

**Inland Fishermen and Inland Fishing:
A Study at Neelamperoor Village
(Alappuzha District)
R.V. Jose**

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Inland Fishermen and Inland Fishing: A Study at Neelampeeror Village (Alappuzha District)

R.V. Jose*

1. Introduction

India is endowed with a long coast-line of 6,100 km and a vast continental shelf of 595.44 lakh hectares with an estimated annual yield of 39.7 lakh tonnes of marine fishes¹. The country is also rich in inland water resources which comprise numerous rivers and rivulets, ponds, reservoirs, fresh and brackish water lakes, estuaries and backwaters suitable for both culture and capture fisheries.

In addition to meeting a substantial portion of the protein requirements of the domestic population, especially in the coastal areas, the fisheries sector of the country contributes more than 3 per cent of its annual export earnings and provides employment opportunities to more than 1.75 million persons. Nearly 2 per cent of the country's GDP is derived from this sector.

Considering the significance of fisheries sector in the overall development of the economy and with a view to increasing the annual fish production and improving the per capita productivity of fishermen in the country, both the Central and the State Governments have formulated and implemented several schemes under the Five-Year Plans.

As a result, annual fish production in India has registered significant growth. Within 10 years (from 1981 to 1990), total fish production in the country increased from 24.44 lakh tonnes to 36.46 lakh tonne at an annual growth rate of 4.72 per cent². At present, India is the sixth largest fish-producing country in the world. However, the current yield still lags far behind the potential yield.

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An Overview of the Fish Economy of Kerala with Special Reference to Inland Fishing Sector

Among the different States in India, Kerala with its coast-line of 590 km and continental shelf of 36000 square km, is the predominant producer and exporter of marine products. During the period from 1981 to 1990, marine fish landings in the State increased from 2.74 lakh tonnes to 6.63 lakh tonnes. The annual growth rate during the period 1990-1995 was 3.02 per cent³. The export of marine products came to 2.96 lakh tonnes in 1995-1996. The State's contribution in terms of the value of marine exports during the year is found to have been 24.48 per cent⁴.

Though the inland fisheries sector also has immense growth potential in Kerala, a major portion of the State's inland water resources still remains largely unexploited. The total area of inland water resources in the State is estimated to be 3,60,535 hectares. It consists of rivers, tanks and ponds, reservoirs, brackish-water lakes, backwater and estuaries. Inland water spread available in Kerala on the basis of its different constituents is given in Table 1.1 which shows that two-thirds of the total area comes under brackish water lakes, backwaters and estuaries while the relative shares of rivers and reservoirs are less than one-fourth and less than one-tenth respectively.

Table 1.1 Inland Water Resources in Kerala (Area in ha.)

Type of Inland Water	Estimated area	Per cent
Rivers	85000	23.58
Tanks and ponds	3300	0.92
Reservoirs	29635	8.22
Brackish water lakes, Backwaters and Estuaries	242600	67.29
Total	360535	100.00

Source: GOK, Department of Fisheries, Facts and Figures 1990, p. 93

In spite of the fact that Kerala occupies 4.65 per cent of the total inland water resources in India, the State's share in inland fish production in the country during the past decade on an average was only 2.45 per cent. Compared to all-India, the annual growth rates in inland fish landings in Kerala are also found lower.

During the period 1981 to 1990, while inland fish production in the country as a whole increased from 9.99 lakh tonnes to 14.83 lakh tonnes at an annual growth rate of 5.12 per cent, in Kerala the increase was from 0.26 lakh tonnes to 0.33 lakh tonnes, at a lower growth rate of 2.49 per cent.

The percentage share of the State in India's inland fish production has consequently declined at an annual rate of 2.50 per cent during the period as is evident in Table 1.2.

Table 1.2 Inland Fish Production in Kerala and India (1981 to 1990)*(Production in '000 tonnes)*

Year	Kerala	India	Percentage share of Kerala
1981	26.0	999.2	2.60
1982	26.5	939.6	2.82
1983	27.0	987.4	2.73
1984	27.3	1082.1	2.52
1985	28.5	1090.1	2.61
1986	29.0	1214.1	2.38
1987	26.5	1259.1	2.10
1988	27.8	1369.4	2.03
1989	32.5	1381.1	2.35
1990	34.7	1483.6	2.34
Annual growth rate	2.49	5.12	(-) 2.50

Source: State Planning Board (SPB), Economic Review 1995, p. 59

According to the socio-economic Survey of fishermen, conducted by the State Fisheries Department, inland fisherfolk population in Kerala during the year 1985 was 1,86,737 which came about 22 per cent of the total fishermen population in the State⁵. By the year 1996, the estimated population of inland fishermen in the State increased to 2,23,772 and their proportion to total fisherfolk population to 22.50 per cent⁶. Between the years 1985 and 1991, the number of active fishermen in the State's inland fisheries sector increased from 42,593 to 50,173 at an annual compound growth rate of 2.77 per cent. Meanwhile, the corresponding growth rate in the number of active fishermen in the marine fisheries sector was only 0.63 per cent⁷.

A wide variety of inland fishes such as catfish (*vaala*, *muzhu*, *kaari*), mullets (*kanambu*), murrels (*bral*), milk fish (*poomeen*), perches (*narimeen*, *chempally*), pearl spot (*karimeen*), chromid (*pallathy*), sole (*manthal*), tilapia, jewfish (*kora*), barbus (*poovali*), macrobrachium (*aattukonju*) and other prawns (*chemmeen*) are commercially exploited from the inland water bodies in Kerala. The major varieties of culture fishes raised in the State are katla, rohu, and mrigala. Among the different inland fish species, prawns and tilapia together constitute nearly 40 per cent of the annual catch. Species-wise inland fish production in the State during the years 1980-1981 and 1995-96 are given in Table 1.3

As shown in Table 1.3, during the past 15 years, the composition of inland fish production in the State has undergone remarkable changes. Within this period, the percentage share of prawns increased from 18.51 to 24.17. Meanwhile the share of tilapia, another major con-

stituent of the State's inland fish production, declined from 16.34 per cent to 14.82 per cent. The relative share of murrels also decreased substantially during this period. Another noteworthy feature of the changes in the composition of inland fish production in Kerala during the last one quarter of the present century is the phenomenal increase in the share of culture fish. During the year 1967-68, the annual yield from culture fisheries was 34.03 tonnes which amounted to only 0.37 per cent of the then total inland fish production in the State⁸. By the year 1993-94 it increased to 9421 tonnes and its percentage share in total production rose to 20.71⁹.

Table 1.3 Species-wise Inland Fish Production in Kerala (1980-81, 1995-96)
(Quantity in tonnes)

Species	Year (1980-81)	Year (1995-96)	Variation in quantity
Prawns	4724(18.51)	11984(24.17)	7260(153.68)
Etroplus	2906(11.38)	4640(9.36)	1734(59.67)
Murrels	2912(11.41)	4386(8.85)	1474(50.62)
Tilapia	4172(16.34)	7347(14.82)	3175(76.10)
Catfish	2685(10.52)	4682(9.44)	1997(74.38)
Jewfish	1520(5.95)	2652(5.35)	1132(74.47)
Others	6607(25.88)	13895(28.02)	7288(110.31)
Total	25526(100.00)	49586(100.00)	24060(94.26)

Figures in Parentheses Indicate Percentages)

Source: SPB, Economic Review 1991, 1996

Kuttanad in Kerala's Inland Fishing Sector

The Kuttanad region represents low-lying land measuring about 25 km east-west and 60 km north-south on the west coast of Kerala. The region that is spread over the three districts of Alappuzha, Kottayam, and Pathanamthitta, comprises a total area of 875 square km and is densely populated¹⁰. The entire Kuttanad area lies 1-2.5 metre below the sea level and is submerged under water for the major part of the year. Earlier, the low lying lands in the region used to be periodically inundated with saline water draught in by tidal inflows from the Arabian Sea.

Even though inland fishing operations are carried out at present in all the regions in Kerala with the exception of Idukki and Wayanad, more than one-third of the activities are confined to the Kuttanad region alone. Vembanad Lake, the biggest brackish inland water body on the western coast of the State is spread over an area of 365 square km. Numerous waterways, channels and rivers Meenachil, Pamba, Manimala, and Achencoil - make this region an ideal habitat and breeding ground for a wide variety of fresh water and brackish water fish species. It is estimated that 30 per cent of the total brackish water area in the state (including backwater and canals) is situated in the Kuttanad region. Besides, this region accounts for

nearly one-fourth of the water area used for fish culture in the State 12. According to the socio-economic Survey of Fishermen, Kerala, 1985, 37 per cent of the inland fisherfolk households (and active fishermen) in the State belonged to Kuttanad region. By the year 1990, their proportion rose to nearly 39 per cent.

During the 11 years from 1985 to 1996, the inland fishermen population in the State increased from 1,86,737 to 2,23,772 showing an overall increase of about 20 per cent. Meanwhile, the inland fishermen population in the Kuttanad region rose from 68,211 to 86,396 registering an aggregate increase of nearly 27 per cent. The inland fishermen population in the Kuttanad region and in Kerala during 1985 and 1996 are given in Table 1.4. It shows that their annual growth rate in the Kuttanad region (2.17 per cent) during this period was higher than that of the State (1.66 per cent).

Table 1.4 Inland Fishermen Population in Kuttanad and Kerala (1985,1996)

Year	Kuttanad	Kerala	Percentage share of Kuttanad
1985	68211	186737	36.53
1996	86396	223772	38.61
Compound growth rate	2.17	1.66	0.50

Source: Department of Fisheries, Kerala Fisheries - Facts and Figures 1990, p.255, SPB, Economic Review 1996, p.S.37

Rationale of the Study

At present, the inland fishing sector in the Kuttanad region is confronted with several problems. As a result of large scale reclamation and encroachments, the area and depth of the inland water bodies in this region have declined substantially since the beginning of the present century. It is estimated that the area of the Vembanad Lake which is the third largest backwater in the country and the major source of aquatic wealth in the region, has already declined by 43.17 per cent, from 31,500 hectares to 17,900 hectares ¹³. Over-fishing, use of banned fishing gear and crafts, unscrupulous practices like water-poisoning and use of explosives, erection of water barriers and the accumulation of wastes, including fertiliser and pesticide residue in water bodies, dredging in the Vembanad Lake etc have caused severe damage to aquatic life in this area. Several wild varieties of fishes once abundant in the region have already become extinct. Despite the relatively higher growth rate in the number of active inland fishermen in the region than at the State level since the mid-eighties, growth rates in capture fishery landings in this region have remained comparatively low ¹⁴. Development efforts initiated by the State Government through the Fish Farmers Development Agencies (FFDA) have also failed to make any perceptible positive impact on the inland culture fisheries sector of this region. All the more, due to their meagre coverage, the various welfare programmes envisaged by the State Fisheries Department to improve the living conditions of fisherfolk such as the schemes for housing, sanitation, drinking water supply and health care have so far failed to yield the desired results. Fish workers as a community still remain socially and economically backward ¹⁵. Against this background it is pertinent to

examine the problems and prospects of inland fisheries and the fishing folk in the Kuttanad region.

Objectives

This study has its focus on the development of inland fisheries in Kuttanad. Its major objectives are:

- (i) a dynamic analysis of the inland fishing and fish marketing operations in the study area;
- (ii) an enquiry into the living conditions of inland fishermen households in the area;
- (iii) an analysis of the major problems in the inland fishing and fish marketing sectors; and
- (iv) formulation of remedial strategies.

Methodology and Sources of Data

The study depends mainly on primary data collected through field investigations conducted from March to November 1997 in the Neelamperoor village. Neelamperoor was selected for study in view of its following characteristics. First, it is situated in the central part of the Kuttanad region and is on the banks of the Vembanad Lake where most of the inland fishing operations of the region are carried out. Secondly, a large proportion of its working population are full time or part time fishermen, the majority of them belonging to the traditional inland fisherfolk community. Thirdly, one of the prominent inland fish marketing centres of the Kuttanad region is situated in the village. Finally, more than 80 per cent of the village is wet lands suitable for the development of both culture and capture fisheries.

In order to understand the demographic and occupational characteristics of the population, a census of households was conducted in the village during the months of March and April, 1997. The census showed that 96 households belonged to inland fishermen. These households derived 50 percent or more of their total annual income from inland fishing¹⁶.

In addition to the household census, several other methods were also employed for collection of information such as personal interview, participant observation, and group discussion. For personal interview of sample households, a detailed structured and pre-tested interview schedule was used. While the first part of the schedule deals with the socio-economic aspects of fishermen households, its second part is concerned with various aspects related to inland fishing. As the size of daily catch, monthly working days, and available fish species showed considerable seasonal variations, data regarding these variables had to be collected separately for each season – the peak, the moderate, and the lean. The data were collected in three rounds, – first, during April and May (lean season), second, during the month of July (peak season) and third, during November (moderate season).

In order to supplement the primary data collected through direct personal interviews, group discussions were organised during June and July at two localities where the inland fishermen population of the study area is concentrated. In the first discussion, 16 fisherfolk and in the second, 18 fishermen participated. Our discussions with the office-bearers of the *Matsya Vilpana Sanghom* – a trade union organisation of local fishermen – brought to light several issues relating to the marketing of inland fish. Our visits to other important fish-producing centres in the region viz Pallom, Thiruvappu, and Aymanam and discussions with some of

the local fishermen were highly informative. Information on the rules and regulations relating to inland fishing and on their implementation were collected from the Inland Fisheries Office at Mannar.

Housing, sanitation, per capita income, work participation rate, education status, debt and savings, and food intake were taken as the indicators of the general living conditions. Annual income, annual expenses on various categories of consumer articles, per capita food intake etc of fisherfolk households were estimated from primary data collected on weekly or monthly basis.

The major sources of secondary data used in this study are the publications of the State Planning Board (SPB), State Fisheries Department, Agency for Development of Aqua Culture, Kerala (ADAK), MJM Centre, Mavelikkara, Kerala Sastra Sahitya Parishat (KSSP), and Panchayat Office, Neelamperoor. Moreover, research papers and articles, study reports like the Report of the Kuttanad Enquiry Commission, Kuttanad Water Balance Study Report etc are also used.

Structure of the Study

The second section deals with the evolution of inland fishing and the fishing and fish marketing operations in the study area. Section 3 examines the socio-economic profile of inland fisherfolk households in the study area. Problems of fishing and fish marketing are discussed in section 4. The major findings of the study are summarised in the fifth section.

Limitations of the Study

Non-availability and non-reliability of secondary data have put serious limitations on the study. Estimates of inland fish wealth and the optimum size of the catch are not available. Reliable statistics on the extent of inland water resources do not exist¹⁷. Estimates of catch published officially have been found inaccurate. For example, during 1991, an inland fish disease called Epizootic Ulcerative Syndrome struck many of the prominent fish producing areas in the State causing mass mortality in inland capture fishes and leaving thousands of fisherfolk unemployed for a major part of the year. Official figures of catch showed, however, an unprecedented increase, by 17 percent, in inland fish production in the State during that year¹⁸.

This study excludes the fishing activities of seasonal and part-time inland fishermen. Usually either many of the agricultural labourers, casual workers, and even farmers in the study area do some fishing to supplement their income or to meet their domestic consumption needs. Similarly, some traditional fishermen engaged in the collection of black clams and mussel fishery have also been excluded. The estimates of annual fish catch and sale proceeds have been prepared based on information supplied by local fishermen. No records were available at the marketing centres to cross-check the reliability of this information. Finally, we have not made any quantitative assessment of the loss of aquatic wealth in the study area due to periodic de-watering of rice fields, premature catching of fish, destructive and illegal methods of fishing and water pollution.

Review of Literature

Considering the importance of the fisheries sector in the State economy, several development

programmes were introduced by the government under the Five Year Plan, with the twin objectives of increasing annual fish production in the State and improving the socio-economic conditions of fisherfolk. The State Government assessed the impact of various development and welfare programmes on the techno-socio-economic conditions of fisherfolk in Kerala in 1985 based on the sample survey of 22 marine and inland fishing villages¹⁹. In the inland fisheries sector, the study emphasised aquaculture development for the upliftment of fishermen.

The problems of inland fishing and fish marketing in the State were analysed by M.J. Sebastian²⁰. According to him, over-fishing and environmental changes have depleted the stock of many wild inland fish species in the State. Although the various reservoirs, tanks and ponds in Kerala could be successfully used for fish culture, this potential remains untapped mainly due to the non-availability of fish seeds. In a similar study, D. Sanjeev Ghosh points out that since the various development programmes in the State's inland fisheries sector are formulated on the basis of obsolete data, most of them fail to accomplish their targets²¹. According to him, the majority of the persons identified as inland fishermen in the official records are bogus fishermen who had obtained licences for acquiring independent nets solely for the purpose of getting benefits from the various welfare schemes meant for genuine active fishermen households. He also points out that the inland fisheries sector of the State is controlled by some private individuals and agencies with vested interests. In order to redeem this sector of its perils, certain legal and administrative measures are recommended which the author hopes would prevent any further encroachments of water bodies and unauthorised inland fishing.

Y. Devalatha²² examined the production potential and the rate of exploitation of inland fishery resources in Kerala. According to her, ecological factors are largely responsible for the depletion of inland fish wealth in the State. It supports the findings of an earlier study of U.K. Gopalan which states that the industrial, agricultural, and domestic wastes discharged daily into the backwater, ponds, lakes, and rivers in the State are making them unsuitable for the sustenance of aquatic life²³. Studies of K.S. Purushan, M.K. Chandrabose and K.G. Selestian also highlight the role of the growing human intervention in the ecosystem and the resultant environmental degradation, in reducing fishable areas and productivity of inland water bodies in the State²⁴. While analysing the causes of the crisis in the State's fisheries sector, T.R. Thankappan Achari pointed out in 1981 that the extensive reclamation of *kayal* land, destruction of mangroves and swamps, pollution of rivers and estuaries, and destructive means adopted in fishing, had caused considerable damage to the inland fishing sector²⁵.

Development possibilities and problems of the culture fishery sector in Kerala were examined by P. U. Varghese and A. G. Varghese who point out that the development of culture fishery sector is of vital importance in Kerala as it would not only result in a substantial increase in the State's annual inland fish production but also had the potential to create immense employment opportunities²⁶. Only a very small portion of the inland water area suitable for fish farming was being utilised. P. M. Mathew has argued that fresh water culture fish can be cultivated economically in low-lying rice fields while brackish water areas and *pokkali* lands in the State can be effectively used for prawn cultivation²⁷. Mini Nair has proposed a development strategy for the spread and development of prawn cultivation in the State²⁸. According to her, the backwater of the State

must be protected from pollution, farmers are to be trained in the new methods of prawn cultivation, the cooperative sector should be asked to play a leading role in its cultivation and a proper marketing system should be developed for promoting domestic sales and export of prawns.

2. Inland Fishing and fish marketing in Neelamperoor Village

Study Area

Location, Area, and Population

Neelamperoor village lies close to the south-east shore of the Vembanad Lake in the Veliyanad block of Kuttanad taluk in Alappuzha district. Inland fisherfolk population in the study area is largely concentrated in the north-western part of the village.

Neelamperoor village covers a total area of 989.75 hectares and more than 80 per cent of its area is wet lands. All parts of the village are inter-connected with waterways and canals. The recently constructed bitumen-surfaced road connecting Kurichi and Kainady passes through the centre of the village and it is the only 'puca' road in this area. The village does not have any higher education institutions, hospitals with modern facilities or major industrial units.

According to the 1991 census, there were 1,096 households and 5,768 persons in Neelamperoor village. More than five percent of the population belong to Scheduled Castes. By the year 1997, the number of households and the population increased to 1,118 and 5,890. Age-wise distribution of the village population is given in Table 2.1.

Table 2.1 Age-wise Distribution of Population in Neelamperoor Village

Age	Male	Female	Total
Less than 1	43 (0.73)	48 (0.81)	91 (1.54)
1-14	616 (10.46)	667 (11.32)	1283 (21.78)
15-49	1665 (28.27)	1649 (28.00)	3314 (56.26)
50-59	222 (3.77)	254 (4.31)	476 (8.08)
60 and above	352 (5.98)	374 (6.35)	726 (12.33)
Total	2898 (49.20)	2992 (50.80)	5890 (100.00)

Note: Percentage to total population is in brackets; Source: Census Survey conducted during Feb- March '97

At present, females outnumber males in the village in the ratio 1032:1000. As Table 2.1 shows 22 per cent of the population is children of less than 15 years of age and 12 per cent is elderly persons of 60 years and above. The dependency rate of the population is found to be about 36 per cent. The number of live births reported in the village during the year 1996-97 was 91 and the number of women in the age group of 15-49 was 1,649. The Crude Birth Rate (CBR) and the General Fertility Rate (GFR) in the village during the year were estimated at 16 and 55.

Education Status

According to the 1991 census, the literacy rate of the population in the study area was 86 per cent

(87 per cent males and 85 per cent females). Currently, the rate is slightly higher. The effective literacy rate comes to around 97 per cent²⁹ (Table 2.2).

Table 2.2 Distribution of Population by Education Status

Education status	Male	Female	Total
Illiterate	368(12.70)	421(14.07)	799(13.57)
Primary	1026(35.40)	1068(35.70)	2084(35.38)
Secondary	877(30.26)	891(29.78)	1768(30.02)
SSLC	409(14.11)	415(13.87)	824(13.99)
Pre-degree	110(3.80)	108(3.61)	218(3.70)
Degree & PG	57(1.97)	51(1.70)	108(1.83)
Technical diploma	45(1.55)	36(1.20)	81(1.38)
Medical degree	6(0.21)	2(0.07)	8(0.14)
Total	2898(100.00)	2992(100.00)	5890(100.00)

Note: Percentage is given in parentheses; Source: Census Survey, 1997

More than one-third of the literates in the study area is either children studying in primary classes or adults who had discontinued their formal studies at the primary level. Only 21 per cent had completed successfully their high school. While nearly 8 per cent of the males have education qualification of pre degree or above, less than 7 per cent of the females came under this category. Further, less than 2 per cent of the population was graduates or post-graduates. The proportions of diploma and degree holders in technical and professional subjects was very small.

Occupation Pattern of Households

The vast majority of households in the village depend on the primary sector for their livelihood (Table 2.3). More than one-third of the households is agricultural labourers. Less than one-third is cultivators and inland fisherfolk. The proportion of households engaged in business and trade is around 5 per cent.

Table 2.3 Occupation-wise Distribution of Households in Neelamperoor Village

Occupation	Number of households	Per cent
Cultivators	261	23.35
Agricultural labourers	413	36.94
Inland fisherfolk	96	8.59
Skilled labourers	110	9.84
Traders and businessmen	54	4.83
Employees	69	6.17
Other (private)service sector	115	10.29
Total	1118	100.00

Source: Primary data

Employment situation

Nearly, one-third of the population is currently employed. Unemployment is relatively low and comes to only about 13 per cent of the labour force ³⁰ (Table 2.4).

Table 2.4 Distribution of Population by Activity Status

Activity status	Male	Female	Total
1. Employed	1684	309	1993
2. Unemployed	181	122	303
3. Labour Force(1 +2)	1865	431	2296
4. Unemployed as percentage of labour force	9.17	28.31	13.20

Source: Primary Data

Among the unemployed, 55 per cent have educational qualifications of SSLC or above.

Brief History of Inland Fishing in Kuttanad Region

Inland fishing is the traditional occupation of a small section of the households in Kuttanad, mostly belonging to the Dheevera community. Their traditional fishing devices include traps, hooks and of cotton nets and small wooden crafts. The fish requirements of the entire population of Central Travancore were met through catches from the Vembanad Lake and nearby waterbodies³¹. The mode of fishing was in perfect harmony with the ecosystem and the basic needs of their households were met comfortably from their daily earnings. In order to maintain the sustainability of yields they strictly adhered to an unwritten code of conduct for fishing, evolved through generations. They used fishing nets with large mesh sizes to avoid catching of fish prematurely; neither did they resort to unscrupulous methods such as water poisoning or using explosives, practices which they feared would lead to mass destruction of aquatic wealth. Small fish and fishlings caught in their nets or trap used to be released in the water, unhurt.

The evolution of inland fishing in the Kuttanad region to its present state is invariably related to the reclamation of *kayal* land for rice cultivation. Reclamations in the backwater of the region had been going on since the 1830s and by the dawn of the 20th century, about 2,200 hectares of the Vembanad Lake had already become cultivable land. The State Government interdicted further reclamation from the Vembanad Lake by the end of 1930s. The prohibition was soon lifted and the pace of reclamation picked up momentum again. Three large blocks viz. *Chithira*, *Marthandom*, and *Rani* covering a total area of 586 hectares were reclaimed during the early forties by private entrepreneurs with active State support. Construction of permanent bunds in 'R-Block' that started in 1961 was another milestone in the history of reclamation of *kayal* lands in the Kuttanad area³². Meanwhile, attracted by the newly generated employment opportunities in the agricultural farm sector, agricultural labourers from the midlands and highlands east of the region migrated to the Kuttanad region and permanently settled there as or *kudikidappukar* (hutment dwellers).

After the successful implementation of the Land Reforms Act of 1970, feudal relations in

agricultural production disappeared from Kerala. Each hutment dweller received 10 cents of land from the landowner. Disappearance of landlordism helped the growth of capitalist farming³³. Consequent on the land reforms, a large number of erstwhile tenants became landowners. With the spread of education and the communist ideology among the working class, agricultural labourers became conscious of their rights and were organised under leftist trade unions. The social and economic status of the workers improved substantially and their bargaining power became strong. The cultivator-labourer relationship got strained and rice fields in Kuttanad became the scenes of incessant labour struggles and agitations.

Technological improvements soon followed. Installation of electrically powered centrifugal pumps (with their capacity ranging from 5 H.P. to 60 H.P.) began to be used to bale out water from rice fields, in place of the manually operated traditional wheels (*chakram*), non-submersible permanent bunds were constructed around *padasekharams*; tractors and power tillers became popular for ploughing and filling operations; rice fields began to be converted on an increasing scale for non-agricultural uses. All these developments led to the decline in the demand for human labour. In response, many of the agricultural labourers in the area turned to inland fishing on an independent basis. Market prices of inland fish had gone up thus making inland fishing an attractive proposition in terms of daily earnings. During mid-eighties, the State Fisheries Department introduced several social welfare schemes for the uplift of the inland fisherfolk community. All these favourable factors have led to an unprecedented increase in the number of active fishermen in Kuttanad in recent years. In the process, over-fishing and consequent depletion of aquatic wealth in the region, have resulted. These questions will be examined further later.

Fishing Gear Used in the Study Area

A variety of fishing gear is in use in inland fishing. However, Chinese nets and stake nets that are very popular in the coastal regions of the southern districts of Kerala are seldom used in Neelamperoor and nearby inland fishing centres. The major approved gear used in the study area are gill nets (*neettuvala* or *odakkuvala*), cast nets (*veesuvala*), traps (*koodu*, *ottal*, etc) and hooks. Depending on the varieties of fish to be caught and the nature of water bodies, gill nets with different mesh sizes and lengths are used. Cast nets are also of different mesh size ranging from 0.5 to two fingers. They are cast either from fishing crafts or from the banks of waterways or canals.

Koodu is a type of trap used to catch inland fish from waterways, rivers, and wide stretches of rice fields (*padasekharams*). *Ottal*, another type of trap that is also made of bamboo or reed and conical in shape is used to catch fish from shallow waters.

In order to use each unit of the officially approved fishing gear, (except hooks), inland fishermen have to get licenses, from the concerned Fisheries Offices, to be renewed annually. The current annual fees per unit of fishing gear are: Rs 7 for gill nets, Rs 5 for cast nets and Rs 3 for devices like *koodu*, *ottal*, and *kuthuvala*. For the year 1997-98, more than 90 per cent of the fishermen in the study have taken licenses for gill nets, 42 per cent for cast nets and 54 per cent for different kinds of traps. Use of fishing gear which leads to the mass destruction of inland fish and their premature capture such as stake nets (*kambavala*), *madavala*, *peruvala*, *podivala*, *perumkoodu*, *muppally*, and *thettali* are banned. Despite the ban, the present survey shows that about one-eighth of the inland fishermen use such prohibited gear (Table 2.5).

Table 2.5 Fishing Gears in Use by Local Fishermen

Fishing gears	Fishermen with licence	Fishermen without licence	Total
Licensed			
Gill net	88(91.67)	5(5.42)	93(96.88)
<i>Koodu</i>	52(54.17)	10(10.42)	62(64.58)
Cast net	40(41.67)	32(33.33)	72(75.00)
<i>Ottal</i>	3(3.13)	7(7.29)	10(10.42)
<i>Kuthuvala</i>	2(2.08)	1(1.04)	3(3.13)
Not Licensed			
<i>Muppally</i>	Nil	2 (2.08)	2 (2.08)
<i>Podivala</i>	Nil	2(2.08)	2(2.08)
<i>Madavala</i>	Nil	7(7.29)	7(7.29)

Source: Primary Data (Percentages are given in parentheses)

A fishing unit comprises specific fishing gear and a fishing craft. All of the inland fishermen in the study area are at present using traditionally built and manually operated wooden crafts. Nearly one-third of them has own crafts; others hire them in. Depending on the size and quality of crafts, hiring rate ranges from Rs 15 to Rs 25 per day. Sometimes fishing crafts are hired on a monthly rent basis. A fisherman who hires a craft is accountable for damages caused to it and has to pay due compensation to the craft owner for repairs.

Until the beginning of the seventies inland fishermen in the study area used cotton nets. Majority of them, well versed in the art of weaving nets, made their own nets and repaired them when damaged. At present, all fishermen in the area use nylon nets, and nearly one-half of them depend on hired labourers for repairs of nets. Owing to their better transparency, the recently introduced *Vysali* nets (zero point nets) are also gaining popularity among the local fishermen. On an average an active fisherman uses 12 kg of nets of different kinds and purchases annually 5.5 kg of new nets to replace the damaged ones. Depending on their variety and mesh size, price of nets varies from Rs 400 to Rs 700 per kg and the cost of accessories such as string weights and floats amounts to Rs 100 to Rs 250. Owing to the exorbitant price of new nets, many fishermen purchase second hand nets from marine fishermen at low prices.

As inland fishing operations in the study area are carried out mainly during the night, hurricane lamps or gaslights are needed. In order to light up their lamps, a local fisherman, on an average needs 0.5 litre of kerosene per day. Since a vast majority of them does not get permits to purchase kerosene from fair price shops at subsidised rates, they purchase it from the open market where it costs about Rs 12 to Rs 14 per litre.

Hours of Work, Available Fish Varieties, and Size of Catch

Unlike agricultural operations that are strictly seasonal in nature, inland fishing is carried on

throughout the year. Thus, the number of available working days for active fishermen in the study area is much higher than that of an average agricultural labourer. Again, while in rice farming much of the human labour requirements are met through female labourers, the role of female labour in inland fishing is negligible.

Based on variations in the size of catch there are three different seasons in inland fishing. With the onset of the south-west monsoon, availability of fishes in the study area increases substantially and the favourable supply conditions last for the next three months. Hence, the three months from June to August may be considered the peak season of fishing operations. The average daily catch and the daily income of fishermen rise substantially during this period. The summer months from February to May constitute the lean season during which availability of fish remains low and fishermen go for fishing for 12 to 18 days a month. The period between the peak and the lean season ie the five months from September to January is the moderate season. During this period, most fishermen work for 25 to 28 days in a month. For about three-fourths of the fishermen in Neelamperoor, the number of annual working days falls in the range of 225 to 300 (Table 2.6).

It is found that many of the fishermen whose annual fishing days are comparatively low have their own wetlands and rice farming constitutes their subsidiary occupation.

Major inland fish species available during the peak season are macrobrachium (*aattukonju*), prawns (*chemmeen*), and pearlspot (*karimeen*), sole (*manthal*), chromid (*pallathy*), perches (*chempally*) and barbus (*poovali*) are species available in all seasons. The availability of fishes like murrles (*bral*), mullets (*kanambu*) and catfishes (*kari*, *mushi*, etc) has declined drastically in recent years.

The average daily catch shows wide seasonal variations. In the case of an active fisherman, it varies from 12.74 kg during the peak season, to 7.22 kg during the moderate, and 2.70 kg during the lean seasons. However, even during the peak season, the catch varies from day to day.

Table 2.6 Distribution of Fisherfolk by Fishing Days (Neelamperoor): 1996-97

Number of working days	Number of households	Percentage of fishermen
Less than 175	2	2.08
175-199	4	4.17
200-224	11	11.46
225-249	25	26.04
250-274	28	29.17
275-299	20	20.83
300 and above	6	6.25
Total	96	100.00

Source: Primary Data

Mode of Fishing

Most of the inland fishing activities is centred on the Vembanad Lake. Fishermen row their fishing crafts for 2 to 4 hours to reach the lake and to reach there before dusk they begin their journey early in the afternoon. For night-time fishing, gill nets and cast nets are used. Fishing time of a night lasts for 5 to 7 hours.

Inland Fish Marketing in the Study Area

In earlier days fishermen used to sell their daily catch to consumers in the locality through the female members of their households. During the peak season, when the daily catch exceeded local demand, fishermen themselves carried the excess catch to other places like Changanasserry and Tiruvalla for sale to fish vendors. As the number of inland fishermen increased, a fish-trading centre emerged in the village. Fish vendors and consumers from areas outside the village flock to this centre.

With the emergence of a full-fledged fish market in the area, a system of sales through auction also has come into existence. The potential buyers, after examining the catch announce their offer of prices and the highest bidder gets the supply. An intermediary (*tharakan*) conducts the auction on behalf of the fishermen and takes 10 per cent of the day's sales proceeds as his commission. Some intermediaries have turned financiers and make advance payments to needy fisherfolk on the condition that they would sell their catch only through them.

In order to avoid middlemen's exploitation, local fishermen in and around the study area set up a Cooperative Fish Marketing Society in 1984. The society also charged 10 per cent of the sale receipts as the middlemen used to do, as commission but half the collected amounts was paid back later to members by way of bonus. However, the society collapsed in 1990 owing to financial mismanagement.

Nearly a year before the closure of the Co-operative Fish Marketing Society, a trade union called the *Matsya Vipanaana Sanghom* had come into existence with an initial membership of 84 inland fishermen in the area. The *Sanghom* conducted its transactions through the middleman (*tharakan*) - who gave 30 per cent of his commission to the *Sanghom*. The *Sanghom* disburses half this amount to its members as bonus. Thus compared to the days of the Cooperative Society, the actual share of fishermen in the sale receipts has declined from 95 per cent to 91.5 per cent. At the time of the present survey, more than 80 per cent of inland fishermen in the study area were members of the *Matsya Vipanaana Sanghom*. The others hesitate to join it due to political reasons. Though the non-members are not entitled to get bonus, they also sell their catch through the *Sanghom*. However, during the prawn season, most fishermen sell their product directly to commission agents of the various processing units in the area and around.

Recently, under the initiative of *Matsya Vipanaana Sanghom*, a cooperative society for inland fishermen called *Ulnadan Matsya Thozhilali Vikasana Kshema Sahakarana Sanghom* has been formed. It was registered in 1996 (Reg. No. F (A) 1105/96). The society proposes to take up the task of inland fish marketing in the area with a view to bringing to end exploitation by middlemen in the marketing of inland fish.

Fishermen's Agitations

Until the late eighties, inland fishermen in the study area were not members of any organisation. Members of communities other than that of traditional fishermen were increasingly taking to fishing. Competition among fishermen was rife. The situation has changed since the formation of the trade union of inland fishermen area called *Matsya Vipanaana Sanghom*, in 1989. Since its inception, the union has been playing an essential role in creating awareness among fishermen about the need to protect their interests as a class and to conserve the aquatic wealth of the region.

Under the auspices of *Matsya Vipanaana Sanghom*, a series of fishermen's agitations against the government were organised in the study area for a variety of causes - control of fish diseases, relief measures to impoverished fishermen, implementation of welfare schemes and financial assistance for developing fishing craft and gear. The agitations that began in 1991 lasted until 1996.

Incessant union activities and agitations have inculcated a sense of unity among the local fishermen. The union protects them from undue harassment by government officials and helps them obtain licences for using fishing gear. Most importantly, the union has educated the fishermen of the need to conserve the aquatic wealth of the area. The fishermen are now vigilant against intruders into their fishing waters who indulge in unfair and destructive practices of fishing through water poisoning, electrocution, and use of explosives.

3. Socio-Economic Profile of Inland Fishermen Households

Community-wise Distribution of Fishermen Households

Until the second half of the present century, the fishermen population in Neelamperoor was very small and a vast majority of them belonged to the *Dheevera* community. Since then the community-wise composition of fishermen households in this area changed drastically. Almost all the new fishermen households in this area belong to other non-fishermen communities. At present, the *Dheeveras* constitute only 12.50 per cent of the total number of 96 inland fishermen households in the area (Table 3.1). Nearly two-thirds belong to the *Ezhava* community that traditionally was engaged in occupations related to the coconut cultivation and its processing. Scheduled Caste households engaged in fishing comprised one-seventh and Christian households less than one-tenth of the total.

3.1 Community-wise Distribution of Fishermen Households in Neelamperoor, 1997

Community	No. of households	Per cent
Ezhava	61	63.54
Cheramar (Scheduled Caste)	13	13.54
Dheevera	12	12.50
Christian	9	9.37
Sambavar (Scheduled Caste)	1	1.04
Total	96	100.00

Source: Primary Data

Family Size and Age Composition

Fishermen population in the area in 1997 was 484. The family size ranged between 2 and 9, the average being 5 (Table 3.2). The sex ratio was in favour of males unlike in the case of the general population of the area.

3.2 Age-wise Distribution of Inland Fishermen Population, Neelamperoor: 1997

Age	Male	Female	Total
Less than 1	5 (1.03)	3(0.62)	8(1.65)
1-14	55(11.36)	49(9.92)	104(21.49)
15-49	143(29.55)	139(28.72)	282(58.26)
50-59	21(4.34)	18(3.72)	38(7.85)
60 and above	25(5.17)	27(5.58)	52(10.74)
Total	249 (51.45)	235 (48.55)	484 (100.00)

Note: Percentages to total population are given in parentheses; Source: Primary Data

At present, there are 120 active fishermen in the study area, all more than 30 years of age. More than one-fourth of them are above 50 years.

Education Status

The prevalence of literacy among the fishermen is high and the sex-wise difference in this respect is small. The effective rate of literacy is found still higher, at about 93 per cent (Table 3.3).

3.3 Distribution of Inland Fishermen Population on the Basis of Education Status

Education status	Male	Female	Total
Illiterate	32 (12.85)	36 (15.32)	68 (14.05)
I – IV	54 (21.69)	49 (20.85)	103 (21.28)
V – VII	53 (21.29)	54 (22.98)	107 (22.12)
VIII - X	61 (24.50)	62 (26.38)	123 (25.41)
SSLC and above	49 (19.68)	34 (14.47)	83 (17.15)
Total	249 (100.00)	235 (100.00)	484 (100.00)

Note: Percentages are given in parentheses; Source: Primary Data

Employment Situation

In the labour force, which constitutes 39 per cent of the population, 33 per cent are employed. Three-fourths of the employed persons in the fisherfolk households are full time fishermen and 3 per cent of them are fish vendors. The others are skilled labourers (like

carpenters, tailors, toddy tapers etc) and employees in private firms with the solitary exception of one person who happens to be a government servant (Table 3.4).

3.4 Occupation-wise Distribution of Workers from Inland Fishermen Households

Name of occupation	Number of workers	Per cent
Inland Fisherfolk	120	75.47
Fish Vendors	5	3.14
Agricultural Labourers	12	8.18
Employment in Private Industry	9	5.66
Govt. Employees	1	0.63
Traders and Businessman	1	0.63
Skilled Labourers	10	6.29
Total	159	100.00

Source: Primary Data

Household Assets and Amenities

All the inland fishermen have their own houses. One-third of them are thatched huts; more than one-half the houses do not have electricity. Modern amenities like television, telephone, mixer and refrigerator do not exist in the vast majority of households. None of them has telephones. At present 36 per cent of the inland fishermen families have radios and 24 per cent have electric fans. As cooking fuel, all the households use firewood.

Land

All the households own dry land. More than half the households got such lands in the capacity of hutment (*kudikidappu*) dwellers, a little less than one-fourth got their lands through purchase. The proportion that inherited land was less than one-fifth. The average size of dry land per household comes to 10 cents. While the top 8 per cent of households possess 20 cents or more, the bottom 18 per cent has less than 5 cents (Table.3.5).

Table 3.5 Distribution of Fishermen Households according to Size of Owned Dry Land Area
(Area in cents)

Size of dry land	Number of households	Per cent
Less than 5	17	17.71
5-9	30	31.25
10-14	35	36.46
15-19	6	6.25
20-24	4	4.17
25 and above	4	4.17
Total	96	100.00

Source: Primary Data

In addition to dry land, 30 per cent of households have wet lands used for rice cultivation. The majority of the wet landowners received their lands as per the provisions of the Kerala Land Reforms Act of 1970 that envisaged a redistribution of surplus land among landless labourers. As in the case of dry lands, wet lands are distributed unevenly. While 35 per cent of the wet landowners possess less than 75 cents, 10 per cent have more than 175 cents. The average size comes to about 89 cents.

Annual Earnings

Income accrues to these households from a variety of sources such as fishing, agricultural farming, animal husbandry and, poultry farming. On an average, income from inland fishing alone constitutes 73 per cent of the annual earnings. While net income from agricultural farming amounts to less than 9 per cent, earnings from work in other sectors constitute about 17 per cent.

The distribution of income among fishermen households is uneven. Annual income of households in the bottom 19 per cent is less than Rs 15,000 each; the top 13 per cent receive Rs 40,000 or more each (Table 3.6). The annual income of an average fisherman household from all sources taken together for the year 1996-97 is estimated at Rs 25,156; in terms of per capita income, it works out to Rs 4,990; 38 per cent less than for the State and 29 per cent less than that of Alappuzha district for the year 1995-96³⁴.

Table 3.6 Distribution of Fishermen Households by Annual Income Group

Annual Income (Rs.)	Number of households	Percentage of households
Less than 10,000	4	4.17
10,000-15,000	14	14.58
15,000-20,000	17	17.71
20,000-25,000	18	18.75
25,000-30,000	16	16.67
30,000-35,000	9	9.38
35,000-40,000	6	6.25
40,000-45,000	6	6.25
45,000-50,000	4	4.17
50,000 and above	2	2.08
Total	96	100.00

Source: Primary Data

Debts and Savings

Most of the inland fishermen households in the study area are indebted. The major sources of their loans are commercial banks, co-operative societies, village moneylenders, local merchants, and friends and relatives.

Interest rates vary widely among the sources. Usually merchants, friends, and relatives do not charge any interest. Loans obtained from the organised sector of the money market carry only moderate rates of interest ranging from 9 per cent to 16.5 per cent per year.

On the other hand, village moneylenders often charge exorbitant rates that come up to 120 per cent per year. Relative shares of outstanding loans are found to be around 42 per cent for co-operative banks, 26 per cent for commercial banks, friends and relatives, 6 per cent for moneylenders and 5 per cent for merchants. It is also observed that a major portion of the debts of fishermen households was incurred for unproductive purposes.

Out of the 96 fishermen households, eight did not have outstanding debts; 12 had less than Rs1,000. The majority of households have debts exceeding Rs 3,000 (Table 3.7). The average per capita debt works out to be more than one-fourth of the per capita income.

Table 3.7 Distribution of Fishermen Households According to Outstanding Debt

Debt (Rs)	Number of households	Per cent
Nil	8	8.33
1 – 1000	12	12.50
1001-3000	14	14.58
3001-5000	19	19.79
5001-10000	24	25.00
10001-20000	12	12.50
Above 20000	7	7.29
Total	96	100.00

Source: Primary Data

Savings of households are found meagre. More than one-fourth of them has no savings at all. Though about 15 per cent of the households were LIC policyholders due to defaults in premium payments, the majority of the policies have already lapsed. The proportion of households that maintain savings accounts in the Post Office Savings Bank is only 3 per cent; and the average per account is less than Rs 500. There are also subscribers to chit funds, but all have received payments from the funds and the payment of subscriptions for several months is due from most of them.

Consumption Pattern

More than 95 per cent of the annual income of an average fishermen household is spent on five major items of consumption viz food, clothing, medicine, cooking fuel, and education (Table.3.8). An average household spends 72 per cent of its annual income on food and fuel.

Health and Sanitation

Though more than two-thirds of the annual income is spent on food, the average food intake

Table 3.8 Average Annual Consumer Expenditure of Fishermen Households

Items	Household expenditure (Rs.)	Per capita expenditure(Rs.)	Percentage household income
Food	16892.90	3351.77	67.15
Clothing	3904.90	774.78	15.52
Medicine	1487.68	295.17	5.91
Cooking fuel	1257.50	249.50	5.00
Education	527.60	104.68	2.10
Total	24070.58	4775.91	95.69

Source: Primary Data

of the fishermen lies far below the required level in terms of the quantity and quality, judged against the Food and Agricultural Organisation and World Health Organisation norms³⁵.

In India, the Planning Commission had defined the 'poverty line' based on the recommended nutritional requirements of 2400 calories per person per day in rural areas and 2100 calories in urban areas³⁶. Considering the age and sex combination of the State's population, the Centre for Development Studies has fixed the calorie norm for the people of Kerala at 2200 per day³⁷. Quantities of the major constituents of a balanced diet that would yield the recommended calorie requirement of 2200 per day per person and the actual daily food intake of the inland fishermen population in the study area is given in Table 3.9³⁸.

Table 3.9 Recommended Food Intake and Actual Per Capita Food Intake of Inland Fishermen Population in the Study Area

Food Items	Per capita daily consumption recommended (gm)	Per capita daily consumption of the sample population (gm)	Percentage deficiency
Cereals	440	377	14.32
Pulses	45	17	66.22
Leafy vegetables	100	14	86.00
Other vegetables	40	11	72.50
Roots and tubers	50	32	36.00
Milk	150	58	61.33
Total	825	509	38.30

Source: (i) Govt. of India (1982), Facts about Our Diets, Food and Nutrition Board, New Delhi, p.13;(ii) Primary Data

In the case of all the major food items, actual daily intake of inland fishermen population lags far behind the recommended levels. The deficiency is all the more serious if the qualitative aspect of their daily diet is also considered. It is observed that the deficiency in 'energy-yielding' food varieties such as cereals, roots, and tubers is comparatively less than that of the 'body building' and 'protective' food items like milk, pulses, and vegetables. Therefore, the fishermen population is easily vulnerable to diseases. The present survey shows that milk is not a part of the daily diet of more than half the local fishermen households. However, largely their protein requirements are met through regular consumption of fish both inland and marine, at about 85 gms per capita per day.

Non-availability of pure drinking water is a major problem of the inhabitants of this village. Owing to accumulation of domestic discharges and fertiliser and pesticide residue, rivers and other waterways of the study area are highly polluted. For most part of the year, more than two-thirds of the local fishermen households use water from rivers and canals for all their domestic requirements including drinking. Another one-sixth use water from ponds or wells that inundated during monsoons.

Usually for three months from the middle of December to March, shutters of the Thanneermukkom Salt Water Regulator are lowered and because of it water level in rivers and waterways recedes aggravating the problem of water pollution. Only one-fourth of the local fishermen households have latrines with septic tanks or pits. Either all the remaining households use open fields very close to water bodies or water bodies themselves for defecation.

Unhealthy habits like smoking, pan chewing, and use of alcoholic drinks are very common among the local fishermen. Out of 96 inland fishermen we have interviewed, 67 are regular smokers and 7 persons are regular pan-takers. Twenty persons use alcohol once in a week while another 7 persons are alcohol addicts.

Inadequate food intake, unhygienic living conditions, and unhealthy habits have made the local fishermen population highly susceptible to a variety of diseases. Common diseases noted in the study area were dysentery, cholera, typhoid, fever and respiratory problems. In our survey, we observed that 28 per cent of the fishermen had undergone treatment during the previous month for various diseases including asthma, tuberculosis, cancer, diabetics, and ulcer.

In brief, the health status of the fishermen community in the area is extremely low. Their living conditions are poor. Their food intake is inadequate. The majority of the households are indebted and household savings are negligible.

4. Problems in Inland Fishing

At present, the inland fisheries sector in the Kuttanad region is on the verge of a severe

crisis. The major problems faced by this sector are discussed in this chapter based on the findings from Neelamperoor village.

Over-Fishing

During the past few decades, the number of active fishermen in the Kuttanad region have increased substantially. Meanwhile, due to massive reclamation for domestic, agricultural, and industrial purposes, the area of water bodies in the region has declined substantially. Over the past several decades, due to soil erosion, the depth of water bodies in the Kuttanad region has declined rapidly. Region-wise depths of the Vemband Lake during the early Forties and the early nineties are given in Table 4.1 that shows that in most regions, its depth has decreased drastically. The decline has been among the greatest in the area adjacent to Neelamperoor.

Increased human intervention and the resultant degeneration of the ecosystem have adversely affected the availability of inland fish in the Kuttanad region. Some of the wild inland fish species like milkfish (*poomeen*), perches (*narimeen*), mullets (*kanambu*), and *manjakkoori* (a variety of cat fish) have become nearly extinct and the availability of murrels (*bral*), barbus (*kuruva*), wallago attu (*vala*), and crabs has declined substantially. Rapid growth in the number of active inland fishermen on the one side and the decline in fish availability on the other side have led to a situation of severe competition among fishermen.

In their bid to maintain the size of the daily catch, they work for long hours and use large quantities of net and other fishing gear. When production efforts exceed the maximum sustainable yield a stage of biological over-exploitation begins as a result of which the production and productivity of fishing grounds decline and the average size of the fishes caught gets smaller³⁹. Over-crowding in the inland fishing sector and the resultant over-exploitation of the aquatic wealth have affected adversely the sustainability of inland fish production in the Kuttanad region.

Unscrupulous Fishing

Though the State Fisheries Department has legally banned the use of all fishing gear which lead to mass destruction and premature catching of inland fish such as *muppally* (three-headed spear), *perumkoodu* (a big triangular bamboo trap), *peruvala* (a large cast net with small mesh size and 10 to 20 meters wide), and *madavala* (a long cylindrical net with very small mesh size), they are frequently in use. Similarly nets with small mesh size (less than 2 fingers) and gill nets exceeding a total length of 35 meters that are also prohibited are in common use. At present, more than one-third of the fishermen use *pattuvala* with mesh size ranging from 0.5 to 1.5 fingers; another one-fifth use long gill nets.

Neelamperoor village comes under the jurisdiction of the Inland Fisheries Office, Mannar, situated nearly 20 km away. This office issues licences to fishermen for different fishing gear and enforce the rules and regulations regarding inland fishing. At present, Mannar Fisheries

Office which has jurisdiction over a wide region comprising several villages in Kuttanad and nearby areas, is acutely understaffed and the five officials in place find it difficult to enforce the rules effectively.

Table 4.1 Region-wise Depth of Vembanad Lake During Early '40s and Early '90s
(Depth in meters)

Zone	Depth early '40s	Depth early '90s	Average decline in depth
South to Thanneermukkom	8.0-9.0	3.0-3.5	5.25
Thanneermukkom to Vaikom	8.0-9.0	3.0-4.0	5.00
Vaikom to South Paravoor	7.0-9.0	4.0-5.0	3.50
South Paravoor to Aroor	5.0-6.0	3.0-4.0	2.00
Aroor to Wellington Island	7.0-8.0	7.0-8.0	Nil
Kochi Harbour	7.0-8.0	7.0-8.0	Nil
Mulavukad to Cherayi	3.0-4.5	2.0-2.5	1.50
Cherayi to Azheekode	3.0-6.0	2.5-4.0	1.75

Source: Gopalan U K (1991), *Kayal Nammude Sampathu* (Mal.), Kerala Sastra Sahitya Parishat, Kozhikode, p.45

Thoompuvala and *madavala* though prohibited are commonly in use. After harvesting the *punja* crop of rice (the summer crop sown during November-December and harvested during February-March), water from adjoining canals is allowed to flow into the low-lying dry fields in a controlled manner through sluices. At the mouth of these sluices, nets with narrow mesh size called *thoompuvala* are fixed to catch fish. During the non-cultivating season, *padasekharams* remain submerged and make ideal habitats for a variety of fish. By the end of September, when dewatering operations are held for 20 to 30 days without interruption, *madavala*, which also has very small mesh size, is used to catch all the fish and the fishlings that flow with the pumped out water.

Water poisoning, electrocution, and the use of explosives are also resorted to by some people, most of whom are not active fishermen, which lead to the destruction of aquatic wealth in the Kuttanad region.

Thanneermukkom Salt Water Barrier

Kuttanad region at present contributes only about 8 per cent of the State's total annual rice production and its share is less than 2.5 per cent of the annual domestic requirements of rice in the State. Yet, the region is referred to as the 'rice bowl' of Kerala⁴⁰. Based on a highly exaggerated idea of potential in foodgrain production, this region has received attention since the middle of the present century. Three major development schemes implemented between 1950 and 1975 are (i) The Thottappally Spillway meant to control the recurring

floods in Kuttanad (ii) The R-Block Holland Project for construction of permanent non-submersible bunds around *padasekharams*, and (iii) The Thaneermukkom Salt Water Barrier.

The 4,500-foot Thaneermukkom Salt Water Barrier⁴¹ in the Vembanad Lake was envisaged to mitigate the problem of saline water intrusion in the rice fields located to the south of Thaneermukkom for raising a second (*punja*) crop during summer.

The barrier has, however, affected the aquatic wealth and inland fish production in the Kuttanad region adversely. During the summer months, when the barrage is closed to prevent the intrusion of saline water into the *padasekharams*, salinity becomes too low in the southern parts of the lake for the growth of several varieties of prawns.

Moreover, the Barrier⁴² also interrupts the migration routes of prawns and other fish. Lack of salinity also leads to the excessive growth of water weeds that prevent smooth movement of fishing craft through the water ways. During the monsoon months when the shutters of the bund are raised a considerable portion of these aquatic weeds flow into the northern parts of the lake and thereby make inland fishing operations in those areas difficult. Growth of aquatic weeds results in the loss or damage of fishing nets.

The elder fishermen in the study area are unanimous in their opinion that most of the current problems in inland fishing in the region originated since the bund came into existence.

Inland Fish Disease

During 1991, an unprecedented fish disease called Epizootic Ulcerative Syndrome (EUS) which results in the sudden development of severe ulcerative conditions and causes mass mortality of inland fish appeared in some of the major inland fish producing centres in Kerala. Ulceration and mortality were relatively more severe in murels, clarias, pearlspot, belone and chanos⁴³. However, unlike in the northern states of the country, cultured fish like rohu, katla, carp, etc were not affected in Kerala.

Within a few months of the outbreak of the disease, several tonnes of inland fish perished and thousands of fishermen were thrown out of employment in the Kuttanad region. In the study area the worst affected fish species were murels, eels (*aaral*), wallago attu (*vala*), heterppneustes (*mushu*), etroplus (*karimeen*), and fresh water cat fish (*kaaree*, *koori*). Murels are on the verge of extinction and *karee* and *koori* have become scarce. This dreaded fish disease persists even today, though only at a mild level.

Environmental Aspects

Over the past several years the ecosystem of the water bodies in the Kuttanad region has substantially degenerated due to the accumulation of domestic waste fertiliser and pesticide residues and discharges from industrial units. Nearly half the households in this region have no proper sanitation facilities and their domestic wastes and sewage is discharged into nearby

rivers, channels or other water bodies. It is estimated that the residue of the nearly 20,000 tonnes of chemical fertilisers and 500-800 tonnes of pesticides annually applied in the Kuttanad *padasekharam* enter the waterways in between the fields when excess water from these *padasekharams* are baled out for the next crop and gradually reach the Vembanad Lake. Since farmers are free to choose the type of pesticides, sometimes products banned in other countries on pollution grounds are also used in Kuttanad. In most cases, farmers not well informed about the consequences of excess use of pesticides are misguided by dealers and salesmen⁴⁴. The indiscriminate use of insecticides, fungicides, weedicides, and rodenticides are causing irrevocable damage to the ecosystem of the Kuttanad region.

Kuttanad as a whole is not an industrially advanced region and no major industrial units are at present operating in the study area. However, the public sector firm, The Travancore Cements and the private firm, The Travancore Electro Chemicals India Ltd (TECIL) are situated in nearby areas. Everyday 1,53,000 litres of effluents are discharged from the former and 1920 litres of effluents are discharged from the latter through its 'Lime Shell Washing Plant' situated in Neelamperoor village⁴⁵. In addition, discharges from the numerous rubber-processing units in the eastern part of the region also flow into the waterways and rivers of Kuttanad. Large-scale dredging operations in the Vembanad Lake for collection of sub fossil deposits of lime shell, conducted by Travancore Cements destroy the live clam beds and fishing grounds in the lake.

Acidity is a severe problem affecting fish both in *kayal* lands and *kari* lands in the Kuttanad region⁴⁸. At times, in order to reduce the acidity of the water in the rice fields, they are washed with fresh water from nearby canals and lakes. As a result, the acidity level in the water bodies increases, which in turn leads to massive fish mortality. Massive destruction in recent years of mangroves that provide an ideal habitat and breeding ground for inland fish in the backwater areas has also resulted in the decline of inland fish wealth in the Kuttanad region.

Lack of Capital and Improper Implementation of Welfare Schemes

Inland fishing as a full time occupation requires a substantial amount of both fixed and recurring capital. At present, a moderate size second hand fishing craft costs Rs 6,500 to Rs 7,500. An active full time inland fisherman requires at least 10 kg of gill nets with different mesh sizes, different types of cast nets, half a dozen traps and a hurricane lamp which together would cost more than Rs 20,000. On an average, he has to replace annually at least one-third of his nets and other fishing gear. The maintenance of crafts would cost him Rs 10 to Rs 15 per day. Most of the fishermen in the study area have low earnings and are nearing in debt. They are unable to purchase the required fishing devices on time. At present about one-third of the inland fishermen in the study area do not have fishing crafts of their own. Usually in backwater fishing two fishermen go together in a craft. The owner of the craft is entitled to get one-third of the day's catch as the rent of the craft besides his due share. It is also observed that the quantities of net possessed by a vast majority of the local fishermen are far less than the required level for optimum fishing.

With a view to improving the deplorable living conditions of inland fishermen and to enhance their per capita productivity, the State Government set up a Welfare Fund Board in 1986. As per the provisions of the Board, its members are eligible for benefits such as education grants for their children, compensations in case of accidents, lumpsum payments in case of death, old age benefits, long-term housing loans with subsidies and soft loans for the purchase of fishing crafts, nets and other items of capital.

At present, nearly 90 per cent of the active fishermen in the study area are members of the Welfare Fund. However, it is observed that some of the welfare schemes meant for the inland fishermen are not well-designed and that several fishermen have not benefited from them. For instance, even though all the inland fishermen who do not own fishing crafts are entitled to long-term loans to purchase crafts, the Welfare Fund Board stipulates that such loans would be given only on the joint security of two independent full-time fishermen. Many of the deserving fishermen in the study area find it extremely difficult to get a trustworthy partner in the deal and hence are unable to apply for the loan.

Many persons who are termed as inland fishermen in the official records are not active fishermen. In the study area all the households belonging to the *Dheevara* community, irrespective of their present occupation, enjoy all the benefits intended for fishermen households such as subsidised long-term housing loans, education grants for children etc while a considerable number of actual fishermen who belong to other communities are denied such benefits.

To cite an example, soon after the outbreak of the inland fish disease each inland fisherman was to be given a lumpsum grant of Rs 150 from the Welfare Fund Board. However, due to reasons not known to them, nearly one-fourth of the fishermen did not receive the grant, while persons engaged in other full-time occupations, received it as they were members of the *Dheevara* community.

Neglect of Culture Fisheries

The wetland ecosystem of the Kuttanad region provides ample scope for the development of culture fisheries. In recent years, owing to the escalation in the cost of cultivation and the shortage of inputs, particularly labour, rice cultivation has become a losing proposition. Consequently, vast stretches of rice fields are either being converted into coconut gardens or are allowed to lie fallow throughout the year.

In areas in which two crops are feasible, farmers make do with one. During the second, they go in for fish farming. A variety of inland culture fish varieties is cultivated in these fields. Experiments conducted by the Kerala Agricultural University have shown that the methods of fish farming are suitable for the rice in the second method rice fields are used for fish farming after the first crop.

It is observed that the per hectare fish productivity under the mixed farming system ranges from 240 to 600 kg while under the second method it ranges from 538 to 1005

kg. It is estimated that if the entire *punja* rice fields in Kuttanad (about 53000 hectares), are utilised for fish cultivation after the first crop, 3700 tonnes of inland fish could be produced annually⁴⁷.

In Kerala, the total brackish and backwater area suitable for inland fish and prawn culture is estimated to be 1.24 lakh hectares⁴⁸. In order to promote culture fisheries the State Government, subject to the orders and guidelines of the Central Government, has set up Fish Farmers Development Agencies (FFDA) in all the districts. These agencies after registering the names of the parties interested in fish farming, examine the feasibility of their projects, impart technical training to them and arrange finance for them along with subsidies from NABARD, through commercial banks for starting their own fish farms.

The FFDA in Alappuzha district started functioning in August 1988 and within two years 499 fish farmers were registered under it. Further, training was given to 188 persons from among them. However, in spite of its best efforts the total coverage of the water area used for inland fish culture in the district at the end of the second year was only 43.40 hectares⁴⁹.

Neelamperoor village has immense growth potential in culture fisheries. More than 80 per cent of the total area of the village are wet lands suitable for rice cultivation. Nevertheless, throughout the year nearly one-fourth of the *padasekharams* are kept fallow and from most of the other areas, only a single crop is raised. The study area is also endowed with numerous ponds, waterways and canals ideal for fish culture. However, fish farming has not been attempted so far, due to a number of reasons such as lack of awareness on the part of the people, lack of training, non-availability of fish seeds, and dearth of capital.

Moreover, agricultural labourers in this area are against conversion of rice fields for the purpose of fish farming, as they fear that such conversion will reduce their work. After the implementation of land reforms, several agricultural labourers became owners of rice fields; some of them are members of *Padasekharam* Committees that take decisions on the allocation of area to different crops. Local bodies are yet to take any positive step to introduce fish farming in the inland waters at their disposal in the form of *poramboke* lands. Thus, the immense potential of the area remains untapped.

Problems in Fish Marketing

At present a lion's share of the daily catch of inland fishermen in Neelamperoor village is sold in the local fish market through the *tharakan*. He conducts auction on behalf of the fishermen and charges 10 per cent of the daily receipts as his commission from which 30 per cent is given to the local fishermen's trade union. As the middleman is entrusted with the entire charge of fish sales in the market, actual fishermen have no say in the fixation of prices. Wide inter-seasonal variations are observed in the prices of inland fish in the study area. However, during all the seasons retail prices paid by the final consumers come to about double the price received by fishermen. Since fish is highly perishable and proper storage

facilities are not available in the locality, the bargaining power of fishermen is very weak.

5. Conclusions and Suggestions

Conclusions

Kerala, which has a long coastline and a highly productive continental shelf, is a major producer and exporter of marine products in India. The State is richly endowed with large inland water resources such as rivers, tanks, ponds, reservoirs, brackish water lakes, backwaters and estuaries; however, a major part of the State's growth potentialities in both the culture and capture inland fisheries still remain unexploited. In spite of a substantial increase in the number of its active inland fishermen, the percentage contribution of the State in the total annual inland fish production in the country has shown a declining trend.

With its unique wetlands ecosystem, the Kuttanad region could play a crucial role in the development of the inland fisheries sector of the State. With the Vembanad Lake spread over an area of 365 square km, numerous waterways, channels, ponds, river systems, large and vast stretches of rice fields (*padasekharams*), this region is an ideal habitat and breeding ground for a wide variety of fresh water and brackish water fish species. The region that accounts for nearly one-fourth of the total water area used for fish culture accommodates more than one-third of the inland fishermen households and active inland fishermen in the State. Despite its natural advantages, the inland fishing sector in Kuttanad is on the brink of a severe crisis. Owing to reclamations and encroachments, the area of the water bodies has substantially declined in recent years. Over-fishing, use of banned fishing gear, practices like water-poisoning, use of explosives and electrocution, erection of water barriers and the resultant degeneration of the ecosystem, water pollution due to discharge of household and industrial waste, and accumulation of pesticide and fertiliser residue in water bodies, have caused irreparable damage to aquatic life in this region. Some wild fish species have already become extinct and a few others are on the verge of extinction.

In Kuttanad, inland fishing is an age-old occupation. Most of the traditional fishermen belonged to a backward Hindu community called Dheevera. Traditionally, fishermen used indigenous fishing gear and adhered to fishing norms conventionally prescribed for sustaining inland fisheries and their productivity. Gradually, with large-scale reclamation of *kayal* lands for rice cultivation, the density of population in the Kuttanad region increased rapidly. Later as a result of the introduction of mechanisation in rice farming, people turned increasingly to inland fishing. These new entrants as well as the new generation of the traditional fishermen have exploited the fishery resources excessively.

Neelamperoor is an important inland fishing centre and a major fish market. At present, there are 96 inland fishermen households and 120 active inland fishermen in this village, the majority of them belonging to the traditional fishermen community. Local fishermen still use, in general, traditional fishing gear and crafts. However, in the place of cotton nets, they use either nylon nets or the recently introduced *Vysali* nets. Wide seasonal variations are observed in both the average daily catch and its consumption. For marketing local

fishermen depend on the services of the *tharakan* who takes a commission on the value of the sales.

At present, inland fishermen households from the Dheevera community have become a small minority. Nearly, two-third of the fishermen households are of the Ezhava community, traditionally, a non-fishing community. The fishermen population forms more than eight per cent of the village population. Unlike in the village population, males are more than females among the inland fishermen. Birth and death rates are low and the household size is small. Although more than 95 per cent of the active fishermen in the village are literate, two-thirds of them had only a primary level education.

More than one-third of the fishermen lives in small and untidy huts without proper ventilation. About 60 per cent of their houses has not electricity connection. Modern amenities like television, telephone, electric fans, and refrigerators are available only to a small proportion of the fishermen households. As cooking fuel, they use firewood. Nearly, 80 per cent are full-time fishermen or full-time vendors. In the absence of alternative sources of income, the vast majority of the fishermen households depend exclusively on inland fishing which yield low and uncertain incomes and are subject to wide seasonal variations. Most fishermen households are in debt.

On an average, more than two-thirds of the annual earnings of a fishermen household is spent on food articles. Yet, the average daily food intake of the fishermen population lies far below the required levels in terms of both quantity and quality. Most of them live in filthy surroundings without proper sanitation facilities and use highly contaminated water for domestic purposes. Unhealthy habits like smoking, pan chewing and are common among them. They have become susceptible to several diseases such as cholera, dysentery, typhoid and tuberculosis. Fishermen households spend a considerable portion of their income on medical treatments.

The inland fisheries sector of the Kuttanad region is ridden with several problems. Over the past few decades, the number of active fishermen in this region has increased substantially. Meanwhile, because of the massive reclamation of kayal lands for household, agricultural, and industrial purposes, available fishable areas have declined drastically. In their bid to maintain the size of the daily catch local fishermen work overtime and use large quantities of nets and other fishing gear. Owing to over-fishing, the productivity of the fishing grounds has decreased drastically. Although the use of fishing gear that lead to mass destruction and the premature catching of inland fish are legally banned, such practices continue.

The gradual but steady degeneration of the ecosystem of the Kuttanad region has become a severe threat to its aquatic life. In this respect, the role of Thanneermukkom Salt Water Barrier has been very crucial. During the summer months when shutters of the Bund are closed the low tidal effects cease and impurities are accumulated in the southern parts of the Vembanad Lake. Salinity in areas lying south of the Bund becomes too low for the growth of prawns and brackish water fish. Migration routes of prawns and fish are also disrupted by the Bund. Owing to the dumping of domestic sewage, discharges from factories and accumulation of fertiliser and insecticide residue flushed out from rice fields, the Vembanad Lake and

the waterways have become highly polluted. The unprecedented outbreak and the sudden spread of the inland fish disease in the water bodies of the Kuttanad region during the early nineties caused mass mortality among almost all the species of wild inland fishes. In spite of its immense growth potential, the culture fisheries sector of the region remains largely unexploited. In addition to substantial decline in the availability of inland fish, fishermen of the study area also face many other severe problems such as inadequacy of capital, improper implementation of welfare schemes and exploitation by marketing middlemen.

Suggestions

In order to tackle the present crisis in the inland fisheries sector of the Kuttanad region, a two- way approach is required. On the one side, prompt and rigorous steps must be taken to protect and improve the aquatic wealth of the region and on the other, apt measures should be adopted to solve the problems involved in inland fishing. We suggest the following measures to preserve and enhance the inland fish wealth in the Kuttanad region.

- (i) Identify and register actual inland fishermen and exclude others registered as fishermen from official records;
- (ii) Formulate and implement a comprehensive inland fisheries policy;
- (iii) Strictly enforce the existing rules and regulations regarding the use of nets and other fishing gear, and the prohibition of destructive devices;
- (iv) Prevent further encroachment on existing fishable land bodies;
- (v) While designing any further development projects in the Kuttanad region give due importance to the inland fishing sector and implement only those projects that are environment-friendly. Reassess the usefulness of Thanneermukkam Bund and Thottappally Spillway in the light of the serious environmental problems caused by them;
- (vi) Take appropriate steps to mitigate water pollution discharge of household and industrial waste. Persuade rice farmers to use only the optimum quantities of pesticides and chemical fertilisers; and restrict dredging activities in the Vembanad Lake;
- (vii) Restrict (or even prevent if necessary) inland fishing operations during the breeding season of inland fish and prawn. Moreover, limit the normal duration of fishing to four or five hours per day.
- (viii) Periodically deposit highly productive fish seeds in the Vembanad Lake and in waterways, *padasekharams* and rivers systems in the Kuttanad region. Take stringent measures to prevent the premature capture of fish.
- (ix) Encourage fish cultivation in *padasekharams* either as a mixed crop along with rice or as an alternative crop. Action plans may be formulated at the village or panchayat levels. Financial and technical assistance must be provided to potential fish farmers.
- (x) In order to preserve the different inland fish species and to protect them from extinction, a portion of the Vembanad Lake must be declared as a 'protected' area or 'fish sanctuary' and fishing within this area should be strictly prohibited; and
- (xi) Rejuvenate the 'Fish Disease Monitoring Cell' set up under the State Fisheries Department in 1991 to deal with problems related to inland fish diseases.

In order to ease the specific problems involved in inland fishing, the following suggestions may be considered.

- (i) Provide long-term loans on personal surety with subsidies to the needy fishermen to purchase capital equipment such as fishing crafts, nets and other fishing gear. Ensure that the loans are not diverted for other purposes.
- (ii) Give adequate compensation to fishermen whose fishing crafts and gear are lost or damaged during fishing. Simplify procedures for availing the benefits.
- (iii) Give 'kerosene permits' to all fishermen.
- (iv) Conduct awareness programmes and organise periodic study classes and seminars to impart proper training to fishermen. These activities may be taken up by the *Sanghom*. Reduce or eliminate the role of the intermediaries in fish marketing.

In the past few years, prices of all varieties of inland fish in the Kuttanad region have increased considerably. However, inland fishermen of the region have not benefited much from the price hike because of the simultaneous increase in their cost of living and the steady decline in the quantity of the daily catch. It is necessary to take effective steps to maintain and improve their productivity by discouraging further entry of full time fisherfolk into this sector.

In conclusion, we reiterate that the immense development potential, in both culture and capture inland fisheries, of the Kuttanad region remains untapped and that the living conditions of fishermen households remain poor and almost unchanging in recent years. Concerted action by government agencies, local bodies, trade unions, and voluntary organisation with the active support, co-operation and participation of the fishermen is required to solve the dilemmas and taking the region and its people towards growth and development.

Notes

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² GOK (1994), Economic Review 1993, State Planning Board, Thiruvananthapuram, p. 55.

³ GOK (1997), Economic Review 1996, State Planning Board, Thiruvananthapuram, p.S. 39

⁴ Ibid, p.S.40

⁵ GOK (1991), Kerala Fisheries Facts and Figures 1990, Department of Fisheries, Thiruvananthapuram p. 255.

⁶ GOK (1997), Economic Review 1996, Op. cit., p.S.37.

⁷ GOK (1993), Kerala Fisheries - An Overview 1992, Department of Fisheries, Thiruvananthapuram, p.7.

⁸ GOK (1970), *Kerala Fisheries Facts and Figures 1967-68*, Department of Fisheries, Thiruvananthapuram, p.7

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¹² GOK (1993), Kerala Fisheries: An Overview 1992, Department of Fisheries, Thiruvananthapuram, p.33.

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¹⁴ Gireesh Kumar A (1995), Problems of Inland Fishery in Kuttanad, M.Phil. ,Thesis submitted to the School of Social Sciences, Mahatma Gandhi University, Kottayam, p.44

¹⁵ GOK (1997), Economic Review 1996, op. cit., pp,56-57

¹⁶ In this regard we had followed the same criterion adopted by the Labour Bureau of the Union Government in the First Agricultural Labour Enquiry (1950-51) and the two subsequent Rural Labour Enquiries

¹⁷ For details see, Sangeevagosh D (1991), Ulnadan Malsya Thozhilalikalum Malsya Bandhana Reethikalum (Mal.), op. cit., pp. 46,47

¹⁸ GOK (1996), Economic Review 1995, State Planning Board, Thiruvananthapuram, Table 4.37, p.59

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²⁸ Mini Nair (1991), 'Keralathil Shasthreeya Reethiyillula Chemmeen Krishi' in Jose J Kaleeckal (ed.) Keralathile Ulnadan Malsya Meghala (Mal.), op. cit., pp.166-176.

- ²⁹ Effective literacy rate relates to the population of age 7 and above
- ³⁰ An unemployed person is defined as one in the age group of 15-49 without any gainful employment during the reference period and not seeking or available for work. See, Prakash B A (1993), 'Unemployment in Kerala - Problems and Policy Options', theme paper presented in the Seminar on Education and Unemployment held at Kottayam
- ³¹ John Abraham (1991), "Malsyethara Meghalakalile Vikasanavum Malsya Meghalayil Athinthe Prathyaghathangalum" (mal.), in Jose J Kaleekel (ed.), Keralathile Ulnadan Malsya Meghala, op. cit., p.98.
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- ³³ Oommen M A (1994), 'Land Reforms and Economic Change', in Prakash B A (ed.), Kerala's Economy, Sage Publications, New Delhi, p.122.
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- ³⁷ United Nations (1975), Poverty, Development and Development Policy - A Case Study of Selected Issues with Reference to Kerala, New York, p.36
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- ⁴⁹ Ibid, pp 30-33.

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