	Total	4,54,358	53.38	46.62

State Fisheries Department, 2015-16

Table.3 Inland seed and fish production of Tamil Nadu

S. No.	Year	Fish seed production (million fry)	Growth rate (%)	Fish production (Kg)	Growth rate (%)
1.	2006-2007	529.28	-	160172	-
2.	2007-2008	529.28	0	164504	-2.70
3.	2008-2009	529.28	0	166456	1.18
4.	2009-2010	529.28	0	169791	2.00
5.	2010-2011	291.82	-44.86	171705	1.12
6.	2011-2012	431.84	47.98	184753	7.6
7.	2012-2013	188.2	-56.41	189563	2.60
8.	2013-2014	287.15	52.57	192029	1.30
9.	2014-2015	263.58	8.20	240862	25.43
10.	2015-2016	413.1	56.72	242559	0.70
11.	2016-2017	612.27	48.21	197000	-18.78
	Average Growth Rate		**10.21**		**1.85**

Handbook of Fisheries statistics, 2014 (Govt. of India and Tamil Nadu)

Tamil Nadu has brackish water spread area about 56000 ha, in which 11% (6250 ha) area was utilized for aquaculture purpose. Since, it was occupied 1.6% in total inland fishery resources but it was achieved 20% (50,786.27t) in total inland fish production.

Fish Farmer Development Agency (FFDA) was taken 1.41% of inland area under its control and developed aquaculture practices by providing subsidy to the fish farmers and achieved the fish production 4.95% in total inland fish production.

Similarly, short seasonal tank and brackish water aquaculture farms also achieved their maximum production.

Reservoirs are one of the bulk inland resources of our state. They were contributing 2% in total inland fish production, while it is available at 16.6% in total inland fishery resources. Moreover, >68% of potential was underutilized condition. So, there was huge potential to improve the inland fish production further (Figure 1).

Growth in seed and fish production

The secondary data for the period 2007-08 to 2017-18 for fish seed and fish production were analyzed to visualize the growth and trend (Table 3). It was found that during last eleven years, Average Annual Growth Rate (AAGR) in fish production was 1.87 percent whereas in growth of seed production was 10.21 percent. Growth rate of seed production was higher than the fish production in Tamil Nadu. Similar result was reported by Maurya *et al.,* (2018) that higher growth rate was observed in seed production (7.67%) than fish production was (7.56%) in Uttar Pradesh (Fig. 2).

Trend in seed and fish production

Tamil Nadu has constant growth in fish production for last eleven years. Inland fish production data of Tamil Nadu were fitted in the linear regression chart which shows that positive production in every year, which was evidenced by R^2 value 0.678, while fish seed production has no constant growth in every year, which was evidenced by R^2 value 0.094. Similar result was reported by Mourya *et al.,* (2018) in the state of Uttar Pradesh.

Relationship between fish seed production and fish production

The time series data on fish seed and fish production from 2009-10 to 2016-17 was taken further analyzed to explore the relationship between seed and fish production of the state. The obtained result is presented in figure 3. The next year fish production data was taken for the corresponding previous year seed production data, as the stocked seeds require at least 8-12 months to grow into marketable size (Chrispin *et al.,* 2016). It was observed from figure 4 that there was weak positive relationship was found between seed and fish production in Tamil Nadu, which was confirmed by R^2 value 0.503. However, positive R^2 value was proved that fish production was completely depending on seed production of the state. Similar relationship was reported in the state of West Bengal and North Eastern States (Ghosh *et al.,* 2017, Upadhyay *et al.,* 2012).

Tamil Nadu is blessed with enormous fisheries and aquaculture resources (3.83 lakh ha.) (Table 1). Still only 53.38% of total inland fishery resources were utilized for fish production and remaining 46.62% resources were reported to be unutilized. Short seasonal tanks, FFDA tanks and brackish water farming area were utilized at 100%, while other resources were underutilized. Fish production of fisheries (open water) resources was high when compared to aquaculture resources. However, still there was huge potential of fisheries resources were underutilized condition such as reservoirs (68.69%), brackish water fisheries (53.93%) and long seasonal tanks (39.26%). This result proved that growth rate of fish production and seed production in Tamil Nadu was

increasing year by year. Fish production trend was positively increasing, while seed production has negative trend in Tamil Nadu. However, the study proved that fish production was completely depending on seed production of the state.

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How to cite this article:

Gowsalya, T., V. Kanaga and Sundaramoorthy, B. 2019. Trend Analysis of Inland Fish Production of Tamil Nadu with Special References to Resources and Seed Production. *Int.J.Curr.Microbiol.App.Sci.* 8(08): 101-107. doi: https://doi.org/10.20546/ijcmas.2019.808.012