Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(2): 920-923

Received: 12-01-2020
Accepted: 14-02-2020

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Dynamics and impact of public investment on the growth of fisheries sector in Jammu & Kashmir

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Abstract
This study has made an attempt to analyze the growth pattern of public investment in the fisheries sector of Jammu & Kashmir by perusing the time series data pertaining to the duration from 1980-81 to 2015-16. The secondary data employed in the study was obtained from various plan document of the Government of Jammu & Kashmir and various issues of Digest of Statistics, GoJK. The findings of the study indicated that the fish production in the state has steadily increased over the years though the production figures have exhibited an unfavourable decline in Kashmir Province. Although government has played an important role in the form of various sponsored schemes and mission, however this sector is contributing less than 2 per cent to agricultural economy. The public investment in the fisheries sector has shown a consistent decline in proportionate terms and in terms of its intensity. Moreover public investment in the fisheries sector has exhibited a declining trend over the years. Based upon findings, a few policy suggestions emerge out of this study.

Keywords: Fisheries sector, public investment, impact, Jammu & Kashmir

Introduction
Fisheries sector of the state has a crucial place in the economy though its role in food security and employment has not been fully tapped. Fisheries provide livelihood opportunites to an appreciable proportion of the economically weaker section of the society [1]. The growing economic status of the masses have led to the consistent increase in the demand of fishes and its value added products across the globe [2]. Although the conservation of fish habitat has always been given due emphasis in plan periods [3, 4], however, the production of fishes from the natural system has shown a significant decline over the years [5].
Across different regions of the country, Jammu & Kashmir provide conducive environment for the survival and production of variety of fish species including trout and shyzothorax [6]. The natural habitat including rivers, lakes and streams in J&K spreads over an area of over 0.40 lakh ha. The domestic demands of fishes in the territory would be satisfied if the potential of available resources is utilized efficiently, however, there has been a deline in its production in the recent years [7] that has led to the decline in per capita availability and intake of fish.
The deterioration of water bodies and their quality parameters on account of growing anthroprogenic activities is one of the reasons for the stagnation of fish production the the terrritory. Moreover, the deficits on account of physical infrastructure and lack of adequate marketing logistic are far from satisfactory [8]. The capital formation in the form of infrastructure and tangible/intangible assets are investment embodied and public investment is crucial to sustain growth of primary sector of the economy including fisheries [9]. Public investment has a major role in the improvement of productivity of agricultural and allied sectors [10]. The role of public investment in the formation of capital, growth of agricultural sector and rural development in the mountainous states has been brought out by a few studies [11, 12, 13], however, no study has studied the scenario and role of public investment in fisheries sector. In this background this study has made an attempt to investgate the scenario of public investment in fisheries sector and has analyzed its role in the growth of this sector in Jammu & Kashmir.

Methodology
The study is mainly based upon chronological data collected from Annual and Five Year Plan Documents of Planning and Development Department, Government of J&K and various issues of Digest of Statistics, Directorate of Economics & Statistics, Government of Jammu & Kashmir.

Regression analysis

In order to quantify the cause and effect of growth of fisheries sector and public investment in this sector, domestic product generated in the fisheries secot of the territory has been endogenized with a number of exogenous variable. The structural form of the model is as equation (I):

Y = f(PRDf, PUBf, LCN, POPf, U) ---------- (I)

Where,
PRDf = Total fish production (000' tonnes),
PUBf = Public investment in fishery sector (Rs in lakhs),
POPf = Fishermen population (000' Nos.),
LCN = License to fishermen (000' Nos.),
Y (dependant variable) = Net domestic generated in fishery sector (Rs in crores), & U = Error term

The model was estimated in a log linear form employing an OLS procedure.
Compound growth rates (%) in public investment in fisheries sector were worked out for different periods by using an exponential function of following form:

$y_t = ab^t v^t$ ---------- (II)

Where, y_t = public investment in fisheries sector in the year (t), a = constant denoting y in the base period (t=0), b is the regression coefficient revealing the extent to which fish net domestic product in fisheries sector changes with respect to the change in time, t is time in years (1,2,3,…) and v^t is the random term.
The function (II) was estimated in log linear form by emplying ordinary least square procedure and the compound rates of growth were calculated by the solving following formula:

CGR = (antiLnB-1) x 100

Standard error (SE) = (100 B/Ln10^e)
x SQRT $((\Sigma \ln Y^2 - (\Sigma LnY)^2/N - LnB(\Sigma tLnY - \Sigma t\Sigma LnY/N)/(N-2)(\Sigma t^2 - (\Sigma t)^2/N))$

The CGRs were tested for significance by employing t-statistics of the growth rates, obtained by dividing compound growth rates by corresponding standard error as:

$t_{cal.}$ = CGR/SE

Results & Discussion

The fish production in Jammu & Kashmir has reached to over 20 thousand tonnes (2015-16) as against just 6.22 thousand tonnes during 1970-71 (Table 1). As documented in the Table 1, the J&K has a meagre share in the Indian fish production and is gradually declined. The J&K has a share of just 0.21 per cent in Indian fish production during 2015-16. Moreover the reduce share implies that the pace of growth of fish production in the territory has been relatively low compared to the countrys' average.

Table 1: Fish production in J&K and India from 1970-71 to 2015-16 (000 tonnes)

Year	India	J&K	J&K's share (%)
1970-71	1756	6.22	0.35
1980-81	2442	9.54	0.39
1990-91	3836	13.50	0.35
2000-05	5656	18.47	0.33
2010-11	8231	19.70	0.24
2015-16	9562	20.08	0.21

Since 1980s, J&K has made a progress in the fish production from 0.96 to 2.0 lakh kgs from 1980-81 to 2015-16 though the fish production in Kashmir has exhibited yet more increase in same span. Currently Kashmir is producing more than half of territorys' fish production (Figure 1). Although the production of all the fish species have increased over the years, however there was a decline in the production of mirror carp and country fish since early 2000s' [6]. The net domestic product (NDP) in J&K experienced a mani-fold increase since 1980s' [14] and the share of agriculture & allied sectors towards it steadily declined over the years. The net domestic product generated in fishery sector has increased from Rs 4.7 crore in 1980-81 to Rs 62.0 crore in 2013-14 in absolute terms, however, its contribution to agricultural and state net domestic product start declining in recent decades.

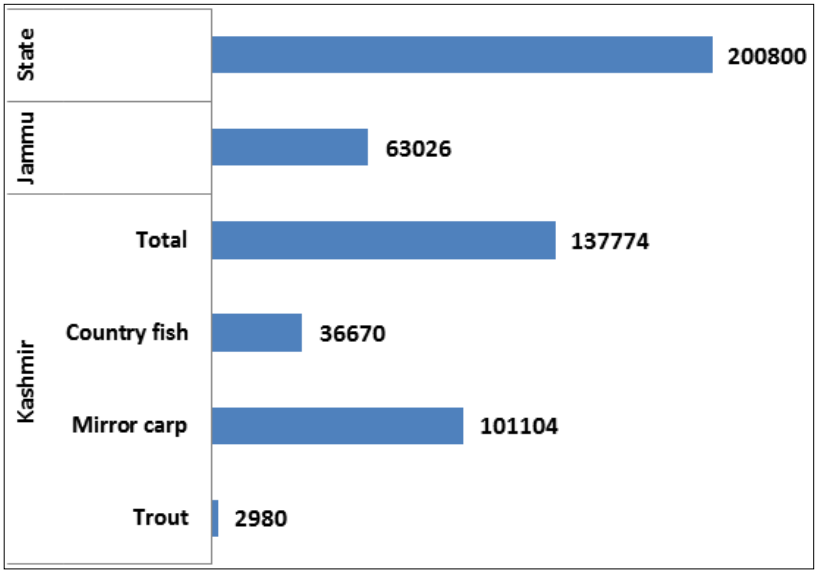

Fig 1: Fish caught in Jammu & Kashmir (q)

Pattern of public investment in fisheries

Plan allocations to a particular sector is crucial to push that activity towards development and growth. The investment in fisheries sector as per cent of public investment for the agricultural sector has increased from 20 per cent in the year 1980-81 to about 29 per cent in 2005-06 (Table 2). In later plans, its share declined and reached to just 13 per cent of agricultural investment. It implies the level of importance given to the fisheries sub-sector within agriculture sector. Its share in the total plan outlay during different plans periods has been fluctuating around 2 per cent. It was proposed in Tenth Plan, 2002-07 to improve fish production by manifolds across the country. During the this Plan Period, new initiatives for development of fisheries were taken to increase production and productivity of inland and capture fishery resources like rivers, canals, reserviours, beels, etc. In addition, creation of infrastructural facilities for an efficient post-harvest management, development of technologies for sustainable aquaculture, establishment of cold storage and marketing network through viable fishermen co-operatives, etc. were taken up to ensure better livelihood opportunities for fishers and enhance export of fisheries products for economic development of the country. During this plan, the allocation to this sector has significantly increased, however it has again gone down later to just Rs 129 crore in 2014-15 at real prices.

Table 2: Public investment in fisheries viz-a-viz agricultural sector

Year	Agriculture (Rs cr.)			Fishery (Rs lakh)			
	Current	Real	% of total	Current	Real	%age of	
						Total	Agri.
1980-81	35	35	20.5	34	34	1.0	20.2
1985-86	64	47	23.4	85	62	1.3	31.1
1990-91	116	54	18.0	146	69	1.3	22.7
1995-96	146	50	13.2	259	89	1.8	23.5
2000-01	333	93	18.9	426	119	1.3	24.2
2005-06	446	106	12.5	1043	247	2.3	29.3
2010-11	489	100	8.5	1319	271	2.7	22.9
2014-15	267	51	5.1	677	129	2.5	13.0

Compound growth rates

The data on public investment in fisheries was categorized in two sub-period for clarity and comparison of growth and compound growth rates were calcuated for separately for each periods. The growth estimated revealed a discouraging pattern (Table 3). The total public plan investment and public investment in fisheries increased at the rate of 6 per cent per year during first period which was relatively relatively higher than agricultural investment in this period. But while the total plan investment increased at 6.58 per cent per annum during period second, the public investment in fisheries sector increase at lower annual rate of 2.14 per cent. The declining trend of public investment and its slow pace need to be reversed to achieve desired growth in fishery sector.

Table 3: Growth of public investment in fisheries sector (CGR %)

Period	Economic sectors		
	All	Agriculture	Fisheries
All (1980-2015)	6.25* (0.19)	2.88* (0.39)	5.72* (0.41)
Period I(1980-97)	6.18* (0.38)	2.40* (0.56)	5.92* (0.60)
Period II (1998-2015)	6.58* (0.69)	-0.28 (1.18)	2.15 (1.25)

Figures with parentheses indicate standard errors,
*Denotes significance at 0.05 or better probability levels

Intensity of public investment in fisheries

Intensity of public investment in fisheries sector viz-a-viz in agricultural sector was estimated as percentage of respective net domestic product and presented in Table 4. The estimates indicated that the investment intensity in fisheries sector was relatively higher compared to agricultural sector in the 2014-15. Intensity of investment in fisheries increased between 1980-81 and 1985-86 but later it has persistently decline, with minor upward spike during 2010-11. It implies that investment intensity in fisheries sector has not been favourable which need to be doubled imedicately to achieve its long lead positive impacts.

Regression estimates

A regression function was developed and estimated in log-linear form to empirically measure the impact of public investment and other indicators on development of fisheries sector and its estimates are presented in Table 5. It could be seen from the figures documented in the table that public investment have significantly contributed to the development of fisheries sector and may help to generate more production of good and services from this economic activity. Total fish production and fishermen population turned significant determinants of NDP generated in fisheries sector. An important finding came out of this analysis that the number of licenses issued to fishermen did not have any positive contribution in the growth in fisheries sector. It may be noted that the dispensation of compensation for not fishing in ban period (March to May) might have attracted registration of more people as fishers but it has not contributed to the improvement in fish production of the state. The estimates of coefficient multiple determination turned significant implying model to be a best fit.

Table 4: Intensity of public investment in fisheries sector vis-a-viz agricultural sector

Year	Intensity (%)	
	Agri. sector	Fish. sector
1980-81	7.0	7.3
1990-91	9.2	8.9
2000-01	7.1	4.1
2010-11	4.2	5.9
2014-15	1.7	2.1

Table 5: Impact of public investment on fishery sector

Exogenous	Coefficient	Standard error
Intercept	-2.64*	0.57
PRDf	0.92*	0.35
PUBf	1.71*	0.35
LCN	-0.24	0.18
POPf	0.44*	0.1
Adjust R^2	0.9171*	
F	115.51	

*Denotes significance at 0.05 or better probability levels

Conclusion & policy suggestions

Considering the importance of fisheries sector in employement generation and alleviation of destitute and disadvantaged section of society in the state, this sector needs due attention of institutions. This sector is characterized by the recent decleration of fish production though trouts have shown a good progress. The net domestic product from fisheries sector has been increasing in absolute terms but its contribution to agriculture and state income has shown a decline since 2000s'. The public investment in this sector has exhibited discouraging trend. Despite important role of investment in the growth of fisheries sector, public investment in fisheries as proportion of total agricultural investment has declined from 22 per cent (2010-11) to just 13 per cent (2014-15). The intensity of public investment in fisheries has also experienced a decline over the years. Following policy implications emerge out of the finding of the study:

There is a need to add glamour to this sector by encouraging scientific approach to the fish culture, fish capture and its value addition. Protection and preservation of water bodies should be prioritized in upcoming plans. There is a need to wipe out encroachments with judicious compensation and preservation of water bodies through desilting, dredging and improvement of physio-chemical properties. Creation of essential marketing infrastructure including cold storage, cold chain, etc in public-private partnership mode is needed around each production centre. There is a need to strengthen extension services to disseminate scientific methods of rearing fishes and development of capacities among different stakeholders involved with the fisheries sector of the state is high imperative. The initiatives taken up by SKUAST-K towards R&D efforts for fishery development has to be vigorously carried. Since public investment has a significant impact on growth of fisheries sector of the state, its declining trends has to be reversed. The intensity of this investment has to be doubled from 2 per cent to 4 per cent net domestic product generated in this sector to achieve desired results. There is a need to enhance investment in research & education in fisheries to encourage innovations, technological breakthroughs and taking academics to excellence. Above all there is a need of an integrated approach for the development of this sector in the state.

Acknowledgement

This study is a part of research work carried out under one of the ongoing RCM projects of the Division of Social Sciences, Faculty of Fisheries, SKUAST-K. All the assistance provided by our institutions for the conduct of this study is gratefully acknowledged.

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