



GOVERNMENT OF KERALA
STATE PLANNING BOARD

THIRTEENTH FIVE-YEAR PLAN
2017-2022

WORKING GROUP ON
FISHERIES

REPORT

AGRICULTURE DIVISION
THIRUVANANTHAPURAM

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PREFACE

In Kerala, the process of a Five-Year Plan is an exercise in people's participation. At the end of September 2016, the Kerala State Planning Board began an effort to conduct the widest possible consultations before formulating the Plan. The Planning Board formed 43 Working Groups, with a total of more than 700 members – scholars, administrators, social and political activists and other experts. Although the Reports do not represent the official position of the Government of Kerala, their content will help in the formulation of the Thirteenth Five-Year Plan document.

This document is the report of the Working Group on Fisheries. The Chairpersons of the Working Group were Shri P James Varghese IAS and Dr C Mohanakumaran Nair. The Member of the Planning Board who coordinated the activities of the Working Group was Professor R Ramakumar. The concerned Chief of Division was Dr P Rajasekharan.

Member Secretary

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CHAPTER 1
INTRODUCTION

1. Kerala has a population of 33.4 million people as per Census 2011. The decadal growth rate of population is 4.9%, when compared to Census 2001. To meet the food requirements of this increasing population, we need to enhance our food production. Certainly, Fisheries sector has an important role to play and the production from the sector need to be increased to address the food and nutritional security issues of the state. Conventionally the production could be increased by expanding the area under farming. But in the peculiar land holding situation of the state, the scope for increasing the farming area is very difficult. Adoption of new techniques for increasing productivity of the existing resources could be the main alternative to meet the increasing demand. Worldwide trend shows that Capture fisheries is stagnating over the past few years (93.4 million metric tonnes in 2014, FAO), which is true in the case of Kerala also. Aquaculture, which is recognized as the fastest growing food production sector, only could be relied on for increasing the fish production. Aquaculture continues to strengthen its role in contributing to food security and poverty alleviation in many developing countries including India. However, when the prevailing conditions in Kerala are considered, it is necessary to increase production efficiency in both capture and culture fisheries. At the same time the steps for increasing production should not cause damage to our natural resources. Therefore, it is important that we increase food production without damaging the environment and without disturbing the ecological balance. Hence, there is need for sustainable approaches in fish production.
2. Traditionally, Kerala is a marine fish producing and consuming state, though aquaculture activities are gaining momentum during the last few decades. Kerala State by virtue of its geographical setting with rich and varied aquatic resources in the form of extensive 39,139 sq km continental shelf area, 2,18,536 ha EEZ, 53 interconnected backwaters (Kayals), 44 rivers, 47 reservoirs, numerous wetlands and a 590 KM long coastline, has a strong resource base for fisheries development. Consequently fisheries is a major sector in Kerala's economy supporting the livelihood of 13 lakh fisherfolk, who accounts for more than 3.89% of State's population.
3. Mechanization of fishing and modernization of processing techniques helped the emergence of fisheries sector as a growing export oriented industry. Kerala is an important contributor to the marine product exports market of India with shrimps contributing the major share. In 2015-16, the state exported over 1,49,138 metric tonnes of marine products to some 90 countries, earning over Rs 4644.42 Crores. Fisheries sector contributes Rs 7086.32 Crores to State GDP. It is 1.36% of State GDP (Constant price) and 11.49% of the primary sector (Agriculture and allied activities).
4. Fish as a nutrient rich food offers the state one of the easiest and fastest way to address malnutrition and food security. Fish resources constitute a potential source of animal food and are the cheapest source of quality protein. Fish being rich in proteins, PUFA, vitamins and minerals is a valuable nutrient rich food. It forms an important item in the diet of people over considerable areas in the state. It is estimated that 85% of the population of the state are fish eating and 70 to 80% of the animal protein requirements of the people are met by fish alone. The per capita consumption of fish in the State has increased from 18.71 kg (2000) to 24.85 kg (2015) against the national average of 3.5 kg.
5. Fishing is one of the major industries in maritime districts of Kerala. The state has a fishermen population of 10.24 lakh who resides in 222 marine fishing villages and 113 inland fishing villages. Out of this, 1.84 lakh fishermen are actively engaged in fishing. The industry also provides

employment for about 1.64 lakh people engaged in fishery allied sectors such as peeling processing, curing and drying, marketing and distribution of fish. Of this only 0.77 lakh are registered with Matsya board. There are 749 fishery co-operatives functioning in the State. The industry serves as an important employment generator as it supports various processing establishments, net making units and boat building yards, ice plants, freezing plants and transportation services. It is estimated that the fisheries sector as a whole has the potential to generate employment to the tune of 566 lakh man days per year.

6. Despite rapid growth in mechanization, average annual catch in Kerala is only 500 Kg per person, compared to national average of 2000 Kg. Low catch per unit effort due to continued over exploitation has reduced the income from fishing drastically and marginalised the fishermen from the mainstream communities in Kerala.
7. While considering the fishermen community, it is never an exaggeration to say that they are one of the most economically and socially backward communities. Only about one-fourth of them possess fishing implements of any kind. The rest, work for others who own the fishing implements. Fishermen are also under the clutches of middlemen. Socio-economic development refers to the increase in the per capita income along with enhancement of living standard. Economic growth would invariably reflect in the social status of the community. Contrary to that, in the case of fisherman, even though introduction of mechanized boats have increased fish production and brought more money, it did not percolate into the hands of the traditional fishermen community. Instead, it has put them into a more pathetic condition by forcing over exploitation of natural resource for more profit. The social standard of living didn't show any appreciable improvement. It was due to the fact that, fisherman had been exploited by middle men. Hence, the future intervention in fisheries sector should not only increase fish production, but also ensure that the benefits reach the traditional fishermen. The economic upliftment of fisherfolk is invariably correlated with fish catch and the value realized. This in turn are functions of technological status, beach price of fish, number of effective man days of fishing and the cost of fishing especially the price of fuel.
8. The density of population in coastal Kerala is 2,168 persons per sq km, whereas the state average is only 859 persons per sq km. In addition to gaining of money, poverty is often related to the feeling of lack of power and ownership of resources. Important measurements of poverty include expenditure on consumption, status of health, literacy, status of employment, and the condition of housing and sanitation facilities. An integrated approach is imperative for improving the socio economic conditions of the fishermen and improving coastal infrastructure.
9. World over, the capture fisheries from the open waters is either stagnating or declining due to many reasons like habitat loss and degradation by anthropogenic impacts, over-exploitation and irresponsible fishing activities etc. The impressive increase in fish production achieved by the country over the last fifty years is attributed to aquaculture. In future too, any increase in fish production has to come from aquaculture. Due to pressure on land and water from other sectors, the focus of the country is on promoting mariculture and vertical expansion of freshwater as well as coastal aquaculture. People of Kerala prefer marine and brackish water fishes. All the fish species relished by Keralites are presently being sourced from capture fisheries. Therefore, there is a need to focus on producing these fishes under aquaculture regimes in order to meet the prospective demands.
10. Food quality will have a more pivotal role as food resources come under greater pressure and; the availability and access to quality fish supplies will become an increasingly critical development issue.

11. Climate change has direct bearing over fisheries sector through multiple channels, including movement of people to coasts, impacts on coastal infrastructure and living space and through more readily observed biophysical pathways of altered fisheries productivity and availability. Indirect changes and trends may interact with, amplify or even engulf biophysical impacts on fish ecology. Temperature is known to affect fish distribution and migration. The combined effect of changes in distribution, abundance and physiology may reduce the body size of marine fishes, particularly in the tropics. The increase in temperature further increases the rising of sea level. The raising of sea level may be variable depending upon the characteristics of the coast such as geomorphology, slope and the variability of marine processes such as wave and tide along the coast. In the coastal front awareness of the fisherfolk to climate change is low and they are not adapted for the change in the environment.
12. With marine fish catch stagnating and inland sector not taking off in a big way, Kerala's pre-eminence in the fisheries sector is slowly diminishing. Kerala's fish processing industry is still dominated by shrimp and the capacity utilization is estimated to be about 20%. Shortage of raw materials is one of the reasons for low capacity utilization. Considering the importance of fisheries in Kerala's economy, rejuvenation and modernization of the sector are vital for the state.
13. The approach to 13th Plan should have twin objectives viz., (a) nutritional security of the population through enhancing fish production even while ensuring sustainability of resources and (b) improving the socio-economic condition and quality of life of fisherfolk.

CHAPTER 2
REVIEW OF 12TH FIVE-YEAR PLAN SCHEMES

14. The objective of 12th plan in Marine fisheries was to ensure sustainable growth of fish and fisheries for nutrition, food security and economic growth by ensuring proper utilization of infrastructures created in the last plan. The total outlay provided for fisheries sector in the 12th year plan is Rs 1815.16 crore. It includes the Rs 126.10 crore earmarked under RIDF and Rs 200 crore under FCA. The sector wise allocation is detailed in table 1.

Table 1 Sector wise allocation for 12th Plan in rupees crore

SI No	Item	Amount
1	Marine fisheries	23.16
2	Inland fisheries and aquaculture	146.96
3	Value addition & Marketing	14.50
4	Social security	137.38
5	Coastal infrastructure development	610.60
6	Socio-economic development of Fisherfolk	151.65
7	Good governance & service delivery	18.33
8	Rural Infrastructure Development Fund	126.10
9	Finance Commission Award	200.00
10	Development of Fishing harbour	240.48
11	Fisheries and ocean studies University	116.00
12	Other	30.00
Total		1815.16

Table 2 Outlay and Expenditure for the plan schemes during 12th Plan

Year	Outlay (in Crore)	Expenditure (in Crore)	%
2012-13	273.61	230.30	84.17
2013-14	299.04	242.70	81.16
2014-15	367.28	252.15	68.70
2015-16	444.94	428.95	96.40
2016-17	430.29		
Total	1815.16		

Overview of Finances

State Plan

15. During the first four years of the 12th Plan, the total outlay provided for schemes in the sectors Fisheries and Coastal Area Development is Rs 1054.59 Crore. The expenditure reported is Rs 910.56 Cr, which is 86.34 % of the outlay. Total allocation during the first four years in Fisheries sector was 655.60 cr and the expenditure reported is Rs 563.21 cr which is 85.91 % of the outlay. Under CAD during the reference period, Outlay was Rs 398.99 cr. Expenditure reported is Rs 347.34 cr, which is 87.06 % of the outlay. Year wise outlay and expenditure is provided in table 3.

Table 3 Total Fisheries Outlay and Expenditure in rupees crore

SI No	Year	Plan Outlay	Expenditure	% Exp
1	2012-13	14200	13792.11	97.12
2	2013-14	15780	13563.19	85.95
3	2014-15	17740	14679.32	82.74

4	2015-16	17840	14286.84	80.08
	Total	65560	56321.46	85.91

Table 4 Total Coastal Area Development Outlay And Expenditure

SI No	Year	Plan Outlay	Expenditure	% Exp
1	2012-13	64	48.69	76.08
2	2013-14	58	48.75	84.05
3	2014-15	87	47.72	54.85
4	2015-16	189.3	202.17	106.80
	Total	398.3	347.33	87.20

16. It is clear from the table that CAD has been given greater prominence in the recent years. Accordingly, outlay to that sector has seen a larger increase. In 2015, the outlay to CAD was greater than that of fisheries sector.

Table 5 Department wise Outlay and Expenditure for above Sectors

Sector	2012-13		2013-14		2014-15		2015-16		Grand Total		% Ex P
	Bud get Outlay	Expend iture	Bud get Outlay	Expend iture	Bud get Outlay	Expend iture	Bud get Outlay	Expend iture	Total Outlay	Total Expend iture	
Fisheries	100	10378.65	108	9095.9	122	11691.40	120	8953.8	452	40120.37	88.69
Fisheries and Ocean Science University	120	1200.00	200	1442.60	270	500.00	270	1406.05	860	4548.65	52.89
HED	293	2213.45	292	3024.69	280	2487.50	306	3926.98	117	11652.23	99.40
TOTAL FISHERIES + HED+KUFOS	142	13792.1	157	13563.2	177	14679.40	178	14286.86	655	56321.60	85.91
Total Coastal Area Development	640	4869.27	583	4875.83	872	4772.37	189	20217.21	398	34734.99	87.06
Grand Total (Fisheries + Coastal Area)	206	18661.35	216	18439.15	264	19452.67	367	34504.07	105	91056.459	86.34

17. Basically there are 3 Departments which are involved in the implementation of works under these two sectors. They are the Fisheries Department, Harbour Engineering Department and KUFOS.

However, including these 3 departments, there are a total of 8 agencies involved in the implementation of schemes. Agency wise outlay and expenditure are provided in the table 6

Table 6 Implementing Agency wise - State Plan

S l N o	Implem enting agency	2012-13		2013-14		2014-15		2015-16		Total		%
		Outla y	Exp .	Outla y	Exp .	Outla y	Exp .	Outla y	Exp .	Outla y	Exp .	
1	Fisherie s Depart ment & KSCAD C	7285. 66	7968. 08	8625. 00	7045. 78	9385. 85	7880. 86	1028 3.65	5419. 54	3558 0.16	2835 0.27	79. 68
2	ADAK	974.3 4	752.0 0	475.0 0	449.4 1	1139. 15	318.4 0	507.3 5	472.8 7	3095. 84	1992. 68	64. 37
3	SAF	815	400	500	500	500	400	300	300.0 0	2115	1600	75. 65
4	MATSY AFED	820.0 0	961.5 5	1020. 00	800.0 0	720.0 0	2657. 04	520.0 0	2051. 91	3080. 00	6470. 50	210 .08
5	KUFOS	1200	1200. 00	2000	1442. 6	2700	500.0 0	2700	1406. 05	8600	4548. 65	52. 89
6	HED	2935	2213. 46	2920	3024. 69	2800	2487. 53	3068	3926. 98	1172 3.00	1161 6.66	99. 09
7	KAVIL	0	0	0	0	0	0	0	256.7 2	0	256.7 2	
8	KFWFB	170	296.9 9	240	300.7 1	495	435.4 9	461	452.7 9	1366	1485. 98	108 .78
Total		1420 0.00	1379 2.08	1578 0.00	1356 3.19	1774 0.00	1467 9.32	1784 0.00	1428 6.86	6556 0.00	5632 1.46	85. 91

18. Total outlay provided under the two sectors includes funds from various sources. Apart from free plan allocation it includes funds under RIDF, State share to CSS, State share to NCDC, ACA and 13th FC Award. Source wise allocation to each of these sectors is provided in the tables below 7

Table 7 Source wise Fisheries

Scheme	2012-13		2013-14		2014-15		2015-16		Grand Total		%
	Bud get Outl ay	Expen diture	Bud get Outl ay	Expen diture	Bud get Outl ay	Expen diture	Bud get Outl ay	Expen diture	Tot al Out lay	Total Expen diture	
State Plan	645	4415.4	655	5632.6	687	4699	718	7539.4	270	22286.	82.3
free Plan	0		0	6	5		7	3	62	5	536
RIDF	600	1111.8 3	180	2268	200	1222.1	220	1991.9 0	660 0	6593.8 5	99.9 068
State share to css	160 0	2627	228 0	2516	321 5	3063	321 5	3640.0 4	103 10	11846	114. 899
State share to NCDC	150	316.55	150	150	150	2124.7	150	1115.4 6	600	3706.7 1	617. 785
ACA	400	400	0	0	500	400	88	0	988	800	80.9 717

13TH Finance Commission Award	500	4921.3	500	2996.5	500	3170.5	500	0	200	11088.	55.4
	0		0	3	0		0		00	3	417
Total	142	13792.	157	13563.	177	14679	178	14286.	655	56321.	85.9
	00	08	80	2	40		40	86	60	5	083

19. Expenditure is often correlated to the actual receipt and release of funds from various sources. Highest expenditure in real terms has been under the free plan. It is followed by those for CSS Schemes and then 13th FC Award. Discontinuation of 13th FC Award has serious implications for the sector.

Table 8 Source Wise Coastal Area Development

Scheme	2012-13		2013-14		2014-15		2015-16		Grand Total		% Expr.
	Budg et Outlay	Expr.	Budg et Outlay	Expr.	Budg et Outlay	Expr.	Budg et Outlay	Expr.	Total Outlay	Total Expr.	
State Plan	5300	4869.27	5035	4378.16	8197	4242.3	1819	17690.92	3672	31180.7	84.89
RIDF	1100	0	800	497.67	530	530	740	2526.29	3170	3553.96	112.11
Total	6400	4869.27	5835	4875.83	8727	4772.3	1893	20217.21	3989	34734.6	87.06

20. Much of allocation under CAD is under free plan. The ratio of funds under RIDF to that under Free Plan has fallen over the years.

Central Assistance under CSS Schemes and NCDC

21. A total of 25 CSS Schemes were in operation during the reference period of which 17 of them were for improving the fisheries infrastructure of Harbours and FLCs. CSS Schemes included those that received 50%, 75% and 100% central funding. Only one scheme namely NCDC assisted IFDP received NCDC funding. Details are provided in the table below 9.

Table 9 Central assistance under CSS Schemes and NCDC

S I N o	Scheme	2012-13		2013-14		2014-15		2015-16		Grand Total	
		Bud get Outlay	Expendi ture	Bud get Outlay	Expendi ture	Bud get Outlay	Expendi ture	Bud get Outlay	Expendi ture	Tot al Outlay	Total Expendi ture
1	100% CSS	228	2046.99	337	2939.24	423	4103.38	403	4210.22	139	13299.8
		0		5		0		8		23	3
2	50% CSS	840	2415.02	115	1597.92	181	1660.00	187	2091.37	568	7764.31
				5		5		9		9	
3	Total CSS	312	4462.01	453	4537.16	604	5763.38	591	6301.59	196	21064.1
		0		0		5		7		12	4
4	NCDC	180	1633.45	180	1735.5	180	0	180	1800	720	5168.95
		0		0		0		0		0	

Total	492 0	6095.46	633 0	6272.66	784 5	5763.38	771 7	8101.59	268 12	26233.0 9
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Analysis of Major Schemes

Marine Fisheries

Conservation and Management of Fish Resources (Marine)

22. Over exploitation of resources and juvenile fishing were the major challenges in the marine sector of Kerala during the 12th plan period. Minimum legal size of 14 commercially important species was notified under KMFR Act to prevent juvenile fishing. Besides, 47 days of trawl ban was continued from 14th June to midnight of 31st July of every year to protect and enhance the fisheries resources of the state. However, it is found that the marine catch has declined drastically due to inefficient surveillance mechanism. Steps have been taken during 2016-17 to improve the situation. During the plan period new 4 fisheries stations at Thottapally (Alappuzha), Azheekode (Thrissur), Ponnani (Malappuram) and Kasargode were envisaged. The construction work was entrusted to KSCADC, but they are yet to be complete.
23. Overfishing in territorial waters has led to decreased availability of fish in that region. The fishermen are forced to go deeper into the sea for their livelihood, and this increases the casualties in the sea. The search and rescue operation in the entire territorial waters is being conducted in co-ordination with Indian Coastal Guard and Indian Navy. The bases of rescue operations are 5 Fisheries stations at Vizhinjam, Neendakara, Vypin, Bepore and Kannur. The operational areas of these fisheries stations are the entire territorial waters adjoining to the respective coast line. The details of sea patrolling, rescue operations and fishermen live saves are detailed in the table 10.

Table 10 Details of Sea patrolling, Rescue operations and Fishermen live saves

Year	Patrolling Conducted	Sea rescue operations	Fishermen lives saved	Violation of KMFR Act reported
2012-13	1002	485	3365	52
2013-14	1230	438	4016	81
2014-15	1078	271	2676	68
2015-16	963	342	2384	114

24. Under the scheme, there is a component for the establishment of artificial reef by the placement of 120 trapezoidal RCC modules for the replenishment of marine stock. During the 12th five year plan period, one unit each was established off the coast of Adimalathura and Mariyanad. An underwater video documentation has been taken and it is ascertained that the project is a successful model for the replenishment of marine stock.

Table 11

Head of account 2405-00-103-91	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budget outlay	100.00	150.00	200.00	325.00	775.00	380.00
Expenditure	152.41	149.98	179	324.98	806.37	

Suitable Components of Fishing Gear

25. The scheme suitable components of fishing gear envisages assisting the traditional fishermen for the purchase of fishing gear to be used in their crafts, by passing on a subsidy limited to the cost or Rs 6,000/- whichever is less. Under the scheme fishermen who own crafts fitted with the outboard motors below 10 HP only are eligible for this subsidy. The assistance will be given only once to a fishermen. Till 2015-16, a total of 2,832 beneficiaries were assisted under the scheme.

Table 12

Head of account 2405-00-103-87	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	50.00	50.00	50.00	50.00	200.00	50.00
Expenditure	50.00	50.00	20.00	50.00	170.00	
Beneficiary assisted	833	833	333	833	2832	

Modernisation / Motorisation of Country Crafts (50% CSS)

26. The scheme is for providing subsidy for kerosene driven, Out Board Motors of below 10 HP. The main objective is to motorize the traditional craft with a subsidy of Rs 10,000/- per unit. The subsidy will be available to only existing units and those constructed in replacement of existing units. Subsidy will be shared equally between the centre and the state. This scheme was implemented during the financial years 2012-13 and 2015-16. Physical achievement is 400 no per year. A total of 800 traditional fishermen who had craft fitted with OBM below 10 H.P. have benefited for the purchase of suitable components of fishing gear.

Table 13

Head of account 2405-00-800-09	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	40.00			40.00	80.00	20.00
Expenditure	40.00			40.00	80.00	
Beneficiary assisted	400			400	800	

Deep Sea Fishing and Sea Safety Equipments

27. Under development of deep sea fishing, sophisticated equipments for line fishing have to be given to the traditional fishermen. The scheme also seeks to provide subsidy on the distribution of sea safety equipments such as VHF Marine Radio, GPS, echo sounder, life jacket etc. The physical target was to provide sophisticated deep sea fishing equipments to 248 fishing units. But, it was not implemented due to administrative delay. Implementation of the scheme is expected to complete by the end of the year 2016.

Table 14

Head of account 2405-00-103-79	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17

Budgeted amount	50.00	50.00	50.00
Expenditure	Nil	Nil	

Subsidy for Diesel Engine

28. In the 12th plan, in order to reduce fuel cost and increase fuel efficiency, it was envisaged to fit the existing boats with inboard diesel engine with Z drive, which facilitates beach landings. During the financial year 2013-14, an amount of Rs 100 lakh was provided to the Matsyafed under the head of account 2405-00-103-89 for implementing the programme. Out of the targeted 100 units, 45 units were commissioned. The project could not be implemented fully due to lack of takers, as the new engine has less speed than the existing one.

Modernization of Net Factory

29. The component is envisaged for replacing the old machineries of net factory at Ernakulam. An amount of Rs 500 lakhs has been budgeted under the head of account 4405-00-195-95 during the year 2015-16 and the same was utilized completely.

Strengthening of Database and Geographical Information System (100% CSS)

30. It is a central sector scheme to assess the fish landings in the state by the Fisheries department based on the methodology developed by CMFRI and CIFRI.

Table 15

Head of account	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
2405-00-101-57						
Budgeted amount		2.81	30.00	30.00	62.81	48.00
Expenditure		2.81	20.15	31.45	54.41	

Inland Fisheries and Aquaculture

Farms, Hatcheries, Fish Health, Aquaria

31. Seed production plays a key role in the development of aquaculture sector. To ensure the availability of quality seed for culture, the state has given adequate importance to the farms and hatcheries in the state. The state faces acute shortage of fish seed to meet even the existing demand. Hence strengthening of infrastructure in the existing seed production centres was highly essential. Six farms were given assistance for improving the infrastructure facilities and the works are in progress. In order to increase the seed production capacity in the existing hatcheries, additional facilities were created. The fish seed production capacity is enhanced from 200 lakh to 362 lakh by last year. The physical achievement in seed production is given Table 16.

Table 16 Physical Achievement in Seed Production

Description	Seed production (in Lakh Rs)				
	Capacity	2012-13	2013-14	2014-15	2015-16

Fish seed	200.00	148.30	116.20	160.02	163.80
Shrimp seed	130.00	31.60	93.50	112.00	122.00

32. Aquatic animals are more vulnerable to diseases compared to plants and terrestrial animals. Disease outbreak often destroys the entire crop of aquaculture. Hence a well-equipped Disease monitoring and Diagnosing Centre is essential. One Aquatic Animal Health Lab was proposed in the Central part of Kerala. Aquatic Animal Health Lab and Environment Management Laboratory are being established through ADAK at Thevara (Ernakulam). The work is progressing and will be completed by 2016-17.
33. Aquaria provide entertainment as well as information at the same time. It is highly essential to have aquaria of varied styles in different parts of the state to provide information and develop interest in the aquatic environment among the public, especially in children. Along with the information dissemination it provides opportunity for revenue generation. Accordingly, two aquaria at Malampuzha and Odayam were planned during the plan period and they have been commissioned successfully. KAVIL, a new organization established for the augmentation of ornamental fisheries has failed in obtaining its goal due to administrative reasons.
34. Aqua museum is a concept depicting the aquatic life and fisheries heritage of Kerala. Kerala has a long tradition in Fisheries due its close proximity to sea and immense inland water resources. As a result there are a number of fishing implements and traditional knowledge in fishing methods which were evolved over the years. An Aqua Museum capturing this information was conceived as a part of the Neythal fishing village in Poyya (Thrissur). However, the project could not be commissioned due to poor quality civil works undertaken by the Habitat technology group.

Table 17

Head of account 2405-00-101-87 4405-00-101-95	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	300.00	269.54	700.00	600.00	1869.54	1599.00
Expenditure	187.98	269.54	689.51	599.20	1746.23	

Matsyasamridhi

35. Matsyasamridhi phase I was implemented during the first 3 years of the 12th Plan. Considering the successful implementation, Matsyasamridhi phase II has been launched from 2015-16. Aquaculture production has increased from 20,000 MT to 40,000 MT. Under the project 12,000 ha of area owned by 60,000 farmers belonging to 750 LSGIs were brought under fish culture. Aquaculture training was also provided to 20,172 new fish farmers.

Table 18

Head of account 2405-00-101-61 2405-00-101-56	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	400.00	400.00	400.00	963.00	2163.00	1950.00
Expenditure	400.00	400.00	400.00	963.00	2163.00	

NFDB Assisted Inland Aquaculture (CSS)

36. Future requirement of quality protein can be met only from Aquaculture. Hence to meet the growing demand, production from this sector has to be increased. Normally this can be done by expanding the area under cultivation. Thus area suitable for fish culture, which were unutilized were identified and brought into cultivation with the help of local bodies. In a state like Kerala, where land usage is a sensitive issue, this is an important activity. An area of 5695 ha was brought into the purview of aquaculture during the plan period.
37. With the increase in the area under fish culture, the production from the aquaculture sector has improved. Along with this introduction of new varieties of fish in the farming sector, promotion of new methods of culture like cage farming, pen culture, Recirculatory aquaculture systems etc., has played a major role in increasing the fish production in the state. The farmers were also given training and field exposure to familiarize with these new practices.

Table 19

Head of account 2405-00-101-66	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	800.00	800.00	800.00	400.00	2800.00	400.00
Expenditure	800.00	800.00	800.00	300.00	2700.00	

Model Fish Farms and Innovative Aquaculture Practices Farms (one time ACA)

38. The fish consuming population of Kerala has an inclination towards marine fishes. But over the years, the production from aquaculture is centred on Major carps due to relative ease in the availability of seed. Low preference for inland fish results in less income to the farmers. The concept of Model fish farms was introduced in order to start the culture of preferred fish varieties of marine and brackish water origin, and to encourage enterprising farmers. The main objectives were to introduce new species in aquaculture scenario of Kerala, establish model farms for specific pathogen free *Litopenaeus vannamei*, Polyculture of Brackish water fishes, cage farming of marine fishes like Seabass, Cobia, Pompano, and Red snapper etc. in coastal waters. Monoculture of catfishes, like *Pangassius*, *Clarius*, *Heteropneustes* etc. were also envisaged in this project. Farming of genetically improved varieties of *Tilapia*, *Jayanthi Rohu* is also done. The project was implemented through ADAK and is identified as one of the most successful project in the fisheries sector. Under the project 7 demonstration units were established for the dissemination of innovative technologies of aquaculture. An amount of Rs 500 lakh was budgeted under the head of account of 2405-00-101-58 for the same, but only Rs 50 lakh was expended due to non-release of fund by Government of India.

Integrated Farming

39. The low lying areas near the coastal zone in the state offer perennial source of water which is ideal for fish culture. This area is also very fertile making it suitable for paddy. Integration of paddy and fish was being practiced in these regions on a rotation basis for a long time. When water level comes down paddy is cultivated and when it goes up, paddy is harvested and fish culture is done. The project envisages development of Fish/ Scampi/ Shrimp farming in rotation with paddy in Pokkali lands of Alappuzha and Ernakulam, Kole lands in Thrissur and Kaipadu lands of Kannur in Kerala. The beneficiaries of the project are the respective Padasekhara samithies, Group farming members,

Cooperatives and individual farmer owners taking land for lease. 'One paddy one fish' scheme is done in Kuttanad in Pokkali fields and in Kole lands. Rice cum shrimp farming was done in Kaipadu lands. During the plan period an area of 1550 ha area has been brought under fish culture. The project was discontinued after the first three years to avoid the possibility of duplication of subsidy and dual pattern of assistance with Matsya samridhi project.

Table 20

Head of account 2405-00-101-71	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	400.00	400.00	400.00	Nil	1200.00	Nil
Expenditure	400.00	400.00	200.00	200.00	1200.00	

Conservation and Management (Inland Fishing)

40. The component was envisaged for the conservation-cum-replenishment of inland fish resources and management of inland fishing. The studies on the impact of ranching of fish and prawn seed to the open water bodies revealed that it augmented the fish production through inland capture fisheries. During the period 5 protected fish sanctuaries/ protected breeding habitats has been established to restore the depleted indigenous fish wealth of the state and also to help in the sustainable productivity of the aquatic environmental systems. Afforestation has been done by planting saplings of native mangrove species in the western part of Ashtamudi Lake. Back water patrolling has been conducted to ensure the adherence to Inland Fisheries Act and Rules.

Table 21

Description	2012-13	2013-14	2014-15	2015-16
Back water patrolling conducted	266	173	228	167
Fish/Shrimp seed ranching in lakh	210.09	210.0	325.65	31.59
Fish sanctuary		2	3	

Table 22

Head of account 2405-00-101-62	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	200.00	200.00	250.00	265.00	915.00	150.00
Expenditure	154.87	172.06	249.99	264.87	841.79	

Compensation to Fishermen for the Removal of Licensed/ Unlicensed Stake/ Chinese Nets

41. The National waterway III is an inland waterway declared on 1.2.1993. It has a length of 205 kms from Kollam to Kottappuram. In order to facilitate smooth passage of crafts through this pathway, it was decided to remove the existing fixed fishing gears in the pathway by giving adequate compensation to the affected fishermen. This compensation issued on humanitarian ground helped them to find alternate livelihood. Consequently, 969 fixed nets affecting the transport were removed from the waterway from the districts of Kollam, Alappuzha, Kottayam and Ernakulam. An expenditure of Rs 1199 lakh has been budgeted during 2013-14. Works have been completed.

Value Addition and Marketing

42. A component on modernisation of fish markets to provide hygienic basic infrastructure facilities has been implemented in the period by exploring the possibility of 90% grant from NFDB. Facilities like auction floor, chilled/frozen storage facilities, approach road; parking spaces etc were included for

whole sale marketing. Sufficient number of stalls with display area, cutting & cleaning area, storage area, continuous supply of water, sanitary wares, ETP, waste utilization facilities etc were ensured in Retail markets. Provision of bathing facility in fish markets was also explored.

43. Out of the targeted 18 fish markets, 16 were completed. Construction of 2 Modern Hygienic fish market at Poovachal in Trivandrum district and Kodimatha in Kottayam district is nearing completion. Availability of quality fish in a quality ambience is the dictum of every new market constructed. Moreover construction of these markets has created a positive change in the mind of the people about the mode of fish selling. The performance of some of the fish markets have not improved due to the lack of training to the stakeholders and institutional mechanism, which were already envisaged by NFDB.
44. During the financial year 2014-15, sanction was accorded for the establishment of Fish maid premium Outlets for Value added fish products. The project envisages establishment of 8 Nos. of premium outlets for value added fish products in selected locations. The premium outlet is designated as a quick service restaurant which offers all the 25 value added fish maid products introduced by KSCADC. But, only one outlet could be established. The only outlet at Kochi is not working properly now.
45. During the financial year 2014-15, sanction was accorded for the construction and establishment of a common processing centre at Azheekkal, Kannur which meets the latest fish processing standards for fish processing. The project components of fish processing centre include a fresh fish unit, a solar fish dry unit and value added fish production unit. It will act as a common facility centre for value addition and scientific processing. The civil work for the construction of fish processing centre at Azheekkal has been initiated.
46. During the financial year 2014-15, sanction was accorded for the establishment of a fish mall with facilities like fresh fish outlets, outlets for dry fish products, cafeterias with ready to fish products, shops for aquarium accessories etc. Accordingly a suitable building space has been identified in the heart of the Trivandrum city. The work for the setting up of the mall has also been started.

Table 23

Head of account 2405-00-105-96	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	300.00	250.00	250.00	250.00	1050.00	400.00
Expenditure	53.00	250.00	249.80	68.18	620.98	

Social Security Schemes

Savings cum Relief Scheme to Fishermen (50% CSS)

47. The scheme is intended to provide off season relief to fishermen (Marine & Inland). An amount of Rs 900 is collected from the fishermen in 9 instalments and an income support of Rs 2700 is provided to fishermen in 3 instalments during lean months. The scheme continuously supports the fisherman in enhancing money saving habits. The outlay provided is for meeting the state share of the expenditure under the scheme.

Table 24

Head of account 2405-00-800-75	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	2000.00	2041.58	2118.00	3282.00	9441.58	2600.00
Expenditure	2152.90	2041.57	2118.00	3281.00	9593.47	
No.of fishermen assisted	169,619	176,499	182,843	183,851		

Group Insurance Scheme for Fishermen (50% CSS)

48. Active Fishermen and allied workers in the State are insured by the Kerala Fishermen Welfare Fund Board (KFWFB). The government bears the premium amount. The scheme is for insurance to fishermen against accident death, heart attack (while fishing at sea), missing, permanent and partial disability. The premium fixed by GOI is Rs 20.27 and GOI reimburses only 50% of Rs 20.27 per beneficiary. The balance amount has to be met by the state government. Out of the total outlay, a part is provided for the 50% state share of the scheme under GOI guidelines and the remaining amount is provided for supplementing the scheme under state plan. On an average, each year about 2.35 lakh fishermen and around 80 thousand allied fish workers have been insured.

Table 25

Head of account 2405-00-800-82	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	200.00	364.24	690.00	154.00	1408.24	154.00
Expenditure	364.05	364.24	616.00	154.00	1498.29	
2405-00-103-78						
Budgeted amount				238.60	238.60	345.00
Expenditure				238.59	238.59	
2405-00-800-50						
Budgeted amount	30.00	118.59	127.49	137.20	413.28	137.00
Expenditure	114.96	118.59	127.49	137.20	498.24	

Table 26

Year	No of fishermen insured	No of allied fish workers insured
2011-12	238466	71628
2012-13	234779	74319
2013-14	234904	76480
2014-15	236310	79346
2015-16	237501	82000

Coastal Infrastructure Development

Housing Scheme Assisted by National Fishermen Welfare Fund (50% CSS)

49. The programme is meant for providing housing to fishermen. The unit cost per house fixed by GOI is Rs 75000/- The State Government have enhanced the unit cost to Rs 2 lakh. The amount is given

to the beneficiary as 100% grant. Hence the State has to meet Rs 1, 62,500 lakh per house and the GOI share will be Rs 37,500. Out of the total outlay, a part is provided for the 50% state share of the scheme under GOI guidelines and the remaining amount is provide for implementing the Housing scheme in the enhanced rate of Rs 2 lakh per house to supplement the central share. During the first 4 years of 12th plan, 2400 nos of house were constructed under this scheme.

Table 27

Head of account 2405-00-800-86	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	1400.00	400.00	400.00	600.00	2800.00	1000.00
Expenditure	1376.25	399.50	400.00	Nil	2175.75	

Table 28

Head of account 2405-00-103-88	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount		800.00	1200.00	1000.00	3000.00	1000.00
Expenditure		800.00	1200.00	628.90	2628.90	

Integrated Development of Fishing Villages

50. The scheme is for the integrated development of fishing villages of the coastal region of the State in an integrated manner by addressing the issues related to scarcity of safe drinking water, electrification, sanitation, library support and livelihood. Based on the report prepared by the National Institute of Rural Development (NIRD), Kerala State Coastal Area Development Corporation Limited, had conducted a survey in the coastal areas. It had mapped out the most backward fishing villages in Kerala. The 25 fishing villages selected during 2012-13 are Vettoor, Vizhinjam, Puthukurichy, Poonthura and Paruthiyoor of Trivandrum district, Shakthikulangara and Thankassery in Kollam district, Arthungal, Pallithode, Kattoor and Purakkad in Alappuzha district, Kumbalam, Pallippuram, Vadakkaekkara and Udayamperoor in Ernakulam district, Venkidengu and Kadappuram in Thrissur district, Paravanna and Ariyalloor in Malappuram, Elathur and Koilandy in Kozhikkode, Chalilgopalpetta in Kannur district, Kottikulam and Bengara Manjeswaram in Kasargode district.
51. During the financial year 2013-14, another 20 fishing villages were selected for addressing the components like drinking water, power supply, sanitation, library support and livelihood support. The fishing villages selected were Valiaveli, Adimalathura, Kannathura and Thumba in Trivandrum district, Neendakara, Muthakara and Eravipuram in Kollam district, Arattupuzha and Punnapra in Alappuzha district, Edavanakkad and Manassery in Ernakulam district, Anappuzha and Blangad in Thrissur district, Thanur and Parappanangadi in Malappuram district, Vellayil in Kozhikkode district, Azhikkode and Thayyil in Kannur district and Shiriya and Valiyaparamaba in Kasargode district.
52. During the financial year 2014-15, another 12 fishing villages were selected for addressing the components like drinking water, power supply, sanitation, library support and livelihood support namely Chilakkoor, Pallithura, Mampally in Trivandrum district, Alappad, Thekkumbhagom/Thevalakkara in Kollam district, Vaikom in Kottayam district, Vadanappally in Thrissur district, Madappally in Kozhikkode, Koottayi in Malappuram district, Edakkad in Kannur district, Kasaba and Koippady in Kasargode district . Component wise progress under the scheme is shown in the table 29.

Table 29 Component wise progress under the scheme

Component	Sanctioned	Completed	Ongoing	Not started
Drinking Water	53	31	12	10
Electrification	57	39	10	8
Public Toilet	35	15	4	16
Library Support	32	20	3	9
Aerobic bin/ Biogas plant	2		1	1
High mast lights	104	82	22	
Fish market	1			1
Individual toilets	3525	806	-	-
Fibre Cattamaram	1940	757	-	-
Drying platform	1	1		

53. The drinking water projects and electrification schemes are being implemented through line departments like Kerala Water Authority and Kerala State Electricity Board. All other projects are directly executed by KSCADC. Out the projects sanctioned under the scheme 10 drinking water projects, 8 electrification projects, 16 public toilet and 9 library construction, 1 biogas plant and 1 mini fish market constructions were not started due various reasons like delay in demolition of existing dilapidated buildings and handing over of the proposed site by the concerned department/LSGI, lack of source for drinking water, delay in getting CRZ clearance etc.
54. By the successful implementation of the above components, the acute drinking water scarcity, lack of proper electrification, lack of Sanitation facility, poor livelihood support activities etc are expected to be addressed efficiently in the selected 57 fishing villages of the State. More than 5 lakh fishermen have been directly benefitted under the scheme.
55. "Safe dwelling to landless fishermen" was a component under the scheme which envisaged providing individual flat units to 450 fishermen family who are both landless and homeless. As a first phase, 8 No of flats were constructed and were handed over to the landless homeless beneficiaries of Valiyathura fishing village. The unit cost of a flat is Rs 6.50 lakh. Each individual flat consists of a bedroom, a study room, a hall, a kitchen and a toilet. However, there was not much progress later.
56. Besides, there was another component implemented directly by the department. The component sought to provide financial assistance to the fishermen for house construction, house repair and toilet construction. Physical and financial details are given in the tables 30 & 31.

Table 30 Physical and Financial details

Particulars	Target	Achievement
House construction	1800	1800
House repair	1000	1000
Sanitary toilets	2857	2857

Table 31

Head of account 2405-00-800-89	Amount allotted in 12th Five year plan (in Lakh Rs)				
	2012-13	2013-14	2014-15	2015-16	Total
Budgeted amount	5000.00	5000.00	7797.00		17797.00
Expenditure	4569.27	4378.32	4242.73	1644.00	14834.32

Basic Infrastructure Facilities and Human development of Fisherfolk

57. To address the overall backwardness of the fishermen community and to upgrade the infrastructure facilities of the coastal area, a new scheme was introduced under coastal area development during 2014-15 viz. Basic infrastructural facilities and Human development of Fisherfolk. The scheme was for ensuring the overall development of the fisheries sector focusing on Housing (includes construction of individual houses and flats with land acquisition cost), sanitation, drinking water, electrification, renovation of houses, libraries, diversification of employment activities integrated with Theeramythri program, improvement of health infrastructure in coastal area, completion of ongoing fishing harbours and renovation of fish seed farms and hatcheries excluding coastal roads. This scheme was continued during the year 2016-17. Physical and financial details are given in the table 30 & 31.

Table 32 *Physical and Financial details*

Name of Component	Target	Completed	Ongoing	Not started
Education Infrastructure	19		5	14
Health Infrastructure	7		3	4
Anganvadi	4	2	2	
Library	2		1	1
Public toilet	1			1
Canal renovation	1	1		
Livelihood support	1		1	
Drainage	1			1
New house construction	4490	3688	802	
House repair	3800	3313	487	
Toilet	3600	3300	300	

Table 33

Head of account 2405-00-103-80 4405-00-103-93	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount				16553.00		17910.00
Expenditure				16046.90		

Finance Commission Award

58. The 13th Finance Commission had recommended a grant- in –aid of Rs 200 crores for the fisheries sector during the award period 2010-2015. The components in Model fishing village include construction of houses, drinking water supply, sanitation, electrification, fisheries infrastructure and social infrastructure. The infrastructure projects were implemented through Kerala State Coastal Area Development Corporation.
59. The project envisages two drinking water supply schemes at Valiyathura, Beypore and Marad fishing villages, electrification schemes at Valiyathura and Beypore fishing villages, construction of building for Valiyathura public health centre, Construction of Angnavadis at Valiyathura, Construction of fisheries roads at Valiyathura and Beypore, Construction of new building for GHSS, Beypore and high mast light installation at Valiyathura, Beypore and Anappuzha. The drinking water supply scheme and electrification at Beypore fishing village is completed and commissioned. The work was implemented through KWA and KSEB respectively.

60. Infrastructure development for the Fisheries hospital at Valiyathura is successfully completed and handed over. The overall facelift of the hospital has resulted in attracting more number of patients from seeking health care facilities from the particular hospital. New building has been constructed for Government High School, Beypore. More number of students was admitted in the particular school post year to the construction of the building. The drinking water supply scheme and the electrification scheme are progressing in a faster pace and will be completed at the earliest. The schemes are implemented by KWA and KSEB respectively.
61. Under the scheme Rs 25 crore was also earmarked for the revamping of 10 Regional Fisheries Technical high schools located in 9 coastal districts. The works of 6 schools have been completed and 3 works were not started due to administrative lapse. Items like equipment and furniture, sports good etc were supplied to all 10 schools, additionally, 6 schools also received support for infrastructure facilities.
62. Sanction was also accorded for revamping of fishermen colonies of the State for an outlay of Rs 500.00 lakh. Over all infrastructure of the selected fishermen colonies like Vellamanl colony at Trivandrum, Kalleluvayal and Pallithottam colony at Kollam, Chamakkala colony at Pathanamthitta, Chappakkadavu fishermen colony and Manappuram fishermen colony at Alappuzha, Udayamperoor fishermen colony and fort Kochi colony at Ernakulam, Puthiyappa fishermen colony at Kozhikkode and Koyippady fishermen colony etc were improved. This has brought notable changes among the colony inhabitants. Physical and financial details are given in the tables 34 & 35.

Table 34 *Physical and financial details*

Name of Project	Target	Completed	Ongoing	Not started
Drinking water	6	2	1	3
Electrification	5	3	1	1
Educational Infrastructure	11	7		4
Health Infrastructure	1	1		
Anganvadi	6	5		1
Coastal road	5	3	1	1
High mast light	5	5		
Library	3	2		1
Drainage	4	3		1
Housing	4973	4973		
House repair	1000	1000		
Toilet	2000	2000		

Table 35

Head of account 2405-00-105-94	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	5000.00	5000.00	5000.00	5000.00*	20000.00	
Expenditure	4921.00	2996.53	3170.50		11088.03	

Note *During the year 2015-16, an amount of Rs 50 Crore were budgeted in anticipation of approval by 14th FCA. As there is no Finance Commission after 2015, it can't be utilized.

Socio-Economic Development of Fisherfolk

Integrated Fisheries Development Project (NCDC Assisted)

63. The major objectives of the scheme were -
1. Meeting the credit needs the co-operatives affiliated to Matsyafed
 2. Strengthening of primary fishermen co-operatives by providing share capital
 3. Provide fishing input subsidy for the modernization of fishing inputs
 4. Establish group ownership system of fishing implements
 5. Promote replacement / renewal of existing fishing implements
 6. Provide share capital to FDWCS

Table 36

Head of account 2405-00-103-82	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	100.00	100.00	100.00	100.00	400.00	200.00
Expenditure	100.00	100.00	653.06	1115.47	1968.53	
4405-00-103-98						
Budgeted amount	50.00	50.00	50.00	50.00	200.00	100.00
Expenditure	216.55	50.00	1471.64	Nil	1738.19	
6405-00-195-99						
Budgeted amount	1800.00	1800.00	1800.00	1800.00	7200.00	1650.00
Expenditure	1633.45	1735.50	978.43	821.57	5168.95	
Beneficiaries assisted	2170	4310	16508	11034		

Subsidy for Getting Bank Loan (Bankable Scheme)

64. The scheme provides 25% subsidy for bank loans taken for the purchase of fishing inputs by traditional fishermen. Details are given in the table 37.

Table 37

Head of account 2405-00-800-85 2405-00-190-96	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	100.00	50.00	50.00	50.00	250.00	50.00
Expenditure	100.00	50.00	50.00	50.00	250.00	
Beneficiaries assisted	276	255	248	154		

Interest Free Loan

65. The scheme aims to provide seed capital for the emergence of credit linkages to facilitate the flow of adequate institutional credit in the form of a self-renewing community support to prevent erosion of income by way of informal credit. Rs 5000-20,000 was given to the beneficiaries as interest free loans to meet the working capital requirement. Sufficient fund is mobilized from the commercial banks and the interest portion is paid as subsidy.

Table 38

Head of account 2405-00-800-23	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	250.00	300.00	300.00	100.00	950.00	100.00
Expenditure	250.00	300.00	262.34	100.00	912.34	
Beneficiaries assisted	24,741	27,812	23,510	21,075		

Seed Money for NBCFDC & NMDFC

66. Matsyafed has been implementing various schemes for generating self-employment with the financial assistance of NBCFDC (National Backward Classes Finance and Development Corporation.) and NMDFC (National Minorities Development and Finance Corporation) against guarantee by the state. The pattern of funding is NBCFDC/NMDFC share 85%, Matsyafed share 10% and the beneficiary share 5%. The seed money is meant to provide 10% of the Matsyafed share of loan released by NBCFDC and NMDFC.

Table 39

Head of account 4405-00-800-87 4405-00-190-97	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	100.00	150.00	150.00	150.00	550.00	150.00
Expenditure	100.00	150.00	150.00	150.00	550.00	
Beneficiaries assisted	879	4475	1042	6965		

Theeramythri

67. The project is envisaged to address the diversified livelihood needs of the fisherwomen. It is for promoting livelihood diversification and to improve the income level of fishermen family through women member. The project was started as a stabilizing package for the sustainability of various livelihood activities initiated during 11th plan under Tsunami Rehabilitation Programme (TRP). During the 12th plan period, sustainability arrangements were provided along with new activity groups. The sustainability arrangements include revolving fund as working capital, construction of own building, institutional arrangements, technology improvement, revamping and handholding of sick groups etc. Initially production activities were promoted, but training oriented programme has been started in the last two years. The target was to provide employment to the entire population of young woman who have been trained under the project. The programme has also been extended to inland fishing villages. During 2015-16, the programme has extended to the fishing villages adjoining Vembanad Lake. In 2016-17, sanction has been given to extend the programme to the fishing villages adjoining Ashtamudi Lake. The details of major achievements are given Table 40 & 41 in number of groups.

Table 40 *Details of Major Achievements*

No.	Particulars/ Items	2012-13	2013-14	2014-15	2015-16	2016-17
1	New Activity groups	89	30	160	125	216

Sustainability of Micro Enterprises

2	Revolving Working Capital	625	525	Nil	Nil	145
3	Construction own building	5	Nil	Nil	Nil	6
4	Technology Improvement	200	Nil	Nil	23	Nil
5	Shift to Appropriate Business	34	Nil	22	5	14
6	Revamping Supermarket	Nil	Nil	4	4	Nil
7	Capacity Building Programme	544	Nil	213	243	120
8	Interest Free Credit Support	Nil	Nil	Nil	750	Nil
9	Finishing School	Nil	Nil	107	54	Nil
10	Theeranaipunya	Nil	Nil	Nil	325	275

Table 41

2405-00-800-10 2405-00-103-81	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	815.00	500.00	500.00	300.00	2115.00	500.00
Expenditure	400.00	500.00	400.00	300.00	1600.00	

Government Regional Fisheries Technical Schools

68. Presently there are 10 Fisheries Technical Schools in the State. Located in the coastal districts, they are intended to provide free education for the children of fishermen. Eight of these schools are for boys while two for girls. All these schools are residential schools and the students are provided free mess and other facilities. The capacity of 10 schools is 1200 students, but there is drastic decline in the number of students due to poor infrastructure facilities. Serious efforts have been taken for creating adequate infrastructure. During the plan period the daily mess allowance for one student has been enhanced from Rs 800 to Rs 2000. Additionally, medical care and counseling support has also been provided for the last two years. It is also decided to provide admission to non-residential students from the next academic year onwards.

Table 42

Head of account 2405-00-109-98	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	200.00	150.00	150.00	100.00	600.00	150.00
Expenditure	94.03	67.09	64.12	77.40	302.64	
No. of students	613	503	452	391		

Governance and Service Delivery

Extension, Training, and Service Delivery

69. The National Institute of Fisheries Administration & Management (NIFAM), at Kadungalore is functioning as a staff training center imparting obligatory in-service training to the field level functionaries of the department. The duration of the training is effectively 90 days.

70. During the period a publication named "Shyamakeralam" was launched. Many brochures, leaflets, news items, journals etc, were also published. In order to augment ornamental fisheries, Aqua Shows were conducted during the year 2014. Seminars, Workshops, Awareness camps & Programmes were also conducted.

Table 43

Head of account 2405-00-800-97 2405-00-109-95	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	120.00	175.00	250.00	250.00	795.00	250.00
Expenditure	97.57	165.48	163.16	151.43	577.64	

E-Governance

71. A web site is maintained under e-governance programme. Under NeGP, a network of kiosks has been established in all the major offices of fisheries department. Sufficient number of hardware was procured for making the directorate and district offices IT enabled. Software for e-grantz has developed for disbursing education concession to the children of fisherman and the same is to undergo security auditing.

Table 44

Head of account 2405-00-800-26 2405-00-109-93	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	40.00	25.00	25.00	50.00	140.00	50.00
Expenditure	28.07	13.14	24.71	38.68	104.60	

Aquaculture Training Centre

72. During the plan period, it was envisaged to establish aquaculture training centres at Neyyar (Thiruvananthapuram), Pallom (Kottayam), Njarakkal (Ernakulam), Azheekode (Thrissur) and Malampuzha (Palakkad). The centre at Pallom has started functioning. The works at Azheekode and Malampuzha are in final stage. Works pertaining to the remaining two are progressing.

Table 45

Head of account 4405-00-109-99	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount			150.00	200.00	350.00	248.00
Expenditure			150.00	200.00	350.00	

Rural Infrastructure Development Fund

Integrated Coastal Area Development Project (NABARD Assistance under RIDF)

73. During the financial year 2013-14 NABARD under Tranche-XIX had sanctioned 147 projects which include drinking water supply, Health and educational infrastructure, social and fisheries infrastructure etc. During the year 2014-15, under Tranche XX, another 24 projects including components like construction of a locker room, installation of high mast lights, educational and health infrastructure, social and fisheries infrastructure, and farm renovation projects were sanctioned.

Table 46

Name of Project	Target	Completed	Ongoing	Not started
Drinking water supply	6	2	3	1
Electrification	1		1	
Education Infrastructure	26	14	7	5
Health Infrastructure	21	6	9	6
Net mending yards	38	22	7	9
Fish landing centre	11	4	5	2
Fisheries roads	7	4	1	2
Culverts	1	1		
Fisheries station	4	1	2	1
Fisheries training centre	2		1	1
Drainage construction	4	2	1	1
Anganvadi	18	7	4	7
Highmast lights	37	23		14
Locker rooms for OBM	1			1
Public toilet	1		1	
Renovation of fish farm	1		1	

74. The drinking water projects and electrification projects sanctioned under the scheme are implemented through line department viz. Kerala Water Authority and KSEB. Public toilets and three anganwadis at Thrikkunnappuzha grama panchayat are constructed by the grama panchayat themselves. All the other components are constructed by KSCADC.

75. By the implementation of the scheme a tangible change has been brought to the infrastructure facilities of the coastal areas of the State. About more than 50 % of the existing critical gaps in the sectors like Drinking water supply, educational & health infrastructure, sanitation facilities, social infrastructure facilities etc were filled. Few project were not started due to various unforeseen reasons like problems in handing over the proposed land by the concerned local self governments in time, delay in getting No Objection Certificates/ Permissive Sanction with regard to the revenue lands, delay in demolition of the existing dilapidated structures in the project area, delay in getting the CRZ clearance, tender excess due to schedule revision, non- cooperation of the local residents, non co-operation of LSGDs etc

Table 47

Head of account	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
4405-00-800-81						
4405-00-104-53						
Budgeted amount	1100.00	800.00	530.00	740.00	3170.00	1240.00
Expenditure	1100.00	497.67	530.00	2526.29	4653.96	

NABARD Assisted under RIDF (Fisheries)

76. Infrastructure projects like the establishment of Fishing harbours, fish landing centres and major bridges have also been taken up by Harbour Engineering Department under Rural Infrastructure Development Fund released by NABARD. Works for 10 major bridges have been taken up during the 12th Five Year Plan with a total cost of Rs 2517.85 lakh.9 bridges amounting to Rs 8210 lakh have been continuing from 11th Five Year Plan. Under the scheme RIDF provided by NABARD,

50 works were taken up in the period. 18 works have been completed, 3 works have been dropped, construction in 15 works is yet to start and 14 works are ongoing. Total outlay on works is Rs 6532.79 lakh. The expenditure reported is Rs 6096.23 lakh, which is 93% of the outlay. The outlay and expenditure are shown table 48.

Table 48

Item	Amount allotted in 12th Five year plan (in Lakh Rs)					
	2012-13	2013-14	2014-15	2015-16	Total	2016-17
Budgeted amount	600	1300	1300	1500	4700	2000.00
Expenditure	1111.83	1770.81	1222.09	1991.93	6096.66	

77. Works like Perumathura-Thazhampally Bridge, Kappad-Koyilandi Road, Ottumpuram – Vayalpara parappu-Chemballikunnu Road etc have been completed using these funds.

Fishing Harbours and Management

78. The construction, maintenance and management of Fishing Harbours are the mandate of Harbur Engineering Department. The Government of Kerala has so far completed construction work of 14 fishing harbours and the works of 10 fishing harbours are progressing. The completed fishing harbours include Thankassery, Neendakara, Kayamkulam, Munambam, Beypore, Puthiyappa, Chombal, Moplabay, Azheekal, Ponnani, Thottappally etc. The On-going FH works include Vizhinjam, Chethi, Arthungal, Chettuvai, Thanur, Koyilandi, Vellayil, Thalai, Manjeswaram etc. During 2015-16, Cheruvathur FH was commissioned in the month of August, 2015.

79. The Fishing Harbours at Kasargod, Cheruvathoor, Koyilandy, Thalai, Chettuva and Muthalapozhy amounting to Rs 21886 lakhs were the continuing projects from 11th Five Year Plan. In 12th Plan, the construction of fishery harbours and landing centres were taken up considering the technical feasibility and economic viability of each case. Accordingly construction of new Fishing harbours at Vellayil, Tanur, Arthungal and Manjeswaram were started during the plan period with cost of Rs18236 lakhs in the 12th Five Year Plan as 75% CSS scheme. The construction of fishing harbours at Cheruvathur, and Kasargod were completed during the plan period.

80. An amount of Rs 19648 lakhs has been expended so far in the twelfth five year plan. 13 Fishing Landing Centre projects amounting to Rs1334 lakhs Lakhs were sanctioned during the 12th Five Year Plan and 9 of them have been completed so far. An amount of Rs 466.67 lakhs has been expended so far.

81. 18 Schemes were taken up in the reference period using CSS Schemes. It includes 14 FHs, one FLC (Munakkakkadavu), one scheme for Inland Fishery Harbours, a scheme for Dredging of Fishery Harbours/ Fish Landing Centres, and a scheme for Development of Marine Fisheries Infrastructure. Out of the 14 FHs – 6 were taken up under 50% CSS and 8 were taken up under 75% CSS. Under the scheme Development of Marine Fisheries Infrastructure, maintenance dredging has been taken up in 8 FHs in the state.

82. Under the scheme Investigation of New Fishery Harbours, investigation works were taken up for 14 works including Fishing Harbours and Mini Fishing Harbours. About 63% of the work Bridge at Northern side of Andhakaranazhy has been completed.

83. At Chethi Fishing Harbour, 1st stage works have been completed. For second stage, work of extension of breakwater for additional 50m is completed. Second stage works at Arthungal FH is progressing. Construction of breakwater is progressing. At Chettuvai FH, all civil works except approach road to break water and dredging have been completed. Pending works of south break water also nearing completion. Break water and reclamation bund works are progressing at Thanur FH. Major components are completed at Thalai FH. Work on auction hall, quay wall and dredging is progressing.

New initiatives in the plan period.

1. New fishing harbours at Vellayil, Tanur, Arthungal and Manjeswaram commenced.
2. Construction of new bridges at Ottumpuram Tanur in Malappuram district, Kumbalam Nettoor Bridge in Ernakulam district, Kopparakadavu bridge and Pathiyankara bridge in alappuzha District were commenced.
3. Investigation for new fishing harbours at Pozhiyoor, Pathiyankara, kaipamangalam and Kuriyadi commenced.
4. Coastal road connecting Koyilandy Fishing harbour and Kappad Beach commenced and completed during the plan period.
5. E tendering process launched for all works costing more than 5 lakhs.
6. Estimation using PRICE software started during the plan period.

Development Schemes under Non-Plan Category

84. There are mainly two non-plan development schemes:-
1. Operation, management and maintenance of Fishery Harbours –
 2. Head of Account is 2405-00-103-97. Budget Provision under this head is utilized for repair and renovation of various harbour structures.
 3. Upgradation of Coastal roads
 4. Head of Account is 4405-00-103-94. A total of 1452 coastal road works with an AS amount of Rs 432.34 crore were taken up during the 12th Plan period.

Table 49

YEAR	No. of Roads	AS Amount in lakhs	completed works	ongoing works	works arranged	abandoned/ done by others
2012-13	385	11099.17	337	16	6	26
2013-14	365	11475.34	278	30	23	34
2014-15	303	9594.36	173	52	63	15
2015-16	399	11065.64	86	128	173	12
Total	1452	43234.51	874	226	265	87

Critical Gaps Identified in Implementation of Schemes

1. Almost all the works especially in coastal areas require land acquisition and rehabilitation of the evictees. Non-availability of revenue land is a problem. Moreover, land acquisition process and rehabilitation require huge amount as the evictees are to be provided with houses and other infrastructure facilities.
2. Marine engineering is a complex branch dealing with extensive and critical natural phenomenon. No theoretical solutions are available for the design of marine structures.

Empirical formulas and past experiences are relied upon to arrive at solutions. Conducting investigation, model studies for a short span will not re-create a complete prototype of the proposed coastal features. This may lead to unexpected sea bed changes, siltation issues etc during the course of construction. This in turn causes intermittent delay in project completion, and is one of the major implementation issues before HED.

85. Year wise outlay and expenditure for Fishing Harbours and associated infrastructure under State Plan are shown table

Table 50 *Fishing Harbours and associated infrastructure under State Plan*

Financial Year	Budget allocation (SDG included) (Rs in lakhs)	Expenditure (Rs in lakhs)	% Exp
2012-13	2935	2213.46	75.41
2013-14	2920	3024.69	103.5
2014-15	2800	2487.53	88.84
2015-16	3068	3926.98	127.9
Total	11723	11616.66	99.09

Kerala University of Fisheries & Ocean Studies

86. Kerala University of Fisheries & Ocean Studies has been provided fund by the Government for developing a dedicated institution of excellence for the sector, and to improve research and extension. During the first four years of the 12th plan, total outlay for KUFOS was Rs 86 crore. Expenditure reported is Rs 45.48 crore (52.89%). Outlay provided for KUFOS is utilized for meeting expenses under 6 sub components like Infrastructure, Education, Research, Administration, Extension; and Activities under RIDF. Year wise outlay and expenditure are provided in table 51.

Table 51 *Year wise Outlay and Expenditure*

Year	Outlay	Expenditure	% Expenditure
2012-13	1200	1200	100
2013-14	2000	1442.6	72.13
2014-15	2700	500	18.5
2015-16	2700	1406.05	52.07
Total	8600	4548.65	52.89

87. It is reported that the actual receipt during the period was only Rs 4942.6 lakh. It is also reported that an amount of Rs 700 lakh is kept in the ELA. Issues regarding the release of RIDF are also reported.

Physical Achievements

Infrastructure Facilities

1. Academic block building: - The three phases of the works for an area of 2310m² was completed. The class rooms and laboratories are functioning in this building. The construction of 2449 m² is in progress and expected to complete before 31st December 2016.
2. Library building: - The library building for an area of 774m² completed and the University library is functioning in this building in the name of "Sir Francis Day Central Library".
3. Swimming pool: - A swimming pool of size 25x10m has completed and inaugurated.

4. P.G. Hostel for ladies:-The first phase of the hostel building is completed. Sixty students are accommodated in this hostel.
 5. Research complex: - The ground floor of the building for an area of 440 m² completed and inaugurated.
88. Other civil works such as Construction of Men's hostel, Twin type quarters, Students Amenity centre, Seminar complex and construction of two schools at Puduveyyu are in progress.

Educational Activities

89. When the University was formed there was only B.FSc., M.FSc. (4 Nos) courses and Ph.D programmes that were run by the Fisheries College under Kerala Agricultural University. From 2012 till current year, University has started 29 courses mostly PG courses like M.FSc, M.Sc. and M.Tech in addition to Massive Open Online Courses. This was a major achievement. However fully equipped labs are yet to be established in some of the Schools. KUFOS has also started Ph.D programmes in emerging areas of Science, Technology and Social Science. In tune with the national policy on Education, University is taking all efforts to increase enrolment rate at UG & PG levels.

Extension Activities

90. Some of the important activities undertaken during the plan period include – Exhibition unit with Mini bus for field consultancy/ lab to land service, Village adoption for empowerment and capacity building ensuring livelihood of fisherfolk in Central Kerala, Farm Radio Station, Farm Advisory services for Fisheries, Establishment of Fisheries Technical and Portal unit, Center for Field Consultancy and Data Analysis, Maintenance of Museum, Modernization and Upgradation of instructional field training facility, Model Fish Processing Plant etc.

Research Activities

91. Establishment of Directorate of Research - During the plan period Director of Research has been posted and the office is being set up. Now all activities of research is co-ordinated through this office. It is functioning according to the powers bestowed as per statutes.
92. During the period 23 plan projects have been undertaken. In addition 6 KUFOS Aided Research projects are also being carried out. The projects are being successfully carried out. From the projects, required equipments are being purchased with a view to pursue research work at international level.

Critical Gaps Identified in Implementation of Schemes

93. KUFOS has reported two issues that need to be addressed. They are –
1. Shortage of manpower, both Academicians and Administrative staff is slowing down the institution building process and affects the quality of work.
 2. The absence of a full-fledged Engineering Wing in the University has led to slow progress in the infrastructure works, which is a major section for which funds are provided.

CHAPTER 3
APPROACH FOR 13TH FIVE YEAR PLAN

Approach for Nutritional Security through the Enhancement of Fish Production

94. Food and nutrition security exists when all people at all times have physical, social and economic access to food, which is consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life. Fish like sardine is one of the cheapest sources of protein in Kerala. In order to regulate fish price and ensure quality, minimum support price to the producer and controlled distribution through outlets can be done. The annual fish requirement of the state is estimated at 7.5 lakh MT. Out of the total fish landings of 7.2 lakh MT, high value fish of 1.49 lakh MT is exported to foreign countries. In order to meet the fish requirement of the state, about 2 lakh MT fish especially sardine and mackerel is imported from the neighbouring states. The gap should be addressed for ensuring availability of fish by enhancing fish production through holistic approaches focused on scientific management of open water fishing and aquaculture. Proper storage and distribution of fish must also be ensured to avoid wastage and to make it accessible to all regions without quality deterioration.
95. Scientific management of open water fishing means conserving and restoring the marine and inland ecosystems through encouraging responsible fishery management practices with a view to (a) allowing smooth functioning of the ecosystem processes in the natural water bodies, (b) arresting the decline in habitat degradation and overfishing and (c) maintaining the current levels of production. In the aquaculture front an integrated multi trophic level approach is to be planned to increase production and productivity. It also involves introduction of more species especially the local ones into the culture systems. Many species cultured in Kerala such as Indian major carps have low consumer preference in the State and therefore increase in their production should be linked to exploring markets outside the State. Similarly, species produced/caught elsewhere like Pearl spot (Karimeen), oil sardine (Mathi), mackerel (Ayila) etc. are steadily being ferried to the State to cater to the demands from markets. This variation in regional preference for species should be taken advantage of by developing marketing strategies, storage, value addition and development of total value chain.
96. Achieving the right balance between optimizing production and ensuring sustainability and inclusiveness is the key to success of the 13th Plan activities. This involves following the available Better Management Practices (BMPs) and adoption of responsible fishing and aquaculture practices, based on the FAO Code of Conduct for Responsible Fisheries (CCRF). This is essential for unitizing the natural resources on a sustainable and equitable basis. Campaigns to create awareness among the fishers and fish farmers will be an essential component of the 13th Five Year Plan activities along with efforts to build capacity to follow these practices.

Management of Marine Fishing

97. Sea fishing has been an occupation for the coastal people from time immemorial. The fishing industry was developed solely by the fishermen over centuries. A meaningful move was made towards mechanization since independence and the progress achieved raised the status of the industry by its recognition as a primary area of growth. In the early Nineteen Sixties, small mechanized vessels were introduced and in the Nineteen Seventies, marine fishing activities rapidly expanded in the continental shelf area. In the Nineteen Eighties, motorization of country crafts

became popular and by employing these crafts with new gears, the exploitation of marine fishes was accelerated. As the fishing fleets increased in number, stagnation in fish catch was felt and the profit from fishing began to decline.

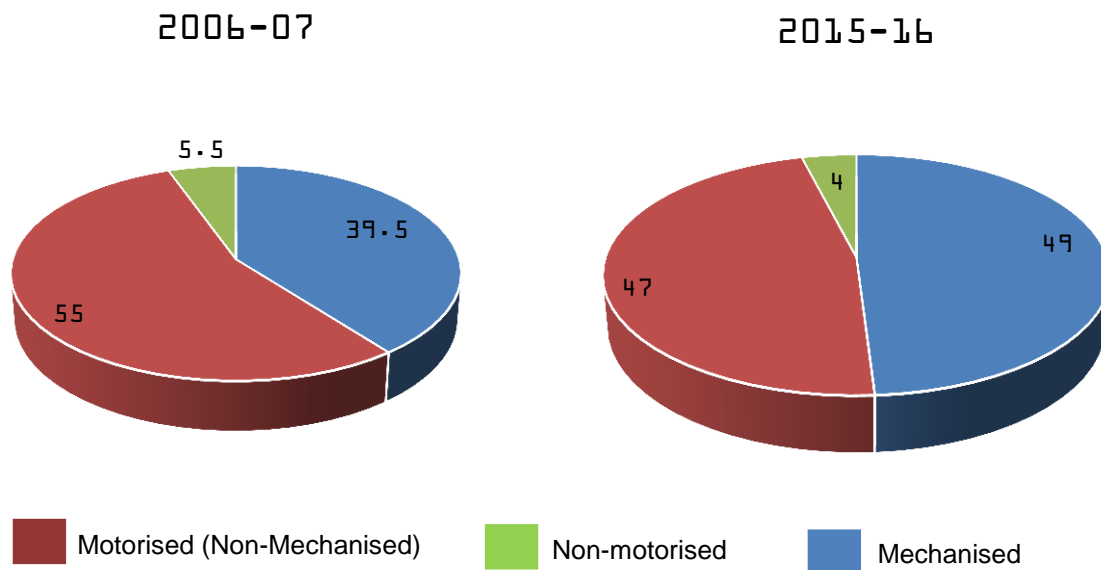
98. The total registered fishing fleet in the state consists of about 5,028 mechanised crafts, 29,345 motorised crafts and 2,514 non-motorised crafts. The marine fish harvested in Kerala consist of about 65 commercially important species/groups. Pelagic species contributed about 52% of the total marine fish landings.
99. The details of depth zone wise marine resource available in the continental shelf of Kerala coast is the one furnished by the Expert Committee on marine Fisheries in Kerala, which was headed by A. G. Kalwar. Details are given table.

Table 52 Depth Zone Wise Marine Resource

Depth zone	Available fish resource in MT	MSY in MT
0 – 20 m	3,45,490	2,07,547
21 – 80 m	8,23,352	4,94,608
81 – 200 m	1,54,875	93,055
Total	13,23,717	7,95,210

100. The areas beyond continental shelf (especially beyond 32 nautical mile) is said to have a potential of 24,000 MT. However, they are not exploited properly now. The marine potential of the state should be re-assessed based on primary productivity.
101. The actual fishing efforts of the traditional crafts are virtually confined within 20 m depth zone and mechanised crafts upto 80 m depth zone. The existing fishing efforts are concentrated in the near shore regions putting the fish stock in the area under pressure. Sector wise contribution of marine fish landings in Kerala is given below (in percentages).

Figure 1 Sector-wise contribution of marine fish landings, Kerala in per cent



102. Marine fish production in Kerala remained more or less stagnant during the two decades ending with 2006. After that it declined from 5.98 lakh ton in 2006-07 to 5.17 lakh ton in 2015-16 principally due to increased fishing effort, overexploiting of resources, and juvenile fishing. In this complex

situation, serious efforts should be taken for scientifically managing the marine stock. The trend in marine fish production in Kerala since 2006 is given below.

103. The existing marine fishing fleet of Kerala is far above the recommended level, and the Kalawar committee in 1994 proposed to limit the number of trawling boats to 1145 motorized crafts to 2690 and non-motorized crafts to 20,000. After the recommendation too, a large number of mechanized and motorized fishing vessels were constructed or are being constructed without the permission of the authorities. There is no control over construction of new crafts. Certain fishing practices like bottom trawling; night trawling, purse seining, pelagic trawling etc are banned in the State with Act & Rules. Use of particular types of fishing gear is also prohibited. However, the effective enforcement of these laws is yet to be realized.
104. Marine fish production from continental shelf area can be restored to the previous level of 6.6 lakh MT during 13th plan period by adopting sustainable fishery management measures, responsible fishing and stock enhancement. Adopting sustainable fishery management measures, includes adoption of by catch exclusion devices, fixing legal size for capture, controlling destructive gear that catch fish in large quantities, putting restriction on fishing efforts, etc. Responsible fishing entails effective implementation of closed seasons by stopping fishing operations using high powered large vessels operating in the name of traditional vessels. This can be done by motivating the fishermen, creating awareness and offering incentives. Stock enhancement can be done through establishing marine protected area/ artificial reef and ranching of fish seeds. Co-management of natural resource by all the stakeholders at fishing village level is another way to tackle the complex situation.
105. There is an urgent need to redeploy the fishing effort from the over exploited continental shelf area to deeper waters for the exploitation of 24,000 MT of oceanic fish resource which are reported to be available. It can be done by weaning away the excess trawlers into tuna long lining by encouraging them to catch the rich oceanic tuna resources. Tuna fishing will be attractive only if the fish caught can be exported as “sashimi” grade, for which expensive tuna crafts are required with facilities to freeze the fish as soon as it is caught. This problem can be overcome by adopting the ‘mother vessels’ approach, under which a mother ship equipped with RSW facilities will collect fish from a number of small tuna fishing vessels attached to it. The mother ships can collect catch from a group of 20 boats and periodically bring tuna ashore for processing into ‘sashimi’ grade fish and loin so that the catch can be marketed at good rate.
106. The strategy for improving marine fishing from continental shelf area should be focused on preventing/ addressing issues like juvenile fishing, overcapitalization of fishing vessels, over exploitation, intra/inter sectoral conflict of interest and indiscriminate fishing methods. The goal can be achieved by making amendments to KMFR Act, creating awareness among stakeholders and establishing new fisheries stations at Thottapally, Azheekode, Ponnani and Kasargode with adequate technical staff.

Management of Brackish Water Fishing

107. A unique feature of Kerala is the presence of large number of lagoons, estuaries and Backwaters along its coast. These water bodies have their bed levels at about 1.5 to 1.8 m below the mean sea level and remain separated from the sea by narrow strips of land having 0.4 to 12km width. Many of the temporary estuaries remain closed during most part of the year by a sand bar formed by the action of the littoral currents and waves of the sea. With the advent of rains, the rivers swell up and the consequent heavy flow of water leads to the opening of bars with resultant sea-estuary

interaction. The entire estuarine system along the coast of Kerala is exposed to tides from the sea and hence water is brackish almost throughout the year.

108. The state has 1.26 lakh ha of brackish water resources consisting 53 backwaters (Kayal) having an area of 46,129 ha, 234 prawn filtration fields with an area of 12,873 ha and brackish water area of 65,213 ha. They have saline waters and only those fish, which can withstand changes in salinity, thrive here. These water bodies are the abode of 75 species which consists of 57 species of fin fish, 6 species of shrimp, 1 species of prawn, 5 species of crabs and 6 species of bivalves. Out of it, 28 species were identified as commercially important. Mulletts, catfishes, perches, pearl spot, prawns, oysters, mussels, crabs and clams are the most common. Most of the inland fish production is marketed and consumed locally. The inland sector of the State contributed around 1.74 lakh metric tonnes of fish during 2015-16.
109. Shrinkage of water bodies, aquatic pollution, and indiscriminate fishing practices coupled with habitat destruction are the major issues to be addressed in brackish water fish resource. Shrinkage of water bodies (reduction in area and water depth) is due to encroachment, soil erosion and reclamation. It can be controlled by water shed based interventions by all line departments. Source of aquatic pollution includes industrial, domestic, agriculture (chemical fertilizer and pesticide) and tourism activities in the catchment area.
110. Backwaters have become the reservoirs of wastes generated by the modern civilization. Lack of facilities for monitoring the estuarine pollution is becoming a severe threat, which may pose hazards to the aquatic living resources. Accumulation of plastic waste in bed and shore is big a threat to biodiversity and the non-biodegradable pollutants alter the aquatic eco-system to a considerable extent. There should be provision in the 13th five year plan for its control and removal.
111. The vertical shrinkage of backwaters by siltation and progressive shallowing of backwaters have rendered them to 35% of original depth. Reduction of water depth near the mouth causes hindrance to breeding migration of fish. Deepening of migratory pathways of fish in the backwaters is required. Detailed survey of backwater area should be done to prevent shrinkage of resource due to anthropogenic activities. Latest survey methods have to be used to manage the reduction of these water bodies. The backwaters of Kerala face excessive, unauthorized & indiscriminate fishing pressure and illegal & detrimental fishing practices. Fishing by explosives & poisoning, electro fishing & light fishing etc. are wide spread in the backwaters. Stake nets are being operated during flood tides. The number of the stationary gears reached many fold of its authorized numbers. Even the gears with less than 5 mm size meshes are used. The indiscriminate fishing practices like use of stake nets with very small mesh size and its operation during high tide should be prevented. The present mechanism of department of fisheries in managing brackish water fishing is not so effective due to lack of patrolling boats and man power.
112. The approach should centre on conservation of natural habitat, where connectivity to the sea and water exchange is the key issues for management of these resources. Brackish water lagoons along with the connected paddy fields are complex ecosystem which is influenced by the water release from spillways, barrages and other hydraulic structures. Low flow rates from the rivers feeding the water bodies have impact on productivity. Checking the habitat degradation and use of responsible fishing practices should be the focus of 13th Plan. Natural fish breeding sites should be legally declared as Fish protection areas or sanctuaries.

113. Kerala once had over 70,000 hectares of mangroves, fringing its unique estuarine systems. Mangrove forests are acting as excellent nursery grounds for a great variety of finfishes and shellfishes by offering food and shelter. Destruction of it led to the depletion of these fishery resources. Due to maximisation of exploitation, indiscriminate land use, reclamation activities etc, it has now become reduced to 1,924 ha confined to some small pockets of the backwaters. Mangroves are unique and ecologically important halophytes that grow in the coastal wetland of tropical belts. Urbanization, industrialization, unsustainable mode of aquaculture etc has resulted in the shrinkage of mangrove to considerable extent. The remaining mangrove should be protected. Afforestation in the back waters and estuaries can also be carried-out. Conservation of threatened inland fishes and protection of biodiversity also assumes great significance.
114. Kerala has around 65000 ha of lakes which are important in inland fish production and in providing livelihood to thousands of inland fishermen. Apart from its importance in fish production these are also important hotspots of bio diversity and they act as nursery grounds of many marine and freshwater fishes. Lakes are also important in navigation, water transport and tourism development etc. However most of the lakes in Kerala are in a moribund condition due to an array of reasons like land reclamation, siltation, eutrophication, weed infestation, water pollution etc. These are to be rejuvenated. Efforts will be taken in the 13th plan period for the protection of the lakes from further destruction and for their rejuvenation.

Management of Riverine & Lacustrine Fishing

115. The rivers, rivulets, streams, etc., originated from the Western Ghats are well known for their biodiversity including fresh water fish species. The 41 west-flowing and 3 east-flowing rivers with a total length of 3200 km and water spread area of 85000 ha, is the lifeline of the State. Altogether 210 primary fishes (excluding the marine migrants) are found in the inland waters, of which 53 species are endemic. Majority of these fish species have ornamental value also. Western Ghats is recognized as one of the 18 “biodiversity hotspots” in the world. Loss of biodiversity due to habitat destruction and deterioration of catchment area, modifications in the Westerns Ghats, sand mining all along the river course, low flow rates and pollution from agricultural, industrial and urban effluents and solid wastes are the major concerns. Many species, which constituted considerable quantum of the commercial catches during the previous years, now show depletion or are even under the threat of extinction due to the mixed effects of various anthropogenic activities.
116. Conservation of river stretches taking into account the breeding and nursery grounds of fish species should be a priority area. River stock enhancement programme can be done by ranching of quality seeds of fresh water fish and prawn in suitable locations of river stretches to increase productivity. It is a step in the direction of ecosystem management and stock restoration. But the ranching needs to be done with the progeny of wild caught brood stock only. Ranching by using hatchery bred brood stock may lead to genetic contamination of the natural stock. 13th Plan on riverine fisheries should focus on ecosystem conservation and restoration in the light of climate change and the possible adverse impact of the proposed river linking scheme. The principles of ‘Environmental Flows’ should guide the conservation and restoration activities.
117. There are 9 lakes having an area of 1620 ha which can be preserved for the conservation of endemic fish varieties. Suitable technology should be developed for the hatchery seed production and husbandry management of these species. Most of these lakes are at the verge of extinction by reducing area and volume. The carrying capacity can be ascertained by deepening the water body, but after conducting a hydrological study.

118. The 47 reservoirs in the State cover an area of 34,205 ha. Of these, one at Idukki (6160 ha) is a large reservoir, 8 are medium reservoirs, and 38 are small reservoirs. Culture-based fisheries i.e., annual stocking and recapturing of fish is the most suitable management practice to be followed in small, shallow reservoirs. Culture-based fisheries provide scope for fish yield up to 500 kg/ha. Small reservoirs having an area of 18,500 ha can produce 9,250 tonnes of fish. In large, deep reservoirs the management involves allowing building up of natural breeding populations to support capture fisheries. This involves stocking suitable species as a part of stock enhancement. It can provide fish yield up to 200 kg/ha. The medium and large reservoirs of area 15,705 ha can produce 3,141 tonnes of fish. Thus the State has the potential to produce 12,650 tonnes of fish from the reservoirs. In order to achieve the desired production levels, culture-based fisheries need to be followed on scientific lines. Stocking rate, size at stocking, size at harvest and growing time are the key management issues for culture-based fisheries. Technologies are also available for producing fingerlings of Indian major carps in cages for stocking reservoirs. This can be adopted to increase the availability of fingerlings for stocking in reservoirs without depending on land-based nurseries.
119. A major reason for the low productivity of reservoir fisheries is the lack of effective community governance platforms. Reservoir is fished on the basis of common property resource with limited or free access. Therefore, a strong co-management platform is essential to decide on and implement management measures. In most cases, the communities are neither organized nor empowered to manage the resource following the principles of culture-based fisheries. The community organization should own the fish stocked in the reservoir and the Government agencies should play the role only as facilitators. Organizing the community and empowering them to manage the resource should form a component of 13th Plan activities.
120. Another major issue of reservoir fisheries in Kerala is the ownership of water bodies and fishing rights. Ideally, even if the water body is owned by Departments like Irrigation, Power etc, the fisheries management should be guided by the Department of Fisheries as use of water for fisheries development is non-consumptive. Often, there are inter-departmental conflicts in perceptions leading to sub-optimal use of reservoirs for fisheries development. There are similar conflicts in perceptions from a sustainability point of view with Departments of Forests and Environment on one side and Fisheries on the other. These should not be allowed to come in the way of utilizing this important resource. Any production left unrealized in reservoirs due to these conflicts amounts to lost opportunity for food production and employment generation.
121. Among 47 reservoirs, only 10 reservoirs were developed for fish production during 1990s under Indo-German Reservoir Fisheries Development Project and these resources remained neglected over the last 17 years without receiving adequate attention. At that time some of the reservoirs showed the highest productivity in Asia. It is targeted to enhance the present level of annual production from 158.40 MT to 2027.60 MT. The projected target is only 14.81% of potential. The present condition and scope for development is furnished table 53.

Table 53

Sl. No.	Name	Area (ha.)	Average productivity for the last 5 years (Kg/ha.)	Projected productivity Kg/ha.)	Average annual production for the last 5 years in MT	Projected production in MT
1	Peechi	1200	0.00	200	0.00	240.00
2	Vazhani	255	0.00	500	0.00	127.50
3	Mangalam	393	47.75	500	18.77	196.50
4	Pothundy	363	18.64	500	6.77	181.50
5	Chulliyar	159	247.09	500	39.29	79.50
6	Meenkara	259	108.73	500	28.16	129.50
7	Walayar	289	24.67	500	7.13	144.50
8	Malampuzha	2313	23.25	200	53.79	462.60
9	Kanjirapuzha	512	8.80	500	4.51	256.00
10	Peruvannamuzhi	1050	0.00	200	0.00	210.00
Total		6793			158.40	2027.60

122. In the case of reservoirs in the protected forest area, stock enhancement can be done by stocking reared seeds of indigenous fish like Thooli (*Labeodussumeri*), Kuyil (*Tor khudree*), Kooral (*Gonoproktopteruscurmuca*), Varal (*Channa spp.*), *Barbodescarnaticus* endemic catfishes, etc.

123. Cage culture in reservoirs has emerged as a new area to improve fish production. A production rate of 3 to 5 tonnes is possible from a cage of 6m x 4m x 4m size, if suitable species are selected. The State can adopt this technology to augment fish production from large and medium reservoirs, following the guidelines issued recently by the Government of India. Similarly, the prescribed limit on number of cages per reservoir needs to be followed strictly. Cage culture activities should be done by involving SHGs or SC/ST Reservoir Fishermen Cooperatives in the adjoining area. Cooperation with the Departments having administrative control over these reservoirs is also to be ensured. It is proposed to establish 100 units with 10 cages each in the reservoirs of the state. The preferred fish are GIFT, *Pangassius*, Sea bass, indigenous Catfish, Mahseer etc.

Freshwater Aquaculture

124. There is scope for growth in freshwater aquaculture in the State by (a) increasing productivity (b) adopting innovative technologies and (c) bringing new species into the fold, especially the genetically improved varieties and locally preferred species. Freshwater aquaculture, the fastest growing segment of aquaculture in the country during the last five decades, is responsible for the 12-fold increase in fish production in the country over the years. In Kerala too, this activity is picking up momentum during the last few decades. Indian Major Carps, *Pangassius* and *Tilapia* are the species given emphasis in the freshwater sector. Fresh water fish culture is practiced in 6000 ha of fresh water bodies and the present level of yield is 3000 kg/ ha. The present level of production from these sector amounts to 18,000 Metric Tonnes. The productivity of these water bodies can be enhanced to 4500 kg/ ha by adopting better management practices like use of genetically improved fish varieties, better husbandry practices and formulated feed and with the help of additional infrastructure facilities like aerators, Pumps, etc.

125. A major issue of freshwater aquaculture in Kerala is that the Indian major carps have limited market preference among Kerala people. Carps generally fetch comparatively lower price in the State. At

present, freshwater aquaculture in Kerala is more or less restricted to Carp culture. Catla, Rohu, Mrigal and Common carp are the principal fishes farmed. Grass carp and Silver carp are also farmed, though to a very limited extent. The selection of fish species for aquaculture production shall be driven by market demand. Carps were the only species whose induced breeding technology was available. But now technology for seed production of new promising varieties is available. Under these circumstances, a shift from the carp centric approach is very much required. Bringing new species into the fold of fresh water aquaculture will enhance profit. Many species such as murrels (Channa), Mushi (Clarius), Karoop (Anabas), Kari (Heteropneustes fossilis), barbs (Puntius sarana) and others are relished by the people of Kerala. Culture of these species is not picking up due to erratic supply of seed. In the context one of the major areas of focus for development of freshwater aquaculture in the State should be developing infrastructure facilities for breeding and seed production of these species and encouraging farmers to take up their culture. Along with these indigenous fresh water fishes, the exotic fishes like GIFT and Pungasius are good alternative candidate species for farming in the freshwater area. It is proposed to utilize 1000 ha of fresh water ponds for GIFT farming and the expected productivity is 14.40 MT/ha. Even though availability of seed of indigenous fishes are limited, it can be cultured in an area of 150 ha. The expected productivity is 2400 kg/ha. Fresh water prawn culture can be practiced in 200 ha and the expected production is 1000 kg/ha.

126. It is estimated that there are 27,625 ha of fresh water ponds and tanks available in the State. Out of this, 7800 ha can be utilized for fresh water fish culture during 13th plan period for higher productivity. The projected target is only 28% of available resource.
127. The paddy fields comprising of 17,000 ha of Kole lands and 35,000 ha of padasekharams in Kuttanad are lying idle during monsoon season due to flood. Of this an area of about 4000 ha is currently used for the culture of Scampi/fishes. This forms only 7.69% of potential resource. Utilization of such type of available paddy fields for aquaculture during off season for paddy will ensure the augmentation of fish/ prawn production in addition to paddy and creation of additional income for farmers. The present yield from Padashekaram is 2000 kg/ ha. The present level of production from these sector amounts to 8,000 MT. The yield from Padashekaram can be enhanced to 3000 kg/ ha by adopting better management practices. The fresh water paddy fields of low lying area especially in Kuttanad is not used for paddy cultivation due to flood for six to seven months in an year. In short, fresh water aquaculture is practiced only for six or seven months in a year there by restricting the routine growth period of 10 months for the fish to reach marketable size. Generally the fry or the early finger lings of carps are stocked in fields after paddy harvest. It points to the necessity of a change in the present system of using fry as the stocking material. Advanced fingerlings or the yearlings which reach marketable size in 6- 7 months of stocking are obvious choice to circumvent the situation. In the context, there is a need for setting up centres for the commercial production of advanced fingerlings or even yearlings at Kuttanad having capacity of producing 200 lakh advanced fingerlings. The Government land of 47 ha in Nedumudi Grama panchayath can be utilized for this.
128. Adopting innovative technologies like Recirculation Aquaculture Systems integrated with the cultivation of leafy vegetables using GIFT or Koi anabas as candidate species have immense potential for the exponential growth of fresh water aquaculture sector of the State. It can be practiced even in urban areas where the availability of the land is limited. It is proposed to establish 1000 units of RAS having the volume of 40 cubic meter on pilot scale. The expected productivity is 1440 kg/unit.

129. Fresh water pearl culture is an area where interventions can be made. The technology of artificial pearl production is simple and highly profitable. This can be identified as an area for alternative livelihood for fishermen and rural community.

Brackish Water Aquaculture

130. Brackish water Aquaculture is a dynamic field where revolutionary changes in the realm of technology have taken place over the years. The brackish water shrimp culture originated from the traditional filtration fields has evolved into scientific and semi-intensive models of lucrative commercial ventures. However, the environmental problems and recurrence of viral disease occurred during the mid-1990s have forced this sector to re-orient the strategy from intensive models to extensive type of sustainable aquaculture in recent years. In the light of frequent outbreak of viral disease, shrimp farmers are looking forward for alternative species for aquaculture.
131. Coastal aquaculture as seen today has developed on a single commodity, shrimp with total export orientation. This has led to neglect of the large potential for diversification and domestic market. There is a need to widen the species spectrum, especially by inducting fin fish species. Diversification of culture activities involving alternative species to shrimp such as Sea bass, Milk fish, Grey Mullet, Pearl spot and Mud crab etc is the need of the hour.
132. There are 12,873 ha of traditional prawn filtration fields having sufficient salinity during November-May for all type of brackish water culture. Out of it, only 35% is targeted for scientific aquaculture. Remaining area is presently used for the age old shrimp filtration practice known as 'Chemmeenketu' in which the yield is 200 - 500 kg/ha/year. It can be brought under scientific aquaculture by using improved fish varieties, better husbandry management practices, formulated feed and with the help of additional infrastructure facilities like good bund, aerators, pumps, etc, so that a yield of 1200-4480 kg/ha is obtained. The closed system of shrimp farming practiced without water exchange which is largely being practiced in Andhra Pradesh, Gujarat, Tamil Nadu etc could also be brought into practice here in areas that are prone to WSSV attacks. A provision may be given for providing interest free capital support from the financial institutions to the marginal farmers of less than 5 ha. All kind of financial support to the farmers can be made available through DBT.
133. It is proposed to conduct polyculture of Milk fish, Grey Mullet and Pearl spot in 3000 ha brackish water ponds. The expected yield is 4480 kg/ha. It is also proposed for supporting 1000 units of cage farming in back water bodies. The principal species can be Sea bass, Pearl spot, Silver pompano, Grouper, Red snapper and Cobia according to the availability of salinity. Each unit may consist of 10 cages of 2x2x1.5 M. Expected yield is 960kg/unit. Care should be taken to select fishermen groups as beneficiaries. Farming of Mud crab can be practised in 100 ha area on pilot scale. The expected yield is 2000kg/ha.
134. The farming of Tiger shrimp can be done in 1250 ha area using quality seeds, PCR screened seed for specific pathogens. The expected yield is 1680 kg/ha. The farming of Indian white shrimp can be done in 250 ha area. The expected yield is 1200 kg/ha. Mussel farming can be continued by 3000 units operated by SHGs. Each unit may have 100 meter rope. The expected yield is 1500kg/unit.
135. Brackish water aquaculture in other states of the country is developing by the introduction of exotic species, *Litopenaeus vannamei*. Subjected to use of certified SPF (Specific Pathogen Free) seed to be sourced from CAA approved hatcheries Kerala has to initiate *L. vannamei* culture in non-conventional aquaculture areas. *L. vannamei* farming is now being successfully carried out in the

agriculture saline soils in many places in the country especially in the state of Haryana. The Government of Haryana and NFDB have initiated various programmes to promote aquaculture in agriculture saline soils. A Scheme could be initiated with support from NFDB to promote aqua farming in agriculture saline soils of Kerala.

136. There are several sustainable technologies developed in other countries in Asia. In cases where technology transfer is needed from outside the country through Technical Cooperation among Developing Countries (TCDC) mechanisms of FAO/UNDP and NACA, can be availed.

Mariculture

137. Growing of marine organisms in the sea water environment is one of the ways to compensate for the stagnating marine capture fisheries. Globally, mariculture is a multimillion-dollar industry, but State's share in it is nil in spite of the availability of diverse and extensive marine resources. There is enormous scope for culturing many fin fish species as well. Tuna, groupers, halibut, cobia, silver pompano, yellow tail, sea breams, seabass, red snapper and pomfret are some of the fin fish species cultured across the world. In India technology is now available for a few species like Cobia, Silver pompano and Sea bass. Cobia is the fastest growing species in aquaculture that can grow up to 5 kg in one year. All the species command lucrative prices and have good demand in both domestic and overseas markets. The State can take up 100 units for cage farming of marine fish as a part of its 13th Plan activities. Each unit will have 10 cages of 6 m dia and 4 m depth. It is expected to produce 24 ton fish from each unit.

138. The farming technologies for oyster, mussel and seaweed, are already available and these are to be scaled up to more areas.

Ornamental Fish Culture

139. Ornamental fisheries are a lucrative US\$ 371.42 million market, the global export trade of which is on a growth trajectory of 4% per annum. Singapore, Thailand, Indonesia, Malaysia and Sri Lanka are the leaders in the market, while India's share remains insignificant at <1%. This is in spite of the diverse aquatic ecosystems and rich fish biodiversity of the country. The country has huge scope and potential for international trade in ornamental fishes. Aquarium keeping as a hobby is fast picking up in India, especially among the middle class, driving an impressive 20% annual growth in the domestic trade.

140. Kerala has the potential to become the hub of ornamental fish culture and trade in the country. Therefore, the 13th Plan should give priority to this segment. Situated in the biodiversity hotspot of Western Ghats, the State has a good species spectrum of freshwater ornamental fish apart from the rich source of marine ornamental fish species. Illegal collection and trade of wild collected fish is a major issue that has far reaching environmental implications. The twin focus of ornamental fish production and trade should be (1) encouraging backyard production of indigenous and exotic varieties/species to create employment and income generation opportunities for the women and low income group people, especially through women SHGs and (2) facilitating breeding, value addition and export of indigenous species to capture a good share of the lucrative overseas market.

141. At present, our attractive ornamental fish are collected from the wild and exported both legally and illegally to Singapore and other countries, from where they are bred, value added and re-exported to the end users, (including hobbyists in India). It is essential that we develop facilities and capacity for

breeding, value addition and export of ornamental fishes to the end user countries and hobbyists. Technologies are available for breeding and seed production of many freshwater and marine ornamental fishes.

142. Like any other activity/industry which deals with living things, ornamental fish industry has its own share of environmental concerns that needs to be addressed. Main concerns are possible clandestine trade of organisms that are not allowed to be traded, and indiscriminate collection of wild stock that will cause depletion of stock in nature and habitat loss. All development plans should address these issues.
143. A few small-scale marine ornamental fish production units (satellite units) can be established in the state with the technical expertise from CMFRI and can be operated by selected self help groups. A brood stock centre can be developed and managed at the government level, from where the larvae can be supplied to these small-scale satellite units. A marketing channel can be developed by linking up with the marine ornamental traders.
144. For the accelerated development of aquaculture in Kerala (in fresh, brackish and marine waters) a Co-operative set up may be evolved. Public water bodies amenable for scientific aquaculture may be leased out to the co-operative societies. A state level apex society may also be set to co-ordinate the working of primary societies and to provide assistance to them.

Availability & Quality of Fish Seed

145. The State has 12 hatcheries in Government/Public sector and 31 hatcheries in private sector. Annual requirement of fish seed of the State is 12 Crore while the present fish seed production capacity is only 3.62 Crore. Presently the State procures fish seeds from Tamilnadu and Andhra Pradesh. To ensure the quantity of fish seed requirement to achieve the targeted production in the marine, brackish water and fresh water sector the basic facilities are to be ensured. For this sufficient number of breeding centres are to be developed in suitable locations. This can be done by establishing new centres and strengthening the infrastructure facilities in the existing seed production centres. Establishment of satellite rearing centres/ farms are also equally important as a means to achieve self-sufficiency in fish seed production. Stress on transportation, inferior quality of seed, unhealthy farm practices etc. affect the production and profitability of farming operation. Quality of seed is major concern in aquaculture and this need to be ensured by adopting quarantine and quality control facilities.
146. Seed requirement during 13th plan period and present level of seed production capacity is given in table 54.

Table 54 Seed requirement during 13th Plan period and present level of seed production capacity

Sl. No.	Item	Seed Requirement			Existing production capacity (in lakhs)
		Aquaculture (in lakhs)	Stock enhancement (in lakhs)	Projected total (in lakhs)	
1	Indian Major Carps	760.00	240.00	1000.00	362.00
2	GIFT	340.00	-	340.00	-
3	Indigenous fresh water fish like Murrels, Catfish, Mashersetc	60.00	20.00	80.00	-
4	Pearl spot	30.00	20.00	50.00	1.0
5	Brackish water fish like Milk fish, Grey mullet etc	180.00	20.00	200.00	6.00
6	Sea bass	24.00	-	24.00	-
7	Marine fish like Silver pompano, Cobia etc	30.00	-	30.00	-
8	Tiger shrimp, Indian white shrimp, Fresh water prawn	1200.00	130.00	1330.00	1330.00
9	Mud crab	10.00	-	10.00	10.00

147. New hatcheries and rearing farms have to be established to attain self-sufficiency in seed production. The proposed new hatcheries/ creation of additional facility for 13th plan period is given in table 55.

Table 55

Sl. No.	Particulars	Hatchery & Rearing facility	Rearing facility
1	Major Carps		Karapuzha, Peringom, Thodupuzha, Kulathupuzha, West Kallada, Kallanode
2	GIFT		Neyyar, Pannivelichira, Kozhikode
3	Murrels, Catfish etc	Neyyar, Kulathupuzha, Polachira, Peechi, Pallom	
4	Pearl spot	Ayiramthengu, Poyya, Peechi, Kulathupuzha, Kuruppusseri	
5	Sea bass, Milk fish, Grey mullet etc	Odayam	Ayiramthengu, Poyya, Kuruppusseri
6	Silver pompano, Cobia etc	Vizhinjam	Azheekode

148. As a move in ensuring quality of fish seeds, State Seed Centre and seed quality inspection centres will also be set up during the 13th Plan period.

Feed Mill for Species Specific Feed

149. Poor quality of feed and over feeding leads to pollution of ponds and in turn environment. Hence quality of feed and its management in the ponds has to be improved. Protein requirement of fish varies from species to species. Carnivores require feed with 45% protein while planktivores & herbivores require only 30% protein in their diet. Some fish require floating feed while some others require sinking feed. Hence, there should be species specific feed to suit the nutritional requirement

of each varieties. Presently the farmers are giving only a common feed without considering its quantity, quality, FCR and protein requirement. Some farmers depend on feed coming from other states, while most of the farmers depend on traditional feeds. Some farmers are not even giving supplementary feed. It is estimated that 58,000 MT formulated pellet feed would be required for the innovative practices of aquaculture. Hence, there should be provision for providing species specific feeds. There is no feed mill in the state to meet the demands from the sector. A fish nutritional support programme may be launched by establishing feed mills under Quasi Government sector and by providing subsidy to the farmers for procuring such type of feeds. Two feed mills with a capacity of 4 tonnes/hr are required for attaining self-sufficiency in feed production.

Use of Aquatic Genetic Resources for the Purposes of Aquaculture

150. It is to conserve the genetic diversity and maintain integrity of aquatic communities and ecosystems by appropriate management. In particular, efforts should be undertaken to minimize the harmful effects of introducing non-native species or genetically altered stocks used for aquaculture including culture-based fisheries. States should take steps to minimize adverse genetic, disease and other effects of escaped farmed fish on wild stocks.

Disease Diagnosis and Management

151. It is essential to have good Fish Health Management programme by ensuring farm hygiene and sound management practices including disease diagnosis and control as well as certification and quarantine. The economic losses and environmental issues are the consequences of the outbreak of major epidemics in fishes. Presently, there is no system at all for the management of fish diseases in Kerala. Aqua clinic and disease management team should be constituted with qualified and technical people in all the districts. Aquatic Animal Health Centre should be established in selected centres like Odayam (Varkala), Kurruppasseri (Arattupuzha), Pallom (Kottayam), Thevara (Ernakulam), Azheekode (Kodungallore), Malampuzha (Palakkad), Vellayil (Kozhikode) and Azheekkal (Kannur). Aquatic Animal Health Centre should involve in quality certification of fish seeds, disease diagnosis, treatment, prevention, reporting and meaningful quarantine. The service may include physio-chemical analysis of soil and water and suggest suitable remedial measures.

Integrated Farming

152. An ecosystem approach to aquaculture (EAA) is a strategy for the integration of the agriculture and animal husbandry with aquaculture within the wider ecosystem such that it promotes sustainable development, equity, and resilience of interlinked social-ecological systems. As a strategy, the ecosystem approach to aquaculture (EAA) is to be adopted in the 13th plan period for the promotion of aquaculture.

Leasing Policy

153. Water being a critical input of aquaculture operations, endeavour of the State should be to evolve appropriate leasing policy for aquaculture operations. Ownership of the public water bodies may rest with the owner Departments, but fishery and aquaculture rights must rest with State Fisheries Departments, so that long term leasing policies congenial for investments in aquaculture can be evolved. A minimum lease period of five years will attract full and proper investments from the entrepreneurs in aquaculture operations. Leasing of coastal and offshore waters for concerned aquaculture programmes should also be considered with due recognition to other sectoral uses like

navigation and fishing. In view of the increased need for fish for food and nutritional needs, the coastal waters should be utilized more and more on a long term perspective. This would, however, involve high technology inputs, which would be a worthy of investment owing to the high economic returns.

Special Aquaculture Zones

154. Similar to Special Agricultural Zones, put forward by the Department of Agriculture, area specific farming activities can be established in the Fisheries sector. Aggregation of activities identical in nature helps to reduce cost of production. Small farm productivity and profitability will be greatly helped if we are able to use this to reinvigorate family farming tradition, with a special focus for empowerment of women and young children. It will also protect the ecological and economic foundations of sustainable aquaculture by conserving bio-diversity and enabling job-led economic growth. Family farming can go a long way in combining nutrition security with food security. The programme aims to promote integrated farming system in fisheries sector.

Eco-labelling and Certification

155. Eco-labelling and Certification is one area which is less explored. So far, Ashtamudi Lake clam is the only species that has been labelled like this. Eco labelling and certification help increase the acceptability of the commodities and fetch higher price. Effort will be taken to get other species labelled and certified.

Fish storage, Distribution & Marketing

156. There are 116 fish processing plants operating in the state. Out of this 94 has approval from EU. These have an installed capacity of 3854 MT/day. Besides, 148 cold stores are also functioning. The installed capacity of the processing & pre-processing plants and cold storages are not fully utilized. One estimate shows that the present level of utilization is less than 40%.
157. In the avaricious attempts to catch the shrimp items, it is reported that non-commercial important fish are harvested and discarded. Utilization of these trash fish or by catch is yet to be explored. Fish also lost due to spoilage from the distribution chain starting from fishing vessel to fish market. It is estimated more than 20 % of catch is lost as discarded trash fish or spoiled fish. Proper storage, distribution and utilization of available resource up to maximum possible level of utilization is equally important as much as actions for further enhancement of production. Fish spoilage can be prevented by ensuring cold chain network from boat to plate which includes insulated boxes/ chamber in boat, chilled storage facilities in the landing center/ harbour, insulated vehicle for transport and insulated facility at fish markets/outlets. The low value fish discarded as trash can be transformed into value added products. Presently, one solar fish drying unit, one value added fish production unit and one chitosan plant two fish meal plants are operating in the State. During 13th plan period, the rate of fish wastage should be brought down to 10% of catch.

Value Addition

158. Value of fish and fishery products can be added according to the requirements of different markets. These products range from live fish and shellfish to ready to serve convenience products. There is great demand for seafood products in ready to eat “convenience” form. A number of such diverse products have already invaded the western markets. One factor responsible for such a situation is

more and more women getting educated and taking up employment. Reasonably good expendable income, education, awareness and consciousness towards hygiene and health, increased emphasis on leisure pursuits etc. are some of the other reasons. Marketing of value added products is completely different from the traditional seafood trade. It is dynamic, sensitive, complex and very expensive. Market surveys, packaging and advertising are a few of the very important areas, which ultimately determine the successful movement of a new product. Most of the market channels currently used is not suitable to trade value added products. A new appropriate channel would be the super market chains which want to procure directly from the source of supply. Appearance, packaging and display are all important factors leading to successful marketing of any new value added product.

159. Fish distribution of the state is well developed because of development of coastal road infrastructure, ice plants, cold storage, but assurance of hygiene and product quality is lacking especially in domestic marketing. Availability of fresh fish to consumers at reasonable prices is still a distant reality. Domestic fish markets do not cope with the demands of the modern society. The drainage and the waste disposal facilities of such markets are pathetic. There are insufficient facilities for parking vehicles, public comfort stations, storage facilities for fish and other perishable commodities etc in such markets. There are 228 fish markets functioning all over the State. Among these, 41 numbers were modernized.
160. The possibility of exporting value added fish and fishery products produced by women Self Help Groups under SAF and those produced by KSCADC can also be explored

Fishing Harbours

161. Kerala has 204 fish landing centers and 25 fishing harbours. Among these harbours, 15 have been commissioned, but only 6 are working properly. The Munambam and Kochi fishing harbour got EU approval as well. Due to the lack of facilities in the landing centers/ fishing harbours to meet the standards of quality stipulated by USA and EU countries, the marine product export scenario of the state are facing serious problems at times. Instances of rejection of sea food consignments on quality grounds are not rare. Such a situation may adversely affect the sustainability of fishing operation in the State. Hence, effort should be taken for quality assurance. The earlier considerations in the design of fishing harbours were shore based facilities for safety in landing and berthing. But in the present scenario, the hygiene and quality has got more importance. During the 13th plan period, the 10 fishing harbour of the state should obtain EU approval. All the harbours should be handed over to Harbour Management Society for better management.
162. Kerala coast has more number of fishing harbours than any other state in India. The ongoing Fishery Harbour Projects at Arthungal, Thanur, Vellayil, Koyilandy, Thalai and Manjeswaram should be completed during the 13th five year plan. Since experts see limited scope for the enhancement of fleet size for marine fishing, the issue of taking up new fishing harbours must be addressed with caution. A High Level Technical Committee may be constituted to evaluate the need, economic viability, design and technological aspects of proposals for new fishing harbours. Such proposals must evaluate the impact on and current functioning of Fishing Harbours existing nearby. It is necessary to formulate a criterion for taking up new Fishing Harbour projects in the state. Fishing harbours are reported to be associated with coastal erosion in some cases. Urgent interventions in terms of design and technology are required to mitigate the issue of coastal erosion associated with Fishing Harbours.

163. Most of the commissioned fishing harbours require annual maintenance dredging or periodic dredging to make them functional throughout the year. Similarly, breakwaters require periodic replenishment and repair works are needed for other structures. The breakwaters at Thankassery, Kayamkulam, Puthiyappa, Chellanam and Munambam require urgent replenishment works.
164. The department should focus on make fully functional, the already constructed fishing harbours considering the hydrographic data also; rather than focusing on constructing new harbours in the plan period. However the department can start new landing centres in the inland sector at places where it is necessary.

Approach for Reduction of Poverty among the Fisherfolk

165. Tremendous economic growth witnessed in marine fisheries since independence enhanced the average per capita income of fisherman as Rs 61,538 (2011-12), but 80% of fisherman have an annual per capita income of less than Rs 12,000/ and are below poverty line. It is due to denial of equal opportunity for exploring natural fish resource, unequal distribution of income, peculiar social structure and sharing pattern, exploitation by money lenders/ middleman, limited scope for alternative employment and higher dependency ratio. The backwardness of fishermen community is visible in terms of low education level, poor access to health care and drinking water, less job opportunities, poor sanitation among fishermen is very poor. The earnings of traditional fisherfolk are far short of their requirement for subsistence. This income is neither proportionate to their hard work nor to the working hours of more than 12 hours. During 13th plan period, it is targeted to enhance the per capita income of the entire fishermen population so that they can be brought above poverty line. It is sought to be achieved by providing more livelihood opportunities, credit support, protection from the exploitation of middle men, shelter, drinking water, sanitary environment, electrification, health care, proper education to children, conducting awareness campaign by social mobilization and creating saving habits.

Alternative Employment Opportunity to Fishermen

166. It is seen that a large section of the fishermen belong to the productive age groups of 20 to 60 years. However, the dependency ratio is 1:4, because, 41.43% of the work force remains unemployed. Contrary to the previous period, most of the new generation abstains from fishing even if they could not find a job outside fishery and tend to remain unemployed. Except in Thiruvananthapuram and Malappuram district, new generation of fisherfolk is showing tendency for moving towards coolie works. This trend began after the hope emanated from the booming gulf migration. Regarding Gulf migrant fishermen, 33% is employed in fishing activities and 50% in coolie activities. Secondary level education and lack of vocational competency fetch them a very meagre salary of Rs 10,000/month. Effective fishing days of fishermen per week have reduced from 6/7 days to 3/4 days. Most of the fishermen aren't considering the NREGS as a means of alternative employment. Sea-wall repairing, cleaning of beaches, planting mangroves/trees for shore protection, and formation of bunds can be included under NREGS to provide supplementary income to fisherfolk at least during the non-fishing days. Rather than remaining idle during non-fishing days, the fishermen can be effectively deployed for other part time livelihood avocation. Self employment opportunity to educated unemployed youth through the mix of bank credit and Government grant should be given after providing skill training. Even though, they may face difficulties in other fields of occupation, it can supplement them with additional income. It can stabilize the already congested fishing sector and enhance their per capita income.

Alternative Employment Opportunity to Fisherwomen

167. In a deprived community with meagre income, the role played by woman in securing the livelihood of their family is quite significant. The trend noticed among a part of the fisherfolk families is that the fishermen generally squander the money they earn, forcing the women to run the family. Among the total fisherwomen of 3,03,194 around 1.70 lakh fisherwomen are in the age group from 25-45 years. Out of this, around 50,000 fisherwomen are involved in fish vending and allied activities like auctioning, peeling, pre-processing etc. After the hazardous attack of tsunami on the Kerala coast on 26th December 2004, Government of Kerala initiated many sustainable livelihood programmes under Tsunami Emergency Assistance programme (TEAP) and Tsunami Rehabilitation programme (TRP). An agency, Society for Assistance for Fisherwomen (SAF) was evolved specially for providing livelihood support to the fisherwomen of Kerala. The venture was a great success and 21,671 fisherwomen got assistance for alternative livelihood activities and 60% of them lead an average life today by earning an additional income. The average monthly net profit is calculated as Rs 3862. The remaining one lakh fisherwomen are presently idle and they will have to be provided with alternate livelihood opportunities. The additional income realized by the women member of the family will in turn accelerate the process of socio-economic development. Sustainability of the alternative livelihood activities of these SHGs can be ensured by forming apex federation of similar activities and securing social capital.

Credit Support

168. Due to uncertainty and seasonal nature of occupation, poor income level and lack of money saving habits, fishermen are often obliged to borrow money for various purposes. Loan facilities are not generally extended to the illiterate fishermen by financial institutions due to lack of awareness, inability to provide collateral security and for fear of non-repayment. Hence, they depend on informal money lenders who charge exorbitant rate of interest of 5-10% of daily catch, to meet day-to-day expenses. It leads them to lifelong indebtedness and erosion of income. The practise of bonded labour system is still in vogue for obtaining debt from the owner of the fishing vessel by pledging their labour. If the fisherman owns a fishing unit by taking informal credit and fails to repay the amount, he is forced to mortgage the fishing implements to the creditor, the middlemen or sell off. Both middle man and educated fisherman enjoy loan facilities from banks and Cooperatives societies. As per the primary survey 2008, it was reported that 69% of fishermen was indebted and the per capita debt was Rs 75,000/-. The cooperatives have to be strengthened to meet the credit needs of fishermen taking into account, the incapability of the fisherfolk to find out collateral security because of landlessness. All the active fishermen shall be brought under the umbrella of fisheries cooperatives. There are 780 fisheries cooperatives functioning in the State but lion's share of the active fishermen are outside the institutional mechanism of fisheries co-operatives. The remaining active fishermen shall be linked with the present cooperatives or organized by creating new cooperatives. Erosion of income as exorbitant interest can be prevented by providing more credit support to the fishermen through the co-operative societies.

Protections from the Exploitation of Middle Men

169. The exploitation of fisherfolk by the middlemen during auctioning and marketing of fish is attributed as a major reason for their meager income. The auction commission collected by the middle men in different ways leads to the erosion of income at different level. Generally 3-5% of fish catch value is collected as auction commission, but it is up to 18% in certain parts of the state.

170. The fisherman could realize only 50-70% of the market value as the beach price. The significant difference in the price of fish at the beach and market indicates the involvement of more intermediaries. Better price can be ensured by reducing the number of intermediaries. The fisheries co-operatives can play a major role in this regard. The fisheries co-operatives affiliated with Matsyafed manage only 10-12% of the fish catch for primary sale with the participation of 44,906 fishermen (2012-13) of 252 fisheries co-operatives. It can be observed that the fishing groups which have not taken loan from fisheries co-operatives are not participating in the auction conducted by them. It may be due to the collection of 5% auction commission of which 1% each is contributed to the auctioneer, fisheries co-operative society and Matsyafed and the remaining 2% as savings of the fisherman. The 1% contribution to Matsyafed may be discontinued by compensating it with special grant by the State Government for meeting their administrative cost. Besides, production bonus can be given to attract more fishermen in the auction system practiced through the fisheries co-operatives.

Money Saving Habits

171. The fisherfolk, by nature, don't save money and spend it on the same day itself by mismanagement and over expenditure. On days of no catch, fisherman demand cash for alcohol from their wives. This leads to miserable situations at home and their children especially the school going, are often the victims of this domestic violence. Erosion of income can be prevented by promoting money saving habit. Saving cum Relief scheme is being implemented to enhance saving habits of fisherman which would make them confident in repaying the loans and also serve as a reserve for use in the lean season. 1,83,851 fishermen enrolled under the scheme during the year 2015-2016.

Campaign against the Use of Alcohol and Drugs

172. The amount spent for alcohol by fisherfolk is four times than that in rural Kerala. As a custom, each fishing unit diverts a portion of their earnings for alcohol consumption. More than 50% of fishermen in Thiruvananthapuram and Alappuzha districts are habitual drinkers, while it is 27.1% if all fishing villages in the state are taken together. A change in attitude and behavioural pattern is necessary to reform the society. Programmes should be addressed at the grass root level to liberate the fishermen from the habit of alcoholism/un authorized drugs. The students can be diverted in to sports activities by providing infrastructure support and coaching, so that they will be engaged in it and will keep away from alcohol and drugs.

Shelter to Fisherfolk

173. Poor land ownership and poverty is the primary reason for poor housing conditions prevalent in fishing villages. The survey conducted in 2010 reveals that 16,359 fishermen are dwelling in thatched hut/shed and 12,850 are both land less as well as homeless. The number of thatched huts has reduced from 48% (1981) to 18% (2009). Possession of land among the fisherfolk is a critical problem. When new housing schemes are announced by the Government, the landless fisherman becomes unable to get the assistance. Regarding land holding, only 35% have more than 5 cents of land. In the coastal parts of the State, the density of population is around 2168 persons per square km which resembles to the slum of urban area. The attitude of fishermen against migration to landward side due to occupational, religious and communal reasons has changed after Tsunami disaster.

174. The CRZ notification also adversely affects housing of fisherfolk. 58.4 % of Fishermen households are residing within the area of 100 meters from sea coast where new construction or replacement of existing houses are restricted. It is more pronounced in Thiruvananthapuram and Malappuram districts where it is 84.6% and 79.8% respectively. 24.7% of total fishermen households are residing in the area between 100M and 200M from shore where only re-construction is permitted. It is estimated that there are 24,851 fishermen houses situated within 50 M distance from the sea shore. Out of it, 10,000 fishermen households are highly vulnerable to vagaries of sea including sea erosion. A special package is required to rehabilitate such fishermen who are interested to move from the vulnerable area to safer areas beyond 200 meter from sea coast.

Drinking Water Facilities

175. Scarcity of safe drinking water is a critical problem in fishing villages as the proximity to saline water makes the ground water unsuitable for human consumption. In many fishing villages higher content of Iron and higher count of coliform bacteria make the ground water unsuitable for human consumption. Water from open wells suitable for drinking purposes is available only in 38 fishing villages. Other fishing villages depend on public water distribution system which are available only at a few centres that too with erratic water supply. The survey report, 2009 revealed that there are 31,523 houses with no access to potable drinking water. There are about 117 fishing villages which are in urgent need of drinking water supply which have already been taken-up by the Government through Kerala Water Authority.

176. Most of the drinking water projects commissioned for coastal area is not functioning well. In some places, capacity of pumping station and overhead tank is seen as not compatible with respect to quantity of water required. In some cases, old pipe lines aren't in a position to withstand higher water pressure. Lack of servicing the motor pumps is also a major reason for the failure of the project. Jalanidhi project could not fetch the desired results in the coastal area, since the cost of operation and maintenance has to be met by the user community. In a few fishing villages, rain water harvesting project have been introduced, but due to mismanagement and people's scepticism on quality. They are not in working condition. These issues can be addressed by implementing a Comprehensive Drinking Water Supply Project including the establishment of de-salination plants.

Sanitary Environment

177. Occurrence of food poisoning and other contagious diseases are common in coastal areas. It is mainly due to open defecation and careless disposal of human excreta which contaminates water. Poverty and lack of awareness are reasons for the condition. Around 31% of fishermen households have latrines with septic tank while 29% have pit latrines and the remaining 40% depends on public comfort station or perform open defecation. As per 2010 survey, there are 23,335 households without any type of toilet facilities. Financial assistance and awareness is required to alter this pathetic situation. In a few cases where the fishermen habitats are congested, community latrines can be considered.

178. The coastal environment gets polluted with the waste dumped upstream as well as that thrown into the sea at shore. Nowadays, it is quite common to see that most of the beaches and coastal waters are heavily polluted with solid waste including plastic materials. In the coastal area, there is no effective mechanism for management of the solid waste. Eco-friendly solid waste disposal system by biological means for degradable materials and disseminator for non-biodegradable materials can be adopted to solve the problem.

179. Drainage plays a multi-dimensional role in maintaining the hygiene and sanitary conditions in the fishing villages. They also prevent water logging during monsoons. Absence of proper drainage system results in aggravating the ill-effects of water logging, and makes the life of the fisherfolk quite miserable. There are about 90 fishing villages which lack proper drainage facilities. Total sanitation program is essential for the entire fishing villages of the State.

Electric Power

180. There is remarkable improvement in the proportion of electrified houses from a mere 10% in 1981 to 93% in 2009. It is reported that there are about 12,562 non- electrified houses in the fishing villages of the State. Low voltage and voltage fluctuations are the common problems faced by the inhabitants of the coastal area. Establishment of transformers along with line extension/ conversion is required. Government has taken-up 65 projects to address the issues through KSEB. Though majority of the fishermen live in small houses with a few electric gadgets, often the electricity bill they get is huge. This can be attributed to poor electrification done in the past. This often makes the financial condition of the fishermen worse. Hence an energy audit has to be conducted and proper rectification measures are to be introduced.

Health-Occupational Hazards

181. Poor housing conditions, non- availability of safe drinking water, lack of total sanitation coverage, improper waste disposal, unscientific drainage systems etc adversely affect the health of the fisherfolk and 7.6% of them suffer from serious health problems. Incidence of water borne diseases, skin diseases, cancer, tuberculosis, stroke, paralysis, filariasis, mental disorder etc are considerably high among fishermen compared to the general population. The frequent occurrence of water borne diseases like diarrhoea, dysentery, cholera and typhoid are clear indicators of the poor health and sanitary conditions prevailing in the area. The fisherfolk also succumb to their job oriented ailments like rheumatism, body pain and gynaecological problems. This situation reduces the number of effective working days and life span.

182. Many of fishermen are unable to benefit from the public health care system. For meeting expenses connected with medical treatment and delivery, they rely on local money lenders who charge exorbitant interest rate. There are cases that people stop treating the disease, after sometime when they think that the expense exceeds their financial capacity. On an average, annually people spend Rs 500-3600 for acute diseases and Rs 7,000 to 16,000 for chronic diseases. Medical insurance is taken by only 35.82% of total households. The existing coastal health centres have poor infrastructure facilities and the doctors often hesitate to work there. Recently the State Government has taken-up steps to provide adequate infrastructure facilities to 54 existing hospitals.

183. Excessive consumption of liquor and its addiction is quite widespread in the coastal area, which has also become a major health hazard and is the root cause of the socio-cultural impoverishment of the community. Persons having the age of 60 and above just constitute only 6.19% indicating the lesser longevity of the fisherfolk. Effective man days and longevity of fisherman can be enhanced by ensuring good health. Good health care to fisherman can be assured by providing sufficient man power and infrastructure facilities in the coastal hospitals. Conduct of extension programmes, medical camps with continuous follow-up and tie-up with super speciality hospitals may ensure good health care to fishermen.

184. The health conditions of the fishermen community are very poor compared to the general public. Health condition of the fisherfolk are often neglected due to lack of awareness and their hectic work. Owing to these reasons they are prone to many types of diseases. Significant erosion of income can be noticed among fisherfolk for the treatment of diseases. In order to address this issue a comprehensive health insurance scheme has to be formulated and all the fishermen should be brought under its purview or under Rashtiya Swasthiya Bima Yojana (RSBY) to improve the financial security of the family as well. RSBY has been launched by Ministry of Labour and Employment, Government of India to provide health insurance coverage for Below Poverty Line (BPL) families. The objective of RSBY is to provide protection to BPL households from financial liabilities arising out of health shocks that involve hospitalization. Beneficiaries under RSBY are entitled to hospitalization coverage up to Rs 30,000/- for most of the diseases that require hospitalization. Government has even fixed the package rates for the hospitals for a large number of interventions. Pre-existing conditions are covered from day one and there is no age limit. Coverage extends to five members of the family which includes the head of the household, spouse and up to three dependents. Beneficiaries need to pay only Rs 30/- as registration fee while Central and State Governments pays the premium.

Education & Literacy

185. Educating the new generation of the fisherfolk is the fundamental solution for poverty reduction. Education makes a person more efficient in using the available financial resources. Often, fishermen give less importance for the education of their children. Educational rate of fishermen population enhanced from 23.2% (1980) to 72.80% (2005), but the rates of drop outs in primary classes remain in between 12-15%. The children are often forced to involve in fishing even at the age of 12 years for assisting their elders. Hence, it is highly important to provide awareness to the parents about the importance of education and its magical transformation role in moulding the future generation. It is reported in 2009 that only 34.21% of students from fisherfolk having study facilities at home. Even though the general population of the State is attaining remarkable change in technical/professional education in the last decade, fishermen population stays aside due to the lack of effective interventions. Nonetheless, in higher education above the higher secondary level, and especially, in the post-graduation, technical and professional education, the community depicts a more distracted situation. Hence, sufficient scaffolding has to be given to the students from fishermen family so that they may be able to compete with general population. In such a predicament, a concerted effort is to be made urgently to bring up the fisherfolk into the educational standard of the general population. The children of fishermen may get better employment in other sector if better education facilities are given to them.

186. There are 246 lower primary schools, 122 upper primary schools, 58 high schools and 62 higher secondary schools existing in the fishing villages. It is pity to note that 123 marine fishing villages have no facility under Government or Aided sector for the high school education of fisherfolk children in and around 5 KM radius. Despite several programmes for improving the educational infrastructure in the State, the coastal villages, particularly the fishermen habitations have not received adequate attention till date. Inadequate infrastructure, poor maintenance, lack of modern educational provision etc. are some of the deficiencies to provide quality education. The physical infrastructures of most of the coastal schools are abysmally poor.

187. In the year 2011, 93.92% of Kerala population was literate. However the fishermen community of Kerala is an outlier to this trend. Average literacy among the fisherfolk is just 85.84%. Among active fishermen the literacy rate is only 60-70%. It creates a major hindrance in creation of awareness

among fishermen through various means of IEC. Regular reading habit exists only in 18% of fishermen households and most of the subscription of newspapers is only due to compulsion by political parties or religious institutions. The pitiable level of reading habits makes the fishermen vulnerable to socio-political awareness and participation. It is a pity that more than 20% of fishermen population is unaware of various welfare schemes implemented by the State Government, particularly fishermen of Thiruvananthapuram, Malappuram and northern parts of Kasargode districts.

188. Effective strategies should be taken to ensure 100% enrolment for education at the age of 5 plus and arrest dropouts at least up to the higher secondary level. The community should be made aware of the role of education in socio-economic development. Study centres for the students among fisherfolk should be established so that proper and effective study habits are developed and educational interest maintained with the help of extension staff. Selected coastal schools may be adopted to provide more focused quality education. Promote regular reading habits among fisherfolk by establishing libraries or reading rooms. Special coaching programmes can be imparted to the youth of fisherfolk for various competitive examinations. Special assistance for education should be given to the children of fishermen.

Vulnerability & Risk Mitigation

189. The peculiar oceanographic and climatic conditions increase the casualties of lives and properties of fishermen particularly during the monsoon season. According to FAO, the marine fishing industry is one of the most accident prone occupations. The annual death rate while fishing is 20 times higher than the overall occupational fatality rate. In the year 2014, it is reported that 101 fishermen lost their lives while fishing at sea. In this context the Government is giving greater attention for risk mitigation by providing sea safety equipments, conducting sea rescue operations and providing group accident insurance coverage. Possibility of implementing life insurance in association with AABY has to be explored. There are no effective programmes to compensate the damage caused to fishing units due to adverse climatic factors. The present fishing craft insurance scheme seems to be not attractive to the fishermen. The fact that most of the fisherfolk settlements are not far off from the sea increases chances of damage to the houses and erosion of land during rough seasons. A comprehensive insurance scheme for the fishing inputs and houses of fishermen against seaquake can be implemented.

Coastal Roads

190. The road connectivity in coastal areas is very poor even though the road connectivity in Kerala is generally high. The primary survey 2009 indicated the need for construction of all-weather roads to an extent of 583.48 kilo meters across nine coastal districts. Even though an amount of Rs 50 Crore is being spent annually by the Government, the reflection in the coastal village is not felt very much. Formation of coastal roads shall be restricted within the boundaries of fishing villages with the nearby service road.

Investment on Fishing Implements

191. The unhealthy competition among the fishing units for the limited fish resources has resulted in over capitalization of the sector and made fishing a non-profitable activity. Introduction of larger fishing vessels with high powered engines and larger fishing gears have increased the venture cost considerably. The per capita investment on fishing implements per active fisherfolk in motorised

sector escalated from Rs 26,000 in 2005 to Rs 98,000 in 2011. But, net annual labour earnings per active fisher man for the same sector came down from Rs 50,491 in 2005 to Rs 16,520 in 2013 (Source-CMFRI study report). Hence, over investment has to be controlled.

Climate Change

192. Coastal communities, fishers and fish farmers are profoundly affected by climate change. Rising sea levels, acid oceans, droughts and floods are the main impacts of climate change. The buildup of carbon dioxide and other greenhouse gases in our atmosphere is changing several of the features of the earth's climate. Oceans are the earth's main buffer to climate change and will likely bear the greatest burden of the impacts on climate change and fishers and coastal people are on the front line. The fisheries sector has distinct interactions and needs with respect to climate change. Capture fisheries has unique features of natural resource harvesting which are linked with global ecosystem processes. Climate change is already affecting the seasonality of particular biological processes, altering marine and freshwater food webs, with unpredictable consequences for fish production. Increased risks of species invasion and spreading of vector-borne diseases provide additional concerns. In this context livelihood strategies will have to be modified. The reduced livelihood options inside and outside the fishery sector will force occupational changes and may increase social pressures. Livelihood diversification is an established means of risk transfer and reduction in the face of shocks, but reduced options for diversification will negatively affect livelihood outcomes. There are particular gender dimensions, including competition for resource access, risk from extreme events and occupational change in areas such as markets, distribution and processing, in which women currently play a significant role. The implications of climate change affect the four dimensions of food security 1) availability of aquatic foods will vary through changes in habitats, stocks and species distribution 2) stability of supply will be impacted by changes in seasonality, increased variance in ecosystem productivity and increased supply variability and risks 3) access to aquatic foods will be affected by changes in livelihoods and catching or farming opportunities and 4) utilization of aquatic products will also be impacted.

193. Fisheries play important roles for food supply, food security and income generation. Food quality will have a more pivotal role as food resources come under greater pressure and the availability and access to fish supplies will become an increasingly critical development issue. Food security in fishing communities will be affected by climate change through multiple channels, including movement of people to coasts, impacts on coastal infrastructure and living space and through more readily observed biophysical pathways of altered fisheries productivity and availability. Indirect changes and trends may amplify or even engulf biophysical impacts on fish ecology. The capacity to adapt to climate change is unevenly distributed across and within fishing communities. Patterns of vulnerability of fisherfolk to climate change are determined by capacity to adapt to change. Building adaptive capacity can reduce vulnerability to a wide variety of impacts. There is a wide range of potential adaptation options for fisheries, but considerable constraints on their implementation for the actors involved, even where the benefits are significant. The government interventions may be trade-offs between efficiency, targeting the most vulnerable and building resilience of the system.

Coastal Disaster Management

194. The coastal zone is prone to natural calamities and threats. In fact this area can be treated as a danger zone. A well-equipped disaster management mechanism should be kept ready with all amenities to meet the challenges both in the sea and land.

Social Mobilization

195. There have been improvements among fishermen from their previous levels, but still lag behind the general population. Even after implementing many schemes for the socio-economic development of fishermen, the achievements are not promising as expected. It may be due to lack of proper planning, wrong selection of beneficiaries, non-participation of community and deviation from guidelines during implementation. In many coastal villages, the information about welfare programmes is not reaching the real beneficiaries. Hence, full-fledged extension support and awareness campaigns are required which are essential to ensure the success of the community development programme a success. It can motivate and help to reduce the number of drop outs from school classes and in curing diseases. The educated youth of fishing villages can be engaged to provide continuous extension support after giving intensive training.
196. Grass root level socio up-liftment programmes for a decent living and awareness on the need to save money, alcohol de-addiction, parenting, family bond etc to fishermen; importance of self-actualization and self-earnings to fisherwomen and need of education, focus in life and human values to the children shall be conducted.
197. Social mobilization will be conducted by engaging fishing village level community motivators as done in the case of scheduled tribes. The programme includes medical camps, prevention of drop-outs from primary education, awareness creation, campaign against use of alcohol/ drug etc.

Approach for Good Governance

Promotion of Innovative Ideas

198. There will be mechanism to give awards/ incentives to officers of the department and progressive farmers who bring in positive changes in the fisheries sector or develop innovative technologies/ models which help in increasing the production, lowering the costs, improvements in service delivery etc. These recognitions motivate the individuals and inspire others.

Dissemination of Information through Mobile Applications

199. M S Swaminathan foundation has developed a mobile phone based information providing mechanism to the fishermen of states like Gujarat and Maharashtra. The fishermen get information about INCOIS data, location etc. through this mechanism. This type of cost effective simple mechanisms will be introduced in Kerala once new Ocean sat is launched. Details of fishermen welfare activities can be provided through mobile applications. Timely and speedy transfer of new technologies, innovative ideas, location of potential fishing ground etc will be disseminated to the end users through mobile alerting system with the support of INCOIS and MSSRF. Electronic display boards on fish availability, weather forecast and market price for different varieties of fish at major fish landing centres of Kerala also is planned.

Call Centres

200. There is a need to strengthen Research Extension to farmer's and fisherfolk in linkages on issues related to Fisheries Information Technology and Communication play a vital role in Fisheries Extension Management to disseminate the technical knowhow to the end users. A state level model established in Andhra Pradesh – Parishkaram Model started in 2003 is a good model in this regard. It

should be replicated to the benefit of the fish farmers and fisherfolk. It will be very helpful for import information, address grievances, and for giving proper directions to the stake holders.

Modernization of Governance

201. There are a number of welfare schemes executed through the Department. Introduction of Direct Beneficiary Transfer ensures transparency of activities. It is faster and reduces chances of mismanagement.
202. The GIS packages viz. ArcGIS 10.0 and Satellite Image processing package viz., Erdas Imagine with Advanced survey equipment DGPS, handheld GPS etc developed and implemented by MSSRF is a new initiative in the socio economic study at village level. The high resolution satellite images such as LISS IV 5.8 meter has been used for the effective monitoring. The GIS and GPS Tool can be used for mapping the socio-economic status of the fishing villages. The technology can be utilized for the future survey in this regard. The service of an e- office system should be utilized for delivering speedy and timely service to the stake holders as part of the modernisation programme with the support of akshaya centres.
203. Approximately 15 Government Organisations are operating in the state in the fisheries sector apart from voluntary organisations. Multiplicity of the agencies often leads to duplication of activities and variations in findings. Clear demarcation of area of operation avoids wastage of resources and time. The possibilities of merging organisations of similar nature to single body may be explored.
204. A consultative body involving all government organisations engaged in the development and promotion of fisheries and aquaculture like MPEDA, KVK, ADAK State Fisheries department etc will be formed to streamline the promotional activities carried out in the state by various agencies to avoid duplication, multiplicity, discrepancies etc.; better resource utilisations and implementation of regulations, zonation etc

Matsyabhavans

205. Many of the Government's schemes especially the programmes for the development of fisherfolk is not reaching the real beneficiaries primarily lack of information about the programme even though the decentralized governance system in strength. The main lacuna in this field is the lack of grass root level office. At present all the programmes are being implemented at district level. The Matsyabhavan concept put forward in the 9th plan period have not yet materialised. The fishermen folk are not participating in the gramasabhas and even when they participate they do not know the real spirit, content and goal of the programme. The awareness about NREGA is also low. Hence effort will be taken in the 13th plan to promote awareness through TV and to strengthen the grass root level execution mechanism including the Matsyabhavans. The existing 100 Matsyabhavans and training centres are in a pathetic condition and are to be strengthened. There is no Matsyabhavans in the inland sector. It is proposed to establish additionally, 100 Matsyabhavans in a phased manner during the plan period.

Block Level Resource Centres

206. At present the extension mechanism of fisheries department is available in head quarter and at district level only. Thus the stake holders are not satisfied with the delivery of services. Aquaculture is the fastest growing food production sector in the world and has immense potential in our state

also. Even though the potential is there, the lack of effective extension mechanism is the main hurdle that pulls back the aquaculture promotion activities in the state. In the world scenario, aquaculture is considered as the main food production sector and also the sector that reduces protein malnutrition. Worldwide many research activities are going on for the diversification of aquaculture and the results are promising. The incorporation of these innovations in aquaculture in our state will definitely improve our fish production sector. In this context a cadre of technically as well as professionally qualified team is essential at the block level for disseminating the new technologies to the farmers. Hence block level resource centre with sufficient technical manpower are being set up for timely and prompt transmission of technologies. The Block level resource centre shall consider the vertical and horizontal integration of activities including the integrated multi trophic approach on aquaculture (IMTA).

Capacity Building Programme to Functionaries

207. Department of Fisheries and affiliated public agencies are a prime necessity for implementing modern fisheries development. Fisheries are a multi-disciplinary subject like agriculture and animal husbandry. Even though the fisheries sector has not been recognised within the country as a sector on par with agriculture or animal husbandry, fish and fish products are currently the highest traded commodity at global level. Kerala has a major chunk of this trade. On par with agriculture and animal husbandry, there is need for development of active professionalism in the fisheries/aquaculture sector.
208. One of the major setbacks in the fisheries sector in the State is recognised as lack of professionalism, while there are several ongoing technology development programmes. There is a multiplicity of public sector agencies besides Department of Fisheries, and in spite of rich aquatic resources and several development programmes in aquaculture and inland fisheries, the progress is slow. Public awareness and participation in sectoral development activities are inadequate. All present incumbents and new entrants should undergo training to begin with and periodically to update technical capabilities required for the new technologies. This HRD component needs an adequately long Induction training and periodic refresher training and Subject matter courses for all professional and technical staff at all levels. A special programme could be charted out for acquiring the newer technologies available abroad.

Fisheries Resource Mapping by the Application of Remote Sensing and Geographical Information System

209. Mapping of a fishery and the resources is of high priority when planning for fisheries management. FAO has produced a series of publications focusing on the necessary skills and procedures for mapping fishery resources, growing need of Geographic Information Systems (GIS) and its applications to fisheries. Remote Sensing and GIS provide the most modern tools for mapping of resources on earth and its water bodies. It has found newer applications in various sectors of inland and marine capture fisheries, and has been in use to aid marine fishing globally. Remote Sensing have a role to play in all geographic and spatial aspects of the development and management of aquaculture too. Satellite, airborne, ground and undersea sensors acquire many useful data, especially those on temperature, current velocity, wave height, chlorophyll concentration and land and patterns of water use. GIS is used to manipulate and analyze spatial and attribute data from all sources, and also to produce reports in map, database and text format to facilitate decision-making. Remote sensing is viewed as an essential tool for the capture of data subsequently to be incorporated into a GIS and for real time monitoring of environmental conditions for operational management of aquaculture facilities. Maps usually are one of the outputs of a GIS, but can be effective tools for

spatial communication in their own right. The applications could be organized issue-wise along the main streams of freshwater and marine aquaculture: culture of fishes in cages, culture of shellfishes and culture of marine plants. The major outcome of this study will be a report, providing up-to-date baseline information on inland and coastal water bodies - fisheries and aquaculture resources including human resources – existing level of utilisation and future potentials; existing facilities and manpower administration & development; extension and research; education and training and manpower. The department should also develop a dependable survey method to collect the marine and inland fish landing/production in the state.

Research and Education at KUFOS

210. The KUFOS is an autonomous institution functioning under Government of Kerala for providing human resources, skills and technology required for the sustainable development of Fisheries and Ocean Studies. KUFOS imparts quality education comparable with world class standards giving significance to research oriented studies with effective meaningful and rewarding extension activities. The academic excellence is intended to be attained by undertaking graduate and post graduate teaching and research programmes in emerging disciplines of fisheries science. The main courses offered by the University are BFSc, MFSc and PhD in Fisheries subjects. Besides, the following courses are also offered by the University.

M.B.A. with Specialization in Finance, Marketing, Human Resource Management,
Rural Management and Fisheries Business Management

MBA in Energy Management

M.Sc. Biological Oceanography and Biodiversity (BO&BD)

M.Sc. Physical Oceanography and Ocean Modelling (PO & OM)

M.Sc. Food Science & Technology

M.Sc. Statistics

M.Sc. Ocean Remote Sensing and GIS

M.Sc. Applied Geo-Sciences

M.Sc. Bio-Technology and Bio-Informatics

M.Sc. Marine Micro Biology and Marine Drugs

M.Sc. Climate Science

M.Sc. Disaster Management

MSc. Marine Chemistry

L.L.M. -Maritime Law (Evening programme)

M.Tech in Integrated Coastal Zone Management

M. Tech in Ocean and Coastal Safety Engineering

M. Tech in Coastal and Harbour Engineering

M. Tech in Fisheries Engineering

211. Instead of starting new courses outside the mainstream of fisheries development, the University will focus on providing quality education in the field of fisheries following the ICAR norms. During the 13th Plan, it is proposed to establish two University centres at Kollam and Kannur with emphasis on producing more fisheries professionals. The university will be equipped with state of art facilities to carry out research.

212. The University must be cautious in constituting Chairs and Centres of excellence. Now they are financed from Plan fund provided by Government. Moreover, existing Centres are part of departmental activities. Hence they should be strengthened using alternative sources of funds. Measures need to be taken to align research activities of the University with the field requirements as

brought forward by Fisheries Department. Apart from speeding up infrastructure construction, KUFOS has to play a greater role in extension and support to the fisheries sector in the state. Management of the Health of Fish is an area where the University has to provide greater focus.

CHAPTER 4
PROPOSALS FOR 13TH FIVE YEAR PLAN

213. The strategy for Fisheries Development during the 13th Five Year Plan is focused on sustainable practices in fish production and socio-economic development of fisherfolk based on the following.

Marine Sector

Management of Marine Fishing

214. To reverse the declining trend in marine fish production noticed during the 12th plan period principally owing to over fishing, failure in recruitment, habitat degradation, juvenile fishing and climate change a system of fisheries management based on sound management principles will be evolved and implemented. Conservation of aquatic resources, adoption of an ecosystem based approaches, prevention of water pollution, adoption of responsible fishing practices, effective surveillance, participatory approach etc will form the core of such a management system. To ensure sustainable development of the sector to keep meeting the nutritional requirement of masses, contributing to national economy and providing livelihood to fisherfolk such an approach is a felt need. The activities identified are –

1. Strict surveillance of KMFR Act & sea patrolling
2. Online registration and licensing of fishing vessels
3. Co-management of marine fishery resources
4. Holographic registration plate and vessel tracking devices
5. Establishment of new fisheries stations
6. Installation of communication network
7. Fitting surveillance cameras in the fishing harbours and fish landing centers
8. Establishment of marine protected area and artificial reef
9. Ranching of fish seed for stock enhancement

Deep Sea Fishing

215. Even though the marine fisheries in the inshore areas is over capitalized, vast scope exists for fishing the offshore and deep sea areas. It is proposed to increase fish production by extending fishing to offshore and deep sea areas.

Sea Safety Equipment

216. Assistance for the procurement of sea safety equipment such as VHF Marine Radio, Global Positioning System, Echo sounder, Life jacket, Automatic Identification System (AIS) and Satellite based radio beacon is proposed.

Marine Ambulance

217. As per World Labour Organization, marine fishing is the most hazardous occupation. In Kerala, it is reported that about 100 fishermen lose their lives every year during fishing at sea. Besides, more than 4000 lives of fishermen were saved using the existing facilities. Hence a full-fledged rescue operation programme is essential for minimising the death rate while fishing at sea. It is proposed to establish Marine Ambulance connected with all fisheries stations for carrying out sea rescue operation quickly

and effectively. The Marine Ambulance will be a steel boat with specifications suited for sea rescue operations preferably designed and fabricated locally to ensure hassle free maintenance.

Insurance Coverage for Fishing Implements

218. Insurance coverage for fishing implements in traditional sector is proposed. The assured value of insurance is agreed value or Rupees five lakh whichever is less. In the current plan period 10,000 traditional fishing units are targeted to be insured. 90% premium will be met as Government share.

Intra Sector and Inter Sector Conflicts

219. To ensure peaceful and harmonious life of fisherfolks, intra sector and inter sector conflicts among the fisher groups will be resolved in a conciliatory and democratic way.

Management of Inland Fishing

220. The inland fish resources of Kerala faces various threats due to loss of habitats, habitat modifications, over fishing, use of destructive fishing methods, water pollution, in discriminates and mining, introduction of exotic fishes, eutrophication, proliferation of aquatic weeds etc. India. d to augment fish production from the inland water. Appropriate management strategies should be evolved to tackle the situation and to augment fish production from the inland water bodies. Some of the strategies are:

1. Natural stock enhancement by ranching of hatchery produced seeds of shrimps, fresh water prawn, Pearl spot, Grey Mullet, Milkfish, Mahseer, Murrels, catfishes
2. Regular Patrolling for the prevention of illegal fishing should be done
3. Co-management of fish resource can be done through Fishery Management Councils (FMCs)
4. Ensuring natural stock recruitment by conservation and management of natural breeding grounds, establishment of fish protected area and artificial habitat.
5. Conservation of the wetlands, paddy fields, canals and other inland aquatic eco systems. The damaged aquatic ecosystems should be restored by adopting scientific interventions
6. The weed infested water bodies may be reclaimed. Possibilities of conversion of the aquatic weeds to value added products may be explored.
7. Water bodies may be reclaimed by regular de-silting.
8. Conversion of water bodies for tourism will not be permitted. However community based environment friendly aqua tourism may be promoted without affecting the water bodies.
9. Mangrove afforestation programmes will be taken up to conserve the natural breeding grounds of fishes with the support of fishers.
10. Fish sanctuaries/ fish protected areas will be set up in selected rivers/ backwaters to conserve fish resources
11. Action will be taken to conserve fish bio diversity and to protect indigenous fishes from extinction.

Aquaculture

Seed Production

221. The main constraint in fish farming is lack of quality fish seed. Presently, fish seed requirement of the state is around 12 Crore, but the existing production capacity is 362 lakh only. Self-sufficiency in fish seed production is targeted during the present plan period. Seed production centres for Carps,

Tilapia, Mahseer, Murrels, Cat fishes, Barbs, Grey Mullet, Milk fish, Pearl spot, Sea bass, Silver pompano, Cobia, Green Mussel and Mangrove crab etc will be established to ensure timely supply of fish seeds.

Diversification of Culture System and Species

222. During previous plans, the strategy was to increase production by extending aquaculture activities into more areas. Now new technologies are available from the Central Institutes to enhance productivity. The target over 13th plan period is to double the aquaculture production by extending aquaculture to new areas and by improving the productivity of existing farms. The components include -

1. Construction of new ponds/ Renovation of existing ponds
2. Enhancement of productivity of existing farms
3. Cage farming/ pen culture in backwaters, open ocean, reservoirs and ponds
4. Re-circulatory aquaculture
5. Polyculture of brackish water fishes
6. Culture of indigenous fish
7. Integrated farming
8. Farming of Shrimp, Prawn, Mussel, Oyster, Mud crab, Lobster etc
9. Mass production of ornamental fishes and aquarium plants
10. Alternate aqua farming with paddy in Pokkali fields, Kole lands, Kaipad, and Kuttanad.
11. Establishment of demonstration farms
12. Utilization of suitable otherwise unutilized wetland areas for ecosystem based aquaculture.

Aquatic Animal Health Lab

223. Aquatic animal health laboratories will be set up for disease diagnosis and management and for inducting innovations of biotechnology and nanotechnology into aquaculture. District level fish disease diagnosing team will be constituted for the effective disease surveillance and aquatic health care. These systems will be linked to the available national networking programs, where ever possible.

Feed Mill for Species Specific Feed

224. Adequate number of feed mills will be established for the production of high quality, species specific fish feeds.

Ornamental fisheries:-

225. Hatcheries for the production of high value ornamental fishes will be set up.

Management of Post-Harvest Activities

Development of Cold Chain

226. It is estimated that around 20% of total fish catch is discarded as spoiled/trash fish. Spoilage can be reduced to a larger extent by ensuring proper preservation, storage and distribution of fish. A cold chain network from the fishing boat to the consumer may be established which includes insulated boxes in fishing craft, chilled storage facility at landing centres, harbours and whole sale markets for

hygienic handling and proper storage, and insulated vehicles for better transport and hygienic fish sales outlet /fish markets at the end point.

Quality Assurance & Value Addition

227. In order to ensure quality of fish in marketing network strict enforcement of food safety norms should be ensured. It also includes components for the establishment of fish processing centers, fish drying units, value added fish production units, ice plants, cold storages and auction halls.

Development and Management of Fishing Harbours

228. The focus in the 13th five year plan regarding fishing harbours will be the modernisation existing fishing harbours for obtaining EU approval and to making all the on-going fishing harbours as functional. Harbour management societies will be formed for the effective management of fishing harbours. A special drive will be done for obtaining EU approval for a minimum of 10 more fishing harbours.

Development of Coastal Area

Rehabilitation of Fishermen and Coastal Protection

229. The vagaries of monsoon and resultant sea erosion lead to loss of properties and dwelling habitats of fisherfolk which frequently disturbs their social life. As a perpetual remedy, rehabilitation of the fishermen to safer areas is envisaged. It is estimated that there are 24,851 fishermen houses situated within 50 M distance from the sea shore. Out of it, 10,000 fishermen houses are highly vulnerable to sea quack and sea erosion. A special package is required to rehabilitate such fishermen who are interested to move from the vulnerable area to safer area which is beyond 200 meter from sea coast.

230. Action may also be taken to establish green buffer zone consisting of bio-shield of mangrove comprising Rhizophorasp., Bruguiera sp., Avicennia sp. and Exoecaria sp. and other vegetation such as Casuarina sp., Thespesia sp. and cashew nut plants along ecologically suitable coastal habitats in a massive manner with full support and active involvement of fisherfolk apart from constructing seawalls and groynes in the erosion prone zones.

Green Corridor in Coastal Belt

231. It is proposed to establish a road having 15 metre width along the entire coast line of Kerala by connecting all the fishing harbours and fish landing centres. The required land may be procured by giving compensation. The residents can be rehabilitated in two storied flats or individual houses, as model fishing habitats/townships.

Social Infrastructure Facilities

232. Primary social infrastructure facilities such as drinking water, sanitation, electric power, drainage canals and waste treatment systems etc are to be ensured in all fishing villages by giving due regard to the prevailing environmental conditions. Common facilities such as library, health facility, main roads, link roads, internet connectivity, culture centre, and disaster relief centre and crematorium in selected fishing villages will be ensured on a priority basis.

Development of Fisherfolk

233. The per capita income of fishermen is 69,202 (2015-16) against the state average of Rs 1,55,005. The poor socio-economic condition of fishermen is primarily due to educational, economical and cultural backwardness, abuse of drugs and chronic indebtedness at exorbitant interest rate. It can be addressed by providing educational/ coaching programmes, social mobilization programme, providing alternative livelihood opportunities, and credit support.

Educational/ Coaching Programme

234. The existing 10 Fisheries Technical Schools will be converted into Centres of Excellence for providing quality education to the children of fishermen at matriculation level. Educational assistance for post metric studies will be given on par with SC/ST/OEC students by providing financial support. Coaching programmes for competitive examinations like Medical entrance, Bank tests, All India Civil Service examination etc is proposed.

Alternative Livelihood Activities

235. The income level of fishermen can be enhanced by providing assistance for alternative livelihood activities including skill training and capital support. Theeramythri project implemented through women SHGs during last plan periods made a drastic change in the coastal area. It is proposed to continue the support to the remaining fisherfolk and to stabilize the alternative livelihood activities which received assistance during 12th Plan period.

Credit Support

236. It is proposed to ensure sufficient credit support to active fishermen groups through Matsyafed for securing fishing inputs and for raising capital for fish vending and alternate livelihood activities with a maximum ceiling of Rupees three lakh per fisherman. Matsyafed can secure credit from NCDC, National Backward Classes Finance Development Corporation (NBCFDC), National Minority Development Finance Corporation (NMDFC), NABARD, Nationalized banks etc and channelize them to fishermen group through Fishermen Development and Welfare Co-operative Societies. It is proposed to provide subsidy support to pay interest if the repayment is prompt.

Social Mobilization

237. Social mobilization includes engagement of community motivators (at fishing village level) for the development of fisherfolk, as done in the case of scheduled tribes. The programme includes medical camps, prevention of drop-outs from primary education, awareness creation, campaign against use of alcohol/ drug etc.

Saving Cum Relief Scheme

238. The scheme includes a component to provide relief to fishermen during lean season. An amount of Rs 1500 is collected from each beneficiary in 5 installments during the period from August to December. The Government will contribute Rs 3000 each and an amount of Rs 4500 is released to the fishermen in 3 installments during lean season which is May to July. The number of beneficiaries anticipated is about 183,000.

Group Insurance Scheme

239. A Group Insurance Scheme is proposed for the Active Fishermen in the State against accidental death, heart attack (while fishing at sea), missing, permanent and partial disability with the compensation of 10 lakh for death/missing/total disability and 5 lakh for partial disability. The group insurance scheme for the allied workers will be continued. Possibility for life insurance in association with AABY will also be explored. A comprehensive insurance scheme for the houses of fishermen against seaquake will be implemented.

Extension, Training and Service delivery

240. It includes components such as extension activities, training to the functionaries, good service delivery and e-governance.

Extension Activities

241. It includes conduct of awareness programme, exhibitions, seminars, workshops, and other IEC activities for the public.

Training to the Functionaries

242. The training to the functionaries includes in-service training and short term training on different aspects of fisheries with the help of reputed institutions within and outside State. The National Institute of Fisheries Administration and Management (NIFAM) will be strengthened for coordinating the training programme.

Good Service Delivery

243. It envisages to establish knowledge centres and digital display units in fishing harbours and hamlets with a view to disseminate satellite based information on weather changes, danger signals and forecasts on Potential Fishery Zones in time. Strengthening the service delivery mechanism for public grievance redress monitoring system (PGRMS), call centers, e-governance and video conferencing facilities etc. will be done.

Training Centres, Awareness Centres and Matsyabhavans

244. Many of the Government's schemes especially the welfare programmes to the fisherfolk are not reaching the real beneficiaries primarily due to lack of awareness about the programmes. The main lacuna in this field is the lack of support from grass root level administration. The matsyabhavan concept put forward in the 90s is yet to materialize. The fishermen folk are not participating in the gramasabhas and are unaware of the real spirit, content and goal of the programme. The awareness about NREGA is also low. Hence primary idea in the 13th plan is to promote awareness through TV and strengthening the grass root level execution mechanism including the Matsyabhavans. The existing 100 Matsyabhavans and training centres will be strengthened. 100 more Matsyabhavans will be established including those in the inland sector, in a phased manner during the plan period.

Traditional Knowledge of Fishermen

245. It is to realize and recognize the significance of indigenous technical knowledge among traditional fishermen. Such unique and valuable skill, knowledge and wisdom acquired by the fisherfolk, their practices, customs and heritage need to be conserved documented and archived in an appropriate manner for the benefit and use of future generations.

Research and Education at KUFOS

246. It is to continue the ongoing fisheries education and research programmes of the University. Ongoing activities for development of Infrastructure will be completed in a time-bound manner. KUFOS will play a lead role in the development of Fisheries research in the state taking into consideration the requirements as identified by Fisheries Department. At the same, the University will be a vital part in ensuring that the findings of research reach the fishing sector of the state. Synergy will be developed between education and research under KUFOS on one hand; and the governmental activities and those of private sector including individuals on field in the sector, on the other. Instead of starting new courses outside the mainstream of fisheries development, the University will try to consolidate the progress made so far. If required, the University may establish two ICAR supported University centres, preferably at Kollam and Kannur. The emphasis will be on producing more fisheries professionals.

Strengthening of Database, Monitoring & Evaluation

247. There will be a cell at the directorate with the experts in fisheries and statistics for conducting monitoring and evaluation study on various interventions by the Government in the fisheries sector.

It includes

1. Marine fish catch assessment survey
2. Inland fish catch assessment survey
3. Survey and updation of data on inland water bodies
4. Census of fishing vessel and gear
5. Fish market survey & collection of fish price
6. Socio-economic survey of fishermen
7. Monitoring and evaluation of schemes

CHAPTER 5
FINANCIAL REQUIREMENT FOR 13TH FIVE-YEAR PLAN PERIOD

248. The total financial requirement during the 13th Plan period for fisheries and coastal area development will be Rs 3300 crore. Scheme wise requirement is shown in the table 56.

Table 56

SI.No	Name of the scheme/ component	Head of Account	Year wise tentative fund requirement (in lakh)					Total Amount in lakh
			2017-18	2018-19	2019-20	2020-21	2021-22	
Conservation and Management of Inland fish resources								
1	Management inland fishing	2405-00-101-62	500	500	500	500	700	2700
Aquaculture development								
2	Fish Farms, Nurseries and Hatcheries-O&M	2405-00-101-87-34	1000	1000	1000	1000	1000	5000
3	Fish Farms, Nurseries and Hatcheries-Capital development	4405-00-101-95-34	1000	1000	1000	1000	1000	5000
4	Development of aquaculture	2405-00-101-NEW	5400	5600	5400	6600	8000	31000
Marine fisheries								
5	Conservation and Management of marine fish resources	2405-00-103-91	500	600	650	750	1000	3500
6	Sea safety and promotion of deep sea fishing	2405-00-103-79	300	300	300	300	500	1700
7	Subsidy for Marine Fishing implements	2405-00-103-NEW-33	100	100	100	100	100	500
8	Marine Ambulance for sea rescue operations	2405-00-103-86	200	400	400	600	200	1800
9	Insurance coverage for marine fishing implements	2405-00-103-NEW	100	500	500	1000	1500	3600
10	Strengthening of database & GIS for fisheries sector (100% CSS)	2405-00-103-NEW	50	50	50	50	50	250

Post harvest activities								
11	Management of post harvest activities	2405-00-105-NEW	1800	2000	2000	2000	2200	10000
Social security to fishermen								
12	Saving cum relief and Group insurance for fisherman	NEW	6600	6800	7000	7200	7400	35000
Extension, Training & Service delivery								
13	Extension, Training & Service delivery	2405-00-109-NEW	300	300	300	500	500	1900
14	Training center & Matsyabhavan	4405-00-109-NEW	250	300	300	450	900	2200
Fishing harbours & Management								
15	Completion of on-going fishing harbours	4405-00-104-NEW	4000	4500	5300	5500	7000	26300
16	Investigation of new fishing harbours and landing centers	4405-00-104-83	250	300	350	400	400	1700
Kerala University of Fisheries & Ocean Studies								
17	Research & Education	2405-(NEW)	3000	3200	3200	3500	3500	16400
RIDF								
18	Infrastructure development of rural coastal area	4405-00-NEW	6000	6000	6000	6800	7000	31800
Basic infrastructural facilities								
19	Rehabilitation of fishermen by providing land and house Sanitation, drinking water, electric power, libraries, health facilities,	4405-00-NEW	15000	18000	21000	22000	24000	100000
20	Fisheries Technical schools, Share capital assistance	4405-00-NEW	3000	3000	4500	5500	5700	21700
Human development of fisherfolk								
21	Theeramythri support and Microenterprises	2405-00-NEW	700	1000	1000	1200	1300	5200
22	Education to	2405-00-	1500	1500	2000	2400	2600	10000

	children of fishermen	NEW						
23	Social mobilization programme	2405-00-NEW	300	300	300	300	300	1500
24	Subsidy and support to pay interest against loan	2405-00-NEW	500	500	500	700	750	2950
25	NCDC assisted Integrated Fisheries Development Project	6405-00-195-99	1650	1650	1650	1650	1700	8300
	TOTAL		54000	59400	65300	72000	79300	330000

CHAPTER 6
OUTPUT/ OUTCOME

1. It is targeted for 6% annual growth rate (Constant price) in the GDP from fisheries sector by enhancing total fish production from the existing 7.5 lakh MT to 9.5 lakh MT over the period of 13th five year plan by adopting scientific management principles.
2. The marine fishing potential of the state is estimated at 7.95 lakh (AG Kalawar 1989). The marine fish production has declined from 5.98 lakh ton (2007) to 5.17 lakh ton (2016). During 13th plan period, it is targeted to enhance annual fish production to a level of 6.7 lakh tonne by adopting modern management principles including strict enforcement of KMFR Act through the existing 5 and new 4 fisheries stations.
3. The aquaculture production will be enhanced from the present level of 40,000 MT to 80,000 MT over a period of three years by extending farming to new areas, improving the productivity of the existing farms, species diversification and by adopting the innovative technologies and integrated approaches such as Cage farming, Pen culture, Re-circulatory aquaculture etc with an annual growth rate of 19%.
4. It is estimated that 18% of total fish catch is discarded as trash fish/ spoiled fish. During the 13th plan it is targeted to reduce fish wastage by 8% by establishing a cold chain network from the boat to the consumer. Quality assurance of fish and fishery product has also ensured.
5. The State will attain self-sufficiency in fish seed production by establishing new hatcheries/seed farms and creating additional infrastructure facilities in the existing ones.
6. District level disease management team and 8 aquatic animal health labs will be established for ensuring the quality of fish seed and to manage fish diseases.
7. The fish production through inland fishing will be stabilized by conservation of indigenous fish stock and by protecting the ecosystem.
8. All fishing harbours under construction will be commissioned during 13th plan period and will be managed effectively by forming harbour management societies. A special drive will be done for obtaining EU approval for a minimum of 10 additional fishing harbours.
9. Two more University centres will be established preferably at Kannur and Kollam under Kerala University of Fisheries and Ocean Studies to meet the requirement of fisheries professionals in the State.
10. The per capita income of about 80% fishermen is less than Rs 12,000. It is targeted to enhance the per capita income of the entire fishermen so that they can be brought above poverty line during 13th plan period by implementing a comprehensive package.
11. A special package will be implemented to provide safe shelter to 10,000 fishermen families who are either landless or highly vulnerable to sea quack. It is anticipated that there will not be any such fishermen after the 13th plan period.
12. All the major fishing villages should be provided with safe drinking water, sanitation facilities, electric power, library, health and education facilities.
13. All educational assistance will be given to the children of fishermen for post metric studies on par with those of SC/ST. Coaching programme for competitive examinations will be implemented.
14. Comprehensive health insurance scheme in association with RSBY, life insurance in association with AABY, Group accident insurance and calamity insurance against houses fishing units and will be implemented.
15. The income of fishermen will be enhanced by exploring the possibilities through alternate livelihood activities.

16. Credit requirement of the fishermen will be met through fisheries co-operatives and formal financial institutions.
17. Social mobilization will be achieved by engaging fishing village level community motivators as done in the case of scheduled tribes. The programme includes medical camps, prevention of drop-outs from primary education, awareness creation, campaign against use of alcohol/ drug etc.
18. It is aimed to strengthen the service delivery mechanism through e-governance, public grievance redressal monitoring system (PGRMS), call centers, IEC activities, in-service training to the functionaries and strengthening existing 100 matsyabhavans and training centres. It is also proposed to establish 100 more matsyabhavans in the inland sector.
19. Conserve the natural water bodies and thereby aquatic biodiversity of the State
20. Provide nutritional security to the state population and thereby ensure better health.
21. Socio-economic status of fishermen will be brought to the level of general population and thereby their living condition will be improved.

ANNEXURE 1

**PROCEEDINGS OF THE MEMBER SECRETARY
STATE PLANNING BOARD
(Present: Sri V S Senthil, IAS)**

Sub: Formulation of 13th Five Year Plan – Constitution of Working Groups – reg.

Ref: Note No. 260/2016/PCD/SPB dated 06.09.2016 of the Chief (i/c), Plan Co-ordination
Division, State Planning Board

Order No. 300/2016/AGRI (W4)/SPB Dated: 19.09.2016

As per the reference cited, State Planning Board has constituted Working Group on 'Fisheries' to formulate the draft proposals in the sector for inclusion in the Thirteenth Five Year Plan.

The Working Group on '**Fisheries**' is hereby constituted with the following members.

Co-Chairperson

Sri P James Varghese IAS, Principal Secretary, Fisheries Department

Co-Chairperson

Dr C Mohanakumaran Nair, Former PVC, Kerala University of Fisheries and Ocean Studies (KUFOS), Kochi and Fisheries Advisor, Government of Andhra Pradesh

Members

1. Dr S Karthikeyan, IAS, Director, Fisheries Department
2. Dr K Ampady, IIS, Managing Director, Kerala State Coastal Area Development Corporation, Thiruvananthapuram
3. Sri P Sahadevan, Executive Director, FIRMA, Thiruvananthapuram
4. Sri P K Anilkumar, Chief Engineer, Harbour Engineering Department
5. Dr K S Purushan, Former Dean, KUFOS (Kizhakkeveetil, 7/398, Nayarambalam P.O, Kochi, 682509)
6. Dr N K. Sasidharan Pillai, Director, IRTC, Palakkad
7. Dr B Manojkumar, Associate Professor, KUFOS, Panangad, Kochi
8. Dr V Sugunan, Sr. consultant, NFDB, Hyderabad and former Director CIFRI
9. Dr K Sunil Mohamed, Principal Scientist & Head of division, CMFRI, Kochi
10. Dr G Gopakumar, Emeritus Scientist ICAR and former Principal Scientist CMFRI Research Centre, Vizhinjam, Thiruvananthapuram
11. Sri M Shaji, Deputy Director, Representative of MPEDA
12. Sri U S Sajeev, Executive Director, ADAK, Thiruvananthapuram
13. Smt K M Lethy, Additional Director, Fisheries Department

Convener

Dr P Rajasekharan, Chief (Agriculture), State Planning Board

Co-Convener

Sri Arun Shyamnath, Research Officer, State Planning Board

Terms of reference

1. To review the development of the sector with emphasis as to progress, achievements, present status and problems under its jurisdiction during the 11th and 12th Five Year Plan periods.
2. To evaluate achievements with regard to the plan projects launched in the sector, both by the State Government and by the Central Government in the State during these plan periods.

3. To list the different sources of data in each sector and provide a critical evaluation of these data sources, including measures for improvement.
4. To identify and formulate a set of output and outcome indicators (preferably measurable) for each sector and base the analysis of the previous plans on these indicators.
5. To outline special problems pertaining to comprehensive development of the coastal areas with focus on Fisheries sector, review the policies adopted for resource conservation and management by the State and Central governments, seed production, reservoir fisheries and aquaculture and the strategies for the sector. In brief, the Group must address the following question: "How can we develop the marine and inland fisheries sector in such a way as to enhance income and nutrition in the State in a scientific way"?
6. To suggest, in particular, a set of projects that can be undertaken during the 13th Plan period in the sector.
7. The Co-Chairperson is authorised to modify terms of reference with approval of State Planning Board. The Co-Chairperson is authorised to invite, on behalf of the Working Group, experts to advise the Group on its subject matter. The non-official members of the Working Group will be entitled to travelling allowances as are applicable to class I officers of the Govt. of Kerala. The class I officers of GoI will be entitled to travelling allowances as per rules if reimbursement is not allowed from Departments.
8. The working group will submit its draft report by 1st December 2016 to the State Planning Board.

Sd/-
Member Secretary

To

The Person concerned
The Sub treasury Officer, Vellayambalam

Copy to:-

The Accountant General, Kerala (A&E) with C/L
All Divisions, State Planning Board
PS to VC
PA to Member Secretary
Stock file

Forwarded by order
Sd/-
Chief (Agriculture)