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An Analysis of Capital Formation in Fisheries Sector in India

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Abstract

The fisheries sector occupies an important place in the socio-economic development of the country. The sector generates income and employment, provides livelihood and nutritional security to a large section of economically backward population, and stimulates growth for a number of subsidiary industries in the country, besides being a source of valuable foreign exchange earnings. In view of the increasing importance of fisheries sector in the national economy, the study was undertaken to examine the trends of capital formation in fisheries sector and its share in total economy. To examine the share of fisheries sector in the total as well as agricultural outlay, the contribution of central sector, centrally sponsored and states schemes for fisheries development, and the investment in fisheries research, the secondary data were compiled and analyzed. To examine the growth in fisheries Gross Fixed Capital Formation (GFCF) as well as Gross Domestic Product (GDP), the trend lines were fitted with the exponential function to estimate the compound growth rates different periods. The elasticity of fish GDP with respect to fish GFCF was also estimated using log-linear relationships.

The study revealed that the share of fisheries in agriculture outlay increased from 1.74% during first plan to 5.62% during sixth plan and then declined to 3.7% during tenth plan. The share of GFCF in fisheries sector in total GFCF was almost constant around half a percent between 1970-1971 to 1985-1986 and then started increasing at a steady pace during 1985-1986 to 2002-2003 at constant prices, whereas at current prices, it was hovering around 0.6% up to 1995-1996, and it reached a high of 1.12% during 2003-2004. The contribution of fish to total GDP is hovering around 1% at 1993-1994 prices (constant prices) since 1970-1971. On the other hand, at current prices, the contribution of fish to total GDP was increasing from 0.63% in 1970-1971 to 1.2% in 2003-2004. The study depicts that the growth in fisheries GFCF has been maintaining a high level of around 9.5% during eighties and nineties. However, during seventies, the growth of fisheries GFCF was of the order of around 5.4%. If one considers the overall period from 1970-1971 to 2003-2004, it was found that the total growth of fisheries GFCF was around 8%. The lower rate of growth over the whole period may be attributed to the nearly stagnant trend of fisheries GFCF during seventies. The study concludes that the investment in fisheries research has been increasing all through the plan periods and the Government is giving some importance to this sector. However, there is still scope for more public investment in fisheries research to realize the potential gains of research.

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Introduction

The fisheries sector occupies an important place in the socio-economic development of the country. The sector generates income and employment, provides livelihood and nutritional security to a large section of economically backward population, and stimulates growth for a number of subsidiary industries in the country, besides being a source of valuable foreign exchange earnings. Fisheries contributed about 1% of the total GDP and 5.3% of the GDP from agriculture sector in 2005–2006. Fishing, aquaculture, and a host of allied activities provide a source of livelihood to over 14 million people. The exports of marine products from the country during 2005-2006 reached US $1435 million accounting for 14% of exports of agriculture and allied products.

Indian fishery is an important component of the global fisheries, with India being the fourth largest producer of fish in the world and second in inland fish production. India's share in the world production has increased from 3.7% in 1950 to 4.1% in 1991 and 4.4%in 2000. Further, India's share in the world export of fish products was 2.3% in 2005. After a decline in 2003-2004, it had picked up in subsequent years and grew by 6.3% in April-October 2006. European Union accounted for the largest share of India's export of marine products, followed by US and Japan.

The country is endowed with an Exclusive Economic Zone (EEZ) extending to 20.2 lakh sq. km with a continental shelf area of about 5.3 lakh sq. km having about 8118 km coastal length with some of the richest fishing grounds in the world. The estimated potential for fish production from marine and inland water bodies is about 3.9 and 4.5 million tons, respectively. The main inland fishery resources include about 12.4 lakh ha of brackish water area, 24.14 lakh ha of fresh water ponds and tanks, 7.98 lakh ha lakes, and 29.07 lakh ha reservoirs, besides about 1.96 lakh km of rivers and canals. However, the fish production of 6.50 million tons was much below than the projected production of 7.75 million tons in the year 2005–2006 by the working group on fisheries for the tenth five-year plan. During the last decade, the marine fish production has reached a plateau. Most of the major commercially exploited stocks are showing signs of over exploitation (Ayyappan 2006). On the contrary, demand for sea food has been growing in domestic markets as well as in overseas markets in view of its high quality. Keeping this in view, the Government of India formulated a comprehensive Marine Fishing Policy in 2004 to fulfill the national objectives of augmenting marine fish production on a sustainable level. National Fisheries Development Board has also been set up by government of India in 2006 to realize the untapped potential of fishery sector through research and development including biotechnology.

Capital formation refers to the net additions to the (physical) capital stock in an accounting period or to the value of the amount of increase of the capital stock. Capital formation is often used as an abbreviation for GFCF. A large number of studies have been undertaken for studying the capital formation in agriculture and allied activities

during the last two decades (Mishra and Chand 1995; Chand 2001). However, at disaggregated level, a detailed study on capital formation in fishery sector has not been undertaken so far. In view of the increasing importance of this sector in the national economy, this study was undertaken to examine the trends of capital formation in fisheries sector and its share in total economy and suggest suitable policy measures for sustainability of this sector.

Material and Methods

To study the five-year plan-wise pattern of investment for fisheries development in the country, the share of fisheries sector in the total as well as agricultural outlay were examined using the secondary data on total, agricultural, and fisheries outlays collected from various issues of Economic Survey and Hand Book of Fisheries Statistics. The secondary data on scheme-wise outlay and expenditure for fisheries development were also compiled under different five-year plans from the Hand Book of Fisheries Statistics and analyzed to study the contribution of central sector, centrally sponsored and states schemes for fisheries development. Further, to examine the investment in fisheries research, the outlay for agriculture and fisheries research were compiled and analyzed. The time series data on the total, agricultural, and fisheries gross domestic product (GDP) as well as GFCF in total, agriculture, and fisheries sectors from 1970-1971 to 2003-2004 were collected from various issues of National Accounts Statistics. The triennium averages centered at the mid-point of the triennia were compiled and tabular analysis was carried out for meaningful conclusions.

To examine the growth in fisheries GFCF as well as GDP, the trend lines were fitted with the exponential function to estimate the compound growth rates for historical period (1970-1971 to 2003-2004) and three decadal periods (1970-1971 to 1979-1980, 1980-1981 to 1989-1990, and 1990-1991 to 1999-2000). To see precisely the year in which deceleration in fisheries growth started, the growth rates were estimated between fixed base 1990-1991 and by extending the terminal year from 1995–1996 onwards. To estimate the elasticity of fish GDP with respect to fish GFCF, log-linear relationships between fish GDP and GFCF were fitted for historical as well as three decadal periods. To study the sudden decrease during the later period, the model was fitted for two sub-periods *viz*., 1990-1991 to 1995-1996 and 1996-1997 to 2003-2004. Further, to identify the year of deceleration in elasticity, the model was fitted between fixed base 1990-1991 and by extending the terminal year from 1995-1996 onwards.

Results and Discussion

Plan-wise outlay and expenditure for fisheries development

The outlay on agriculture and allied sectors (agriculture, forestry, and fishing), fisheries subsector, and total outlay during the five-year plan periods is presented in Table 1. It is seen from the table that the share of agriculture sector outlay in total outlay was continuously decreasing during the five-year plans from nearly 15% under first five-year plan to 3.9% under tenth plan. On the other hand, the share of fisheries subsector

outlay in total outlay initially increased from 0.26% under first plan to 0.52% under fourth plan and then started declining and decreased up to 0.19% during tenth plan. However, the share of fisheries outlay in agriculture outlay increased from first plan (1.74%) to sixth plan (5.62%) and then declined to 3.7% during the tenth plan, although the Working Group on Agricultural Research and Education for the Tenth Five-Year Plan recommended that the budgetary allocation to fisheries sector should be enhanced to 9% of total agricultural allocation in X Plan (Planning Commission 2001b). It shows that although the importance of fisheries in agriculture sector was increasingly felt up to sixth plan only, the fisheries still continues to be a neglected sector in national policies. Even now, this sector has got an important place in India's export basket.

Table 1. Outlay for Fisheries Development during Five-Year Plans

(Rs. in Crores)

Plan	Total Outlay	Outlay for Agriculture and Allied Sector	Outlay for Fisheries Sector	Share of Fisheries Sector (%)		Share of Agriculture to Total Outlay (%)
				Total Outlay	Agriculture Outlay	
I (1951-1956)	1960	294	5.13	0.26	1.74	15.00
II (1956-1961)	4600	529	12.26	0.27	2.32	11.50
III (1961-1966)	7500	1068	28.27	0.38	2.65	14.24
IV (1969-1974)	15902	2728	82.68	0.52	3.03	17.16
V (1974-1979)	39322	4302	151.24	0.38	3.52	10.94
VI (1980-1985)	97500	6609	371.14	0.38	5.62	6.78
VII (1985-1990)	180000	10524	546.54	0.30	5.19	5.85
VIII (1992-1997)	434100	22467	1232.82	0.28	5.49	5.18
IX (1997-2002)	859200	42462	2070.00	0.24	4.88	4.94
X (2002-2007)	1525639	58933	2060.54*	0.19	3.70	3.86

Source: Economic Survey – Different issues
* Hand book of Fisheries Statistics, 2004

Scheme-wise outlay and expenditure for fisheries development

An overview of scheme-wise outlay for fisheries development under different plans is presented in Table 2. The table depicts the outlay under three heads: central sector schemes, state schemes, and centrally sponsored schemes (from fourth plan onwards). Up to the third five-year plan, the centrally sponsored schemes were part of central sector schemes. It is also seen that the share of state schemes in total fish outlay decreased from first plan (81%) to sixth plan (53%) and then fluctuated between

60% in seventh plan to 64% in tenth five-year plan. Under central schemes, the share of centrally sponsored schemes increased from 7% under fourth plan and 27% under tenth plan. A careful observation of Table 1 and 2 reveals that the central government has played an important role in the development of fisheries sector as there is a direct relationship between central sector schemes outlay and share of fisheries in agricultural outlay.

Table 2. Scheme-wise Outlay for Fisheries Development over Five-Year Plans

(Rs. Crore)

Plans	Central Sector Schemes	Centrally Sponsored Schemes	State Schemes	Total
First Plan	1.00* (19.49)	-	4.13(80.51)	5.13 (100.00)
Second Plan	3.73* (30.42)	-	8.53 (69.58)	12.26 (100.00)
Third Plan	6.72* (23.77)	-	21.55 (76.23)	28.27 (100.00)
Annual Plans (1966-69)	15.30* (36.25)	-	26.91 (63.75)	42.21 (100.00)
Fourth Plan	28.00 (33.87)	6.00 (7.26)	48.68 (58.88)	82.68 (100.00)
Fifth Plan	51.05 (33.76)	17.00 (11.24)	83.19 (55.02)	151.21 (100.00)
Sixth Plan	137.10 (36.94)	36.62 (9.87)	197.42 (53.19)	371.14 (100.00)
Seventh Plan	156.58 (28.65)	60.75 (11.12)	329.19 (60.23)	546.52 (100.00)
Annual Plans (1990-92)	25.45 (8.69)	55.16(18.84)	212.13 (72.46)	292.74 (100.00)
Eighth Plan	139.00 (11.53)	300.00 (24.89)	766.39 (63.58)	1205.39 (100.00)
Ninth Plan	240.00 (11.60)	560.00(27.06)	1269.78(61.35)	2069.70 (100.00)
Tenth Plan	175.00 (8.49)	565.00(27.42)	1320.54(64.09)	2060.54 (100.00)

* includes centrally sponsored schemes outlay.
Note: Figures in the parentheses are the percentages to total
Source: Hand book of Fishery Statistics, 2004.

Table 3. depicts scheme-wise expenditure under different five-year plans. It can be observed that the expenditure on fisheries development was impressively increasing over the various five-year plans. It ranged from around Rs. 3 crores during the first plan period to Rs.1414 crores during the ninth plan period at current prices. However, the share of state's schemes was decreasing over the plans except the third and the ninth plan. It was around 86% during the first plan and decreased to 62% in the eighth plan. On the other hand, the share of expenditure under centrally sponsored schemes was increasing impressively from fourth plan (10%) to 24% during eighth plan. However, it declined to 19% during the ninth plan period.

Table 3. Scheme-wise Expenditure for Fisheries Development over Plans

Plans	Scheme-wise Expenditure (Rs. Crore)				Percentage expenditure to outlay			
	Central Sector	Centrally Sponsored	State Schemes	Total	Central Sector Schemes	Centrally Sponsored Schemes	State Schemes	Total
First Plan	0.38* (13.67)	-	2.4 (86.33)	2.78 (100)	38.00*	-	58.11	54.19
Second Plan	1.8* (19.87)	-	7.26 (80.13)	9.06	48.26*	-	85.11	73.90
Third Plan	3.03* (12.99)	-	20.29 (87.01)	23.32	45.09*	-	94.15	82.49
Annual Plans (1966-69)	9.04* (27.67)	-	23.63 (72.33)	32.67	59.08*	-	87.81	77.40
Fourth Plan	8.11 (14.99)	5.17 (9.55)	40.83 (75.46)	54.11	28.96	86.17	83.87	65.45
Fifth Plan	39.93 (34.66)	4.07 (3.53)	71.21 (61.81)	115.21	78.22	23.94	85.60	76.19
Sixth Plan	75.54 (26.33)	28.8 (10.04)	182.61 (63.64)	286.95	55.10	78.65	92.50	77.32
Seventh Plan	116.93 (24.48)	53.26 (11.15)	307.4 (64.36)	477.59	74.68	87.67	93.38	87.39
Annual Plans (1990-1992)	16.48 (6.06)	43.73 (16.07)	211.9 (77.87)	272.11	64.75	79.28	99.89	92.95
Eighth Plan	161.01 (14.40)	268.02 (23.96)	689.43 (61.64)	1118.5	115.83	89.34	89.96	92.79
Ninth Plan	124.97 (8.84)	273.18 (19.31)	1016.26 (71.85)	1414.4	52.07	48.78	80.03	68.34

* includes centrally sponsored schemes outlay.
Note: Figures in the parentheses are the percentages to total
Source: Hand book of Fishery Statistics, 2004.

Table 3 also presents plan-wise proportion of expenditure to outlay for fishery development. There was poor utilization of total outlay in fisheries development except the seventh and eighth five-year plans (87% and 93%, respectively). It is very disturbing to observe that the outlay utilization has declined to 68% during ninth plan from a record of 93% during eighth plan period. Further, the share of expenditure in total outlay was as low as 54% and 65% during first and fourth plan periods, respectively. Moreover,

the central sector and centrally sponsored schemes performed impressively only during seventh and eighth plan periods. On the other hand, the performance of states schemes was very good in the utilization of total outlay for fisheries development except first five-year plan (58%). The impressive performance of central schemes in the utilization of outlay for fisheries development has been translated into impressive growth in GDP of this sector (Table 8). It can be inferred from the above discussion that there is an urgent need to first increase the central outlay and secondly to better utilize the allocated outlay under the central schemes for the faster development of fisheries in the country to meet the growing domestic demand and to exploit the opportunities for becoming an important player in the global market.

Outlay for fisheries research

Research is an important component for sustaining fish production and productivity along with maintaining international standards necessary for fish quality assurance. There is a great need for research in the area of aquaculture and marine biotechnology for strengthening the gap in the areas of fish health and disease diagnostics, transgenic aspects, cell and tissue culture, etc.

The plan-wise outlay of fisheries research is presented in Table 4. It is seen that the outlay for research in agriculture and allied sectors had increased phenomenally ever since the fourth five-year plan. It was around Rs. 85 crores during the fourth plan and had increased to Rs.5050 crores in the tenth plan. On the same lines, the outlay for fisheries research has also increased manifolds from Rs.2.25 crores in the fourth plan to Rs. 157 crores in the tenth plan. The proportionate share of outlay for fisheries research in total fisheries outlay had more than doubled from the fourth plan to the ninth plan, whereas the share of Indian Council of Agricultural Research (ICAR) and Department of Agricultural Research and Education (DARE) in total agriculture outlay had increased at a slower pace during the same period. On the other hand, the share of agricultural research outlay to total outlay had been decreasing over the various plan periods. It is important to note that the internal rate of return to investment on fisheries research and development was found to be very high (42% to 55%) and benefit-cost ratio was also found to be very impressive (2.1 to 3.4) under different Total Factor Productivity (TFP) Scenarios (Kumar 2004). Thus, one can conclude that the investment in fisheries research has been increasing all through the plan periods and the Government is giving some importance to this sector. However, there is still scope for more capital formation in fisheries research to realize the potential gains of research in this sector.

Table 4. Plan-wise Outlays for Fisheries Research

(Rs. in Crores)

Plans	Outlay for ICAR and DARE	Outlay for Fisheries Research	% of ICAR reasearch outlay to total fisheries Outlay	% of fisheries reasearch outlay to total fisheries Outlay	% of fisheries reasearch outlay to total ICAR outlay
Fourth Plan	85.00	2.25	3.12	2.72	2.7
Fifth Plan	153.56	9.60	3.57	6.35	6.2
Sixth Plan	340.00	15.75	5.14	4.24	4.6
Seventh Plan	448.00	18.25	4.26	3.34	4.0
Eighth Plan	1300.00	65.00	5.79	5.27	5.0
Ninth Plan	2100.00	125.00	4.95	6.04	6.0
Tenth Plan	5050.00*	157.14*	8.57	7.63	3.1

Source: Planning Commission, Government of India, 2001

* Total plan outlay for Indian Council of Agricultural Research and Department of Agricultural Research and Education

Capital formation in fisheries

The pace and pattern of fisheries development is to a great extent conditioned by the growth of the infrastructure facilities. Infrastructure plays a critical role on both input and output sides. On the input front, it helps to ensure timely, adequate, and quality input delivery to the farmers, whereas on the output front, it helps to integrate local markets with national and international markets. Therefore, an adequate and efficient infrastructure system is essential for realizing the potential of the sector. Figure 1 shows the trend in capital formation in fisheries sector during the last three decades. It is observed that the index of capital formation in fisheries was almost stagnant till 1980-1981 and then continued increasing steadily and surpassed the index of agriculture capital formation (Ag GFCF) during the year 1995-1996.

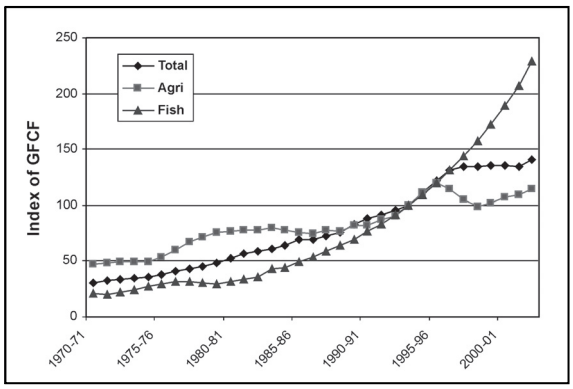

Figure 1. Trend of Capital Formation in Fisheries and Agriculture (Base TE: 1993-94 = 100)

A perusal of Table 5 reveals the percent share of GFCF in fisheries sector to total GFCF as well as Ag GFCF at constant and current prices. It can be observed that the share of GFCF in fisheries sector in total GFCF was almost constant around half a percent between 1970–1971 and 1985–1986 and then started increasing at a steady pace during 1985–1986 to 2002–2003 at constant prices, whereas at current prices, it was hovering around 0.6% up to 1995–1996 and it reached a high of 1.12% during 2003–2004. The share of fish GFCF to Ag GFCF was subdued during the seventies as fishery was practiced as a subsistence activity by fishermen community with little or no use of external inputs. However, it showed a rising trend ever since 1980–1981 and reached a high of 14% during 2002–2003. In contrast, the share of GFCF in agriculture sector to total GFCF has always been on the decline ever since 1970–1971 and reached as low as 7.6% during 2000–2001.

Table 5. Capital Formation for Fisheries Development (Rs. Crores)

Periods	Total GFCF	Ag GFCF	Fish GFCF	% Ag GFCF to Total GFCF	% Fish GFCF to Total GFCF	% Fish GFCF to Ag GFCF
At 1993–1994 prices						
1970-71	54369	8196	261	15.07	0.48	3.18
1975-76	68509	9401	373	13.72	0.54	3.96
1980-81	95370	13491	390	14.15	0.41	2.89
1985-86	125683	13232	614	10.53	0.49	4.64
1990-91	160452	14360	957	8.95	0.60	6.67
1995-96	221720	20850	1507	9.40	0.68	7.23
2000-01	246664	18695	2370	7.58	0.96	12.68
2002-03	255101	20103	2874	7.88	1.13	14.30
At Current price						
1970-71	6445	947	39	14.70	0.61	4.15
1975-76	13938	1857	84	13.32	0.60	4.51
1980-81	29577	3765	133	12.73	0.45	3.52
1985-86	62750	6064	377	9.66	0.60	6.22
1990-91	125605	10934	818	8.70	0.65	7.48
1995-96	291223	20523	1813	7.05	0.62	8.83
2000-01	351162	28747	3193	8.19	0.91	11.11
2003-04	414957	36151	4661	8.71	1.12	12.89

Source: National Accounts Statistics – Various Issues

Contribution of fisheries sector to gross domestic product

The share of fisheries gross domestic product (Fish GDP) to total GDP and agricultural and allied activities (Ag GDP) is presented in Table 6. The contribution of fish GDP to total GDP is hovering around 1% at 1993-1994 prices (constant prices) since 1970-1971. On the other hand, at current prices, the contribution of fish GDP to total GDP was increasing from 0.63% in 1970-1971 to 1.2% in 2003-2004. As a result, the contribution of fish GDP to Ag GDP was increasing at current as well as constant prices. These developments indicate that the fisheries sector is poised to grow further in the near future. During the same period, the growth rate of fisheries GDP has been declining (Table 8). Further, the growth in the total fish production during the liberalization period (1990-1991 to 1995-1996) and the post liberalization period (1996-1997 to 2003-2004) had decreased from 5.16% to 2.78%, respectively. This decline was due to declining growth especially in marine fish production during the same periods, which decreased from 3.25% to 0.16 %. There was also a declining trend in inland fish production during the said periods. This clearly shows that there has been a virtual stagnation in the marine fish production due to overexploitation.

Table 6. Contribution of Fisheries Sector to Gross Domestic Product in India (Rs in crores)

Periods	GDP	Ag GDP	Fish GDP	Percentage contribution of		
				Ag GDP to Total GDP (%)	Fish GDP to Total GDP (%)	Fish GDP to Ag GDP (%)
At 1993–1994 Prices						
1970-71	292560	133429	3043	45.61	1.04	2.28
1975-76	335887	143779	3741	42.81	1.11	2.60
1980-81	400164	156041	3947	38.99	0.99	2.53
1985-86	514108	185706	5229	36.12	1.02	2.82
1990-91	683688	219030	6919	32.04	1.01	3.16
1995-96	902559	260691	9807	28.88	1.09	3.76
2000-01	1204968	292772	11552	24.30	0.96	3.95
2002-03	1338952	299557	13059	22.37	0.98	4.36
At Current Prices						
1970-71	42279	19397	267	45.88	0.63	1.38
1975-76	76124	31595	567	41.50	0.74	1.79
1980-81	130386	49233	943	37.76	0.72	1.91
1985-86	250170	84327	2160	33.71	0.86	2.56
1990-91	512687	160788	4868	31.36	0.95	3.03
1995-96	1077959	314827	12184	29.21	1.13	3.87
2000-01	1915437	480337	22465	25.08	1.17	4.68
2003-04	2285382	531238	26321	23.25	1.15	4.95

Source: National Accounts Statistics – Various Issues

Capital formation and gross domestic product in fisheries

The share of fisheries capital formation to fisheries GDP had been increasing at a slower pace up to the year 1980-1981 and then continued to increase at a steady pace (Table 7). The proportion of total GFCF to total GDP was around 19% during 1970-1971 and 2002-2003 at constant prices. However, it had grown to 24% during 1980-1981 and stayed at same proportion up to 1995-1996 and then started declining. At current prices, this proportion was continuously increasing throughout the period from 1970-1971 to 2003-2004 except 1990-1991 and 2000-2001.

Table 7. Share of Capital Formation in Fisheries to Gross Domestic Product in India

(Percent)

Periods	GFCF to GDP	Ag GFCF to Ag GDP	Fish GFCF to Fish GDP	Fish GFCF to Total GDP	Fish GFCF to Ag GDP
At 1993-994 Prices					
1970-71	18.58	6.14	8.57	0.09	0.20
1975-76	20.40	6.54	9.96	0.11	0.26
1980-81	23.83	8.65	9.87	0.10	0.25
1985-86	24.45	7.13	11.74	0.12	0.33
1990-91	23.47	6.56	13.84	0.14	0.44
1995-96	24.57	8.00	15.37	0.17	0.58
2000-01	20.47	6.39	20.51	0.20	0.81
2002-03	19.05	6.71	22.01	0.21	0.96
Current Prices					
1970-71	15.24	4.88	14.73	0.09	0.20
1975-76	18.31	5.88	14.76	0.11	0.26
1980-81	22.68	7.65	14.07	0.10	0.27
1985-86	25.08	7.19	17.47	0.15	0.45
1990-91	24.50	6.80	16.80	0.16	0.51
1995-96	27.02	6.52	14.88	0.17	0.58
2000-01	18.33	5.98	14.21	0.17	0.66
2003-04	18.16	6.80	17.71	0.20	0.88

Growth in Capital formation and gross domestic product in fisheries

Table 8 reveals that the growth in fisheries GFCF has been maintaining a high level of around 9.5% during eighties and nineties. However, during seventies, the growth of fisheries GFCF was of the order of around 5.4%. If one considers the overall period

from 1970-1971 to 2003-2004, it was found that the total growth of fisheries GFCF was around 8%. This lower rate of growth over the whole period may be attributed to the declining trend of fisheries GFCF during seventies. On the other hand, the GFCF in the agriculture sector has been very low (2.8%) over the whole period *viz.,* 1970-1971 to 2003-2004. Although the growth in agricultural GFCF has been on the decline ever since 1990-1991 onwards, the growth in fisheries GFCF has maintained almost a uniform trend of 9.5%.

Table 8. Growth in Fisheries GFCF and GDP at Constant Prices (percent)

Particulars	Growth Rates of GFCF			Growth Rates of GDP		
	Total	Agri.	Fishery	Total	Agri.	Fisheries
Historical Period						
(1970-71 to 2003-04)	5.34	2.77	7.94	5.06	2.85	4.87
Decadal Period						
1970-71 to 1979-80	5.20	5.83	5.44	3.58	2.10	2.86
1980-81 to 1989-90	4.78	0.12	9.53	5.41	3.13	5.74
1990-91 to 1999-00	5.68	2.42	9.50	6.16	3.19	5.43
Liberalization Period						
1990-91 to 1995-96	6.62	7.94	9.51	5.72	3.57	7.46
1990-91 to 1996-97	7.05	6.71	9.50	5.99	3.45	7.15
1990-91 to 1997-98	6.84	4.89	9.51	6.13	3.47	6.55
1990-91 to 1998-99	6.49	2.56	9.51	6.16	3.38	5.90
1990-91 to 1999-00	5.68	2.42	9.50	6.16	3.19	5.43
1990-91 to 2000-01	5.20	1.76	9.49	6.12	2.99	5.15
1990-91 to 2001-02	4.71	1.71	9.49	6.07	2.98	5.07
1990-91 to 2002-03	4.01	1.61	9.49	5.97	2.63	5.09
1990-91 to 2003-04	4.20	1.92	9.54	6.00	2.74	5.07

Table 8 presents the compound growth rates in fish GDP during the last three decades as well as during the post liberalization period. It can be observed that historical growth in fish GDP was higher than the growth in Ag GDP. However, it was only

marginally lower than the growth in total GDP. The decade-wise analysis showed that growth in fish GDP was higher than the Ag GDP in all the three decades. However, growth in fish GDP was found to be higher only during eighties compared with total GDP. Decade-wise comparison of growth in fish GDP revealed that the growth was impressive during eighties (5.74%) and nineties (5.43%) in comparison with the seventies (2.86%). The study of growth in fish GDP during the liberalization phase reveals that during the early period of liberalization (1990-1991 to 1995-1996), there was a steady growth (7.46%) in contrast to preliberalization phase (1980-1981 to 1989-1990).

To see precisely in which year deceleration in fisheries growth started, the growth rates were estimated between fixed base 1990-1991 and extending the terminal year from 1995-1996 onwards. The results also reveal that the growth rate of fish GDP was the highest during the period 1990-1991 to 1995-1996. There is a continuous deceleration in the growth rate after this period till 2000-2001 beyond which the growth has almost stagnated at around 5.07%. No doubt, there was a deceleration in growth in fish GDP beyond 1990-1991: 1995-1996 period, yet the growth was higher than the growth rates in agriculture during the respective periods. Further, the rate of growth in total economy turned out to be higher than the growth in fisheries sector after the period beyond 1990-1991 to 1998-1999. It is important to note that during the period 1996-1997 to 2003-2004, the growth in fish production had decreased to 2.78% from 5.16%, which is the production during 1990-1991 to 1995-1996, and this decline can be attributed to the decline in marine fish production during the same periods, which decreased to 0.16% from 3.25%.

Relationship between fisheries gross domestic product and capital formation

Table 9 presents the results of log-linear relationship between fish GDP and GFCF in fisheries sector for different periods. The model explained the variation in fish GDP by capital formation in this sector to a considerable extent. GFCF was explaining the maximum variation in the GDP (to the extent of 99%), as this variable represents collectively the influence of all other variables like investment on fishing crafts and gears, investment on hatcheries, ponds development, and other infrastructural development variables like landing centers, cold storage facilities, transportation etc. The elasticity of fish GDP with respect to fish GFCF was found to be significant for all the periods under consideration.

Table 9. Elasticity of Fish GDP with respect to Fish GFCF during Different Periods

Period	Constant	Elasticity	t-value	R^2
Historical Period				
(1970/71-2003/04)	4.579	0.620	51.70	98.8
Decadal Period				
1970/71-1979/80	5.745	0.420	7.141	86.4
1980/81-1989/90	4.542	0.623	11.315	94.1
1990/91-1999/00	4.852	0.586	9.807	92.3
Liberalization Period				
1990/91-1995/96	3.366	0.796	15.936	98.4
1996/97-2003/04	5.867	0.451	7.002	89.1
1990/91-1996/97	3.433	0.787	22.018	99.0
1990/91-1997/98	3.796	0.735	18.369	98.3
1990/91-1998/99	4.53	0.632	9.387	92.6
1990/91-1999/00	4.852	0.586	9.807	92.3
1990/91-2000/01	5.081	0.554	10.606	92.6
1990/91-2001/02	5.144	0.545	12.462	94.0
1990/91-2002/03	5.127	0.548	14.801	95.2
1990/91-2003/04	5.176	0.541	17.108	96.1

The perusal of the table reveals that the response of fish GFCF to fish GDP was poor during seventies (0.42), whereas it increased during eighties to 0.62 and again decreased to 0.59 during the period nineties. To study this sudden decrease during the later period, the model was fitted for two subperiods *viz.*, 1990-1991 to 1995-1996 and 1996-1997 to 2003-2004. It was surprising to observe that during the first half of the nineties, there was a significant increase in the elasticity coefficient (0.8). This may be due to the effect of liberalization policies initiated in 1991. During this period, greater emphasis was laid on the development of inland fish production including brackishwater and freshwater aquaculture because of its export potential and high value. There was considerable private investment because of the favorable policy environment. However, owing to production mismanagement and regulatory problems, the production growth started tapering off and as a result, the elasticity coefficient decreased to 0.45 during the period 1996-1997 to 2003-2004. Further, to identify the year of deceleration in elasticity, the model was fitted between fixed base 1990-1991 and extending the terminal year

from 1995–1996 onwards. It was observed that the response of fish GFCF to fish GDP started decelerating from the year 1996–1997.

Conclusions

The study concluded that the central government has played an important role in the development of fisheries sector as there is a direct relationship between central sector schemes outlay and share of fisheries in agricultural outlay. The scheme-wise expenditure under different five-year plans depicts that the expenditure on fisheries development was impressively increasing over the various five-year plans. Although, the growth in fish GDP during the period 1990-1991 to 1995-1996 was steady (7.46%), there was a continuous deceleration in the growth rate after this period till 2000–2001 (5.07%).

Thus, there is an urgent need to increase the central outlay and utilize the allocated outlay efficiently under central schemes for the faster development of fisheries in the country to meet the growing domestic demand and to exploit the opportunities for becoming an important player in the global market. The investment in fisheries research has been increasing all through the plan periods, and the Government is giving some importance to this sector. However, there is still scope for more public investment in fisheries research to realize the potential gains of research. Further, increasing public and private investment is also needed for strengthening infrastructure for diversifying fisheries activities to enhance fish production, productivity, and export. Private sector investment in fisheries can also play an important role in seed and feed production, adopting existing technologies for higher production, human resources development, postharvest management, and marketing.

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