



GOVERNMENT OF KERALA

**COMPARITIVE STUDY ON
MAJOR AND MEDIUM IRREGATION
WITH MINOR IRRIGATION SCHEMES**

**Department of Economics & Statistics
Thiruvananthapuram**

2006

PREFACE

The comprehensive development of an area is very much dependent on various factors such as availability of raw materials credit, infrastructure and water. This reports attempt to analyze the impact of irrigation in the agriculture sector. It is known that Kerala is profusely abundant with water due to monsoons and there are many irrigation schemes implemented to tap this water for various purposes.

The economy is on the path of sustained development especially in the secondary and territory sections. This is indicative in the production productivity of various crops and over all improvement in NSDP and per capita income.

I take this opportunity to congratulate all officers and staff in this Directorate who have associated with the preparation of this report and it is hoped that this will be immense use for taking decision to the irrigation schemes of this state.

**M.R.BALAKRISHNAN
DIRECTOR**

**Trivandrum,
May 2006.**



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Objective of Study

Subject Committee on Water Resources Government of Kerala has directed to conduct a Post-facto evaluation study of all major and medium irrigation projects with M.I Schemes in the State to have a comparative analysis of the sector to arrive at a conclusion which one is more suited to Kerala condition.

- 1. To prepare a status report of Major & Medium irrigation Schemes implemented in the State.**
- 2. To review the extend of irrigation potential created and utilized in the State by irrigation projects.**
- 3. To critically analyze the production and productivity of different crops cultivated in the agriculture sector.**
- 4. To examine the social attitude towards the irrigation projects and its impact in the State.**
- 5. To review the various factors in the execution of irrigation projects.**
- 6. Critically analyze whether Major Irrigation or Minor Irrigation is more suited to the State.**

The Subject Committee on Water Resources issued direction to Planning and Economic Affairs Department to conduct the study. The Director of Economics & Statistics conducted the study based on the Secondary data available with Water Resources Department, Planning Board and Department of Economics & Statistics etc.

For the study a Sub Committee was constituted in the Department consisting of Director of Economics & Statistics as Chairman and the Committee Members are

- 1. Additional Director (General)**
- 2. Additional Director (State Income)**
- 3. Additional Director (T.R.S)**
- 4. Joint Director (Survey & Designing)**
- 5. Joint Director (RMIS Cell)**
- 6. Assistant Director (Major Irrigation State Cell)**

The study report is forwarded and presented to Subject Committee for consideration.

Chapter – I

INTRODUCTION

Kerala is one of the smallest States of India having a geographical area of 38885 sq.km. The State lies in between 8 0- 17'-3" and 120-47'-40" north latitudes and 740 -51'-57" to 770-24'-47" east longitudes. The Karnataka State bounds the State on the north and north east, Tamil Nadu borders her eastern and southern limit, Arabian sea lies west and the Western Ghat on the east. The Western Ghat protect the state from the dry winds of the eastern plateau and provide steady rainfall.

Based on the diversity of physical features, the state is broadly divided into three natural zones of lowland, midland and high land. Geographically, the state is divided into four distinct category viz; Crystalline rock, Residual laterite, warkalli formations, alluvial marine and lacustrine deposits. The soil of the State can be broadly be classified into sandy, alluvial, laterite, red, black and forest soil.

Minerals of great economic importance occur along with the coastal beach in the region between Kollam and Kayamkulam. This beach sand contain minerals like illuminate, monazite, Zircon sillimanite etc. In addition to this minerals like China clay, mica, graphite, glass sand , shell lime stone are found in the State; low grade magnetic iron-ore, quartz reefs, are also available in Malabar region and in Wayanad District.

The high land or eastern portion is divided by long spurs, extensive, ravines, dense forests and tangled jungles. The plantation crops such as tea, cardamom, rubber, coffee, pepper etc. are extensively cultivated in these areas.

Another special features of the state is having continuous chain of lagoons or back waters along the coastal areas and all are connected with canals. They thus form one of the best navigation system in the state. The main mountain passes are Perambadi pass, Periya Pass , Kakkur Pass Palakkad gap, Bodinaikannur pass, Thevaram pass, Kumuli pass and Aryankavu pass.

Population

According to population Census 2001, the state population was 318.41 lakhs consisting of 154.69 lakhs males and 165.72 lakh female with a decadal growth rate of 9.42%. Of the total population 74% lives in rural areas and 26% lives in Urban towns or urban agglomeration areas.

Table -1.1

Demographic details of the state

| | | |
|----|--------------------------------|-----------------|
| 1. | Population (2001 Census) | 31841374 |
| 2. | Male | 15468814 |
| 3. | Female | 16572560 |
| 4. | Density of Population | 819/ Sq.Km. |
| 5. | Sex ratio | 1058/1000 males |
| 6. | Decadal population growth rate | 9.42 % |
| 7. | Annual growth rate (91-01) | 0.91% |
| 8. | Literacy rate | 90.92% |
| 9. | Projected population (2005) | 33018963 |

The density of population is perhaps the highest in the whole of India, i.e. 819 persons per sq.km. The ensuing table shows the district wise area , total cropped area population and density of population in the State.

Table- 1.2

District wise area population and density of population

| Sl.No. | Name of District | Area | Total cropped area | Population | Density of population |
|--------|--------------------|---------|--------------------|------------|-----------------------|
| 1 | Thiruvananthapuram | 218600 | 183191 | 3234356 | 1476 |
| 2 | Kollam | 251838 | 187497 | 2585208 | 1038 |
| 3 | Pathanamthitta | 268750 | 115276 | 1234016 | 468 |
| 4 | Alappuzha | 136058 | 126502 | 2109160 | 1492 |
| 5 | Idukki | 514962 | 289836 | 1129221 | 259 |
| 6 | Kottayam | 219550 | 214436 | 1953646 | 882 |
| 7 | Ernakulam | 235319 | 209781 | 3105798 | 1012 |
| 8 | Trissur | 299390 | 195743 | 2974232 | 981 |
| 9 | Malappuram | 438980 | 317234 | 3625471 | 1021 |
| 10 | Palakkad | 363230 | 273245 | 2617482 | 584 |
| 11 | Kozhikode | 233330 | 227383 | 2879131 | 1228 |
| 12 | Wayanad | 212560 | 205027 | 780619 | 366 |
| 13 | Kannur | 296797 | 257211 | 2408956 | 812 |
| 14 | Kasargod | 196133 | 152092 | 1204078 | 604 |
| State | | 3885497 | 2954454 | 31841374 | 819 |

(Source: Agri. Statistics 2003-04)
(Area-Hectres, Population 2001 census)

Among the districts, Malappuram has the highest population followed by Thiruvananthapuram and Ernakulam. Wayanad is the least populated District in the State preceded by Idukki and Kasargod. Among the Districts Pathanamthitta has the lowest decadal growth rate of population of 3.72% and Malappuram have the highest growth rate of 17.22%.

Among the Districts, Alappuzha has the highest density of population with 1492 persons /sq.km. followed by Thiruvananthapuram 1476 persons/sq.km. Idukki district has the lowest density of population of 259 persons per sq.km and Wayanad 366 persons.

Chapter II

Agriculture & allied activities

Kerala is basically an agrarian state and agriculture and allied activities are the main livelihood of the people. The climatic condition and the terrain of the State are favourable for the cultivation of a variety of crops. The educational, industrious and hard working people are an added asset to our State.

Paddy, coconut, rubber, tapioca etc. are the main crops cultivated in the state. In addition to these crops, tapioca, arecanut, oil seeds, ginger, vegetables, cashew, pepper, rubber, cardamom etc. are extensively cultivated.

Table -2.1

No. of operational holdings and area operated by size classes in Kerala 2000-01

| Sl. No. | Size of holdings | No.of holdings | Area (He) | Average size (He) |
|---------|-------------------|----------------|----------------|-------------------|
| 1 | 2 | 3 | 4 | 5 |
| 1 | Below 0.50 He | 5453211 | 587542 | 0.11 |
| 2 | 0.50-1.00 | 464714 | 324907 | 0.70 |
| | Marginal Holdings | 5917925 | 912449 | 0.15 |
| 3 | 1 to 2 He | 262291 | 349541 | 1.33 |
| 4 | Above 2 He | 118173 | 450233 | 3.81 |
| | Total | 6298389 | 1712223 | 0.27 |

Source: Statistics for Planning 2005

The existing land use pattern in (2003-04)are illustrated below.

Table -2.2

Land utilization pattern in Kerala 2003-04

| Sl. No. | Classification of land | Area(He) |
|---------|---|----------|
| 1 | Total Geographical Area | 3885497 |
| 2 | Forest | 1081509 |
| 3 | Land put to non-agricultural use | 395980 |
| 4 | Barren & uncultivable land | 28803 |
| 5 | Permanent pastures & other grazing land | 316 |
| 6 | Land under miscellaneous tree crops | 10831 |
| 6 | Cultivable waste | 67285 |
| 7 | Fallow other than current fallow | 41261 |
| 8 | Current fallow | 68679 |
| 9 | Marshy land | 77 |
| 10 | Still water | 317 |
| 11 | Water logged areas | 401 |
| 12 | Social forestry | 98 |
| 13 | Net area sown | 2189940 |
| 14 | Area sown more than once | 764514 |
| 15 | Total cropped area | 2954454 |

The State is famous for its hill products like pepper, rubber, coffee, tea, cardamom, ginger etc. and these contribute a large share to the country's foreign exchange earnings.

It is seen that total cropped area under food crops in the state is diminishing every year and land used for non-agriculture crops is at positive trend. In this situation of limited availability of cultivable land, the only alternative is to increase agriculture production and productivity by intensive agriculture practices.

Table- 2.3

The year-wise area under cultivation of food crops and non-food crops are given below: Area in hectares

| Sl. No. | Year | Area under food crops | Area under non-food crops | Total cropped area |
|---------|---------|-----------------------|---------------------------|--------------------|
| 1 | 2 | 3 | 4 | 5 |
| 1 | 1986-87 | 1590931 | 1279383 | 2870314 |
| 2 | 1987-88 | 1536014 | 1363841 | 2899855 |
| 3 | 1988-89 | 1537351 | 1426122 | 2963473 |
| 4 | 1989-90 | 1550342 | 1468677 | 3019019 |
| 5 | 1990-91 | 1496182 | 1523798 | 3019980 |
| 6 | 1991-92 | 1480258 | 1540859 | 3021116 |
| 7 | 1992-93 | 1469961 | 1576510 | 3046471 |
| 8 | 1993-94 | 1454302 | 1587399 | 3042701 |
| 9 | 1994-95 | 1434688 | 1516349 | 3048310 |
| 10 | 1995-96 | 1441390 | 1625832 | 3067225 |
| 11 | 1996-97 | 1398549 | 1622675 | 3021224 |
| 12 | 1997-98 | 1345891 | 1623111 | 2969002 |
| 13 | 1998-99 | 1295298 | 1621207 | 2916505 |
| 14 | 1999-00 | 1336000 | 1665704 | 3001704 |
| 15 | 2000-01 | 1349076 | 1672606 | 3021682 |
| 16 | 2001-02 | 1335409 | 1656843 | 2992252 |
| 17 | 2002-03 | 1321696 | 1648688 | 2970384 |
| 18 | 2003-04 | 1297542 | 1656912 | 2954454 |

Table- 2.4

Year wise classification of Land use pattern in Kerala

| Sl. No. | Classification | 1999-00 | 2000-01 | 2001-02 | 2002-03 | 2003-04 |
|---------|------------------------------------|---------|---------|---------|---------|---------|
| 1 | Total Geographical area | 3885497 | 3885497 | 3885497 | 3885497 | 3885497 |
| 2 | Forest | 1081509 | 1081509 | 1081509 | 1081509 | 1081509 |
| 3 | Land put on non agriculture use | 354390 | 381873 | 392352 | 393341 | 395980 |
| 4 | Barren & Un cultivable land | 28884 | 29318 | 29728 | 29580 | 28803 |
| 5 | Permanent pastures | 253 | 164 | * 233 | 263 | 316 |
| 6 | Land put under miscellaneous crops | 18515 | 15409 | 13613 | 13022 | 11724 |
| 7 | Cultivable waste | 58279 | 59257 | 63771 | 69266 | 672285 |
| 8 | Fallow other than current fallow | 332138 | 33988 | 34331 | 39181 | 41261 |
| 9 | Current fallow | 721166 | 77853 | 79270 | 70798 | 68679 |
| 10 | Net area sown | 2239363 | 2206126 | 2190690 | 2188537 | 2189940 |
| 11 | Area sown more than once | 762341 | 815556 | 801562 | 781847 | 764515 |
| 12 | Total cropped area | 3001704 | 3021682 | 2992252 | 2970384 | 2954454 |

Table -2.5

Area and production of important food crops in Kerala

| Sl. No. | Crops | 1970-71 | | 1980-81 | | 1990-91 | |
|-------------------------|-------------------------|---------|------------|---------|------------|---------|------------|
| | | Area | Production | Area | Production | Area | Production |
| <i>A. Food Crops</i> | | | | | | | |
| 1 | Rice | 874830 | 1298005 | 801699 | 1271962 | 559450 | 1086578 |
| 2 | Pulses | 39535 | 13983 | 33859 | 22479 | 23385 | 16544 |
| 3 | Sugar cane | 7652 | 37633 | 8041 | 48178 | 7625 | 51977 |
| 4 | Pepper | 117544 | 25029 | 108073 | 28519 | 168507 | 46802 |
| 5 | Ginger | 12170 | 196800 | 12662 | 32039 | 14145 | 45685 |
| 6 | Turmeric | 4304 | 5341 | 3270 | 6141 | 2669 | 5123 |
| 7 | Cardamom | 47490 | 1246 | 54044 | 63234 | 43826 | 3450 |
| 8 | Betelnut | 85818 | 12738 | 61242 | 10805 | 64817 | 13074 |
| 9 | Banana & other plantain | 48759 | 368984 | 49262 | 317405 | 65637 | 491935 |
| 10 | Cashewnut | 102713 | 115244 | 141277 | 81900 | 115621 | 102771 |
| 11 | Tapioca | 293552 | 4617189 | 244990 | 4060911 | 146493 | 2803001 |
| 12 | Other food crops | 209939 | N.E. | 285626 | | | |
| <i>Total food crops</i> | | 1844306 | - | 1804045 | | 1212175 | |

Table- 2.6
Area and production of important non-food crops

| B. Non food crops | 1970-71 | | 1980-81 | | 1990-91 | |
|------------------------|----------------|------------|----------------|------------|----------------|------------|
| | Area | Production | Area | Production | Area | Production |
| 1 Ground nut | 14692 | 16088 | 9399 | 8225 | 12819 | 9527 |
| 2 Sesamum | 11819 | 3900 | 14572 | 3833 | 9433 | 2063 |
| 3 Coconut | 719136 | 3981 | 651370 | 3008 | 870022 | 4232 |
| 4 Cotton | 7258 | 7178 | 6223 | 86847 | 10731 | 17320 |
| 5 Tobacco | 766 | 1632 | 551 | 1015 | 252 | 472 |
| 6 Tea | 31593 | 41449 | 36164 | 50716 | 34616 | 60638 |
| 7 Coffee | 31564 | 13576 | 52949 | 23540 | 75057 | 20910 |
| 8 Rubber | 179259 | 78731 | 237769 | 140333 | 411615 | 307521 |
| 9 Other non food crops | 86150 | NE | 67488 | | 66932 | |
| Total | 1088237 | | 1076485 | | 1491477 | - |

The paddy cultivation in the State is diminishing as it is not profitable to cultivators. It is now a tendency among the cultivators to change over to more remunerative crops.

Table -2.7
Year wise area under cultivation of important crops

| Sl. No. | Name of Crop | Area under Cultivation during | | | |
|---------|--------------|-------------------------------|---------|---------|---------|
| | | 1993-94 | 1998-99 | 2002-03 | 2003-04 |
| 1 | Paddy | 507835 | 352631 | 310523 | 287340 |
| 2 | Pulses | 20874 | 12627 | 5764 | 5998 |
| 3 | Tapioca | 130987 | 112774 | 104179 | 94297 |
| 4 | Ginger | 11125 | 11107 | 8998 | 8516 |
| 5 | Turmeric | 3250 | 3706 | 3140 | 2774 |
| 6 | Cardamom | 43456 | 41449 | 41412 | 41332 |
| 7 | Cashew | 106733 | 91268 | 28548 | 86376 |
| 8 | Tubers | 31914 | 28768 | 26330 | 24017 |
| 9 | Sweet Potato | 2279 | 1099 | 850 | 1002 |
| 10 | Jowar | 5456 | 2117 | 2571 | 1087 |
| 11 | Sugarcane | 6235 | 6160 | 3758 | 3535 |
| 12 | Groundnut | 14516 | 7021 | 2422 | 2687 |
| 13 | Sesamum | 7891 | 3303 | 811 | 1204 |
| 14 | Cotton | 13753 | 10999 | 3600 | 2949 |

From 1993-94 onwards there is substantial increase in the area under cultivation of plantation crops especially cash crops like Pepper, Arecanut, Pineapple, Coconut, Rubber and Tea.

Table -2.8

Year wise area under cultivation of important crops

| Sl. No | Crops | 1993-94 | 1998-99 | 2002-03 | 2003-04 |
|--------|--------------|---------|---------|---------|---------|
| 1 | Pepper | 118441 | 182384 | 208607 | 216440 |
| 2 | Arecanut | 69153 | 73639 | 97485 | 102504 |
| 3 | Tamarind | 16201 | 18305 | 19220 | 19190 |
| 4 | Nutmug | 4061 | 5811 | 8418 | 9718 |
| 5 | Jack | 75119 | 85885 | 922651 | 92861 |
| 6 | Mango | 77003 | 87137 | 86344 | 85428 |
| 7 | Banana | 23050 | 30521 | 55668 | 55908 |
| 8 | Plantain | 48290 | 50947 | 54811 | 53496 |
| 9 | Pineapple | | 8963 | 10943 | 11484 |
| 10 | Other fruits | 7459 | 12858 | 12329 | 10886 |
| 11 | Drumstick | 19304 | 19629 | 21252 | 21293 |
| 12 | Coconut | 882293 | 882288 | 899198 | 898498 |
| 13 | Tea | 34793 | 34693 | 37068 | 3832 |
| 14 | Rubber | 437100 | 469924 | 476047 | 478402 |

Table-2.9

**The area and production of important crops in Kerala for
the last three years**

| Sl. No. | Name of crops | 2001-02 | | 2002-03 | | 2003-04 | |
|---------|----------------------|---------|------------|---------|------------|---------|------------|
| | | Area | Production | Area | Production | Area | Production |
| | Paddy | 322368 | 703504 | 310521 | 688859 | 287340 | 570045 |
| 1 | Pulses including Tur | 8191 | 6281 | 5764 | 4615 | 5998 | 4930 |
| 2 | Sugarcane | 3267 | 26978 | 3758 | 31283 | 3535 | 29098 |
| 3 | Pepper | 203956 | 58240 | 208607 | 67358 | 216440 | 69015 |
| 4 | Green chilly | 692 | 692 | 783 | 787 | 682 | 679 |
| 5 | Cardamom | 41336 | 8380 | 41412 | 8680 | 41332 | 8875 |
| 6 | Tamarind | 18911 | 29295 | 19220 | 29514 | 19190 | 29406 |
| 7 | Cloves | 754 | 52 | 737 | 53 | 744 | 49 |
| 8 | Nutmug | 7601 | 1888 | 8418 | 2086 | 9718 | 2427 |
| 9 | Jack | 93472 | 308 | 92561 | 320 | 92861 | 341 |
| 10 | Mango | 86308 | 305545 | 86344 | 347154 | 85428 | 384190 |
| 11 | Banana | 50871 | 375903 | 55668 | 421809 | 55906 | 442220 |
| 12 | Plantain | 55183 | 393182 | 54811 | 409282 | 53496 | 399717 |
| 13 | Pineapple | 11159 | 83873 | 10943 | 94842 | 11484 | 95001 |
| 14 | Cashewnut | 89718 | 65867 | -88548 | 66087 | -86376 | 65655 |
| 15 | Drumstick | 21283 | 23007 | -21252 | 23052 | -21293 | 23093 |
| 16 | Sweet potato | 747 | 8672 | -850 | 10463 | -1002 | 11981 |
| 17 | Tapioca | 111189 | 2455880 | -104179 | 241321 | -94927 | 254079 |
| | | | | | 7 | | 0 |
| 18 | Sesamum | 878 | 284 | -811 | 260 | -1204 | 285 |

The land use pattern of the State shows that 21.89 lakhs hectares are utilized for cultivation of agriculture crops and from 1991-92 to 2003-04 there is a reduction of 66662 hectares of agriculture land used for food crops. On the other hand during the same period there is an increase of 94609 hectares of land under cultivation of plantain crops.

Table -2.10

Area, Production and productivity of Principal crops in Kerala

| Sl N o | Crops | Area | | | Production | | | Productivity (KG/He) | | |
|--------------|---------------|---------|---------|---------|------------|---------|-------------|-------------------------|---------|---------|
| | | 2001-02 | 2002-03 | 2003-04 | 2001-02 | 2002-03 | 2003-04 | 2001-02 | 2002-03 | 2003-04 |
| 1 | Rice | 322368 | 310521 | 287340 | 703504 | 688859 | 257004 5 | 2182 | 2218 | 1954 |
| 2 | Jowar | 2902 | 2571 | 2365 | 1480 | 1311 | 1187 | 510 | 510 | 502 |
| 3 | Ragi | 1947 | 1320 | 1360 | 1575 | 1068 | 1100 | 809 | 809 | 809 |
| 4 | Other cereals | 2658 | 2121 | - | 2065 | 1645 | - | 777 | 776 | - |
| 5 | Pulses | 8191 | 5764 | 5604 | 6281 | 4615 | 4272 | 767 | 801 | 762 |
| 6 | Sugarcane | 3267 | 3758 | 3442 | 26978 | 31283 | 28651 | 8258 | 8324 | 8324 |
| 7 | Pepper | 203956 | 208607 | 206902 | 58240 | 67358 | 56842 | 228 | 323 | 275 |
| 8 | Chilly | 692 | 783 | 697 | 692 | 787 | 551 | 1000 | 1005 | 791 |
| 9 | Ginger | 10706 | 8998 | 8923 | 40181 | 32412 | 29714 | 3753 | 3601 | 3330 |
| 10 | Turmeric | 3558 | 3140 | 3047 | 7895 | 6938 | 6653 | 2219 | 2210 | 2183 |
| 11 | Cardamom | 41336 | 41412 | 41782 | 8380 | 8680 | 8709 | 203 | 210 | 208 |
| 12 | Arecanut | 93193 | 97485 | 93380 | 84681 | 107279 | 83749 | 909 | 1100 | 897 |
| 13 | Banana | 50871 | 55668 | 51892 | 375903 | 421809 | 386382 | 7389 | 7577 | 7446 |
| 14 | Plantain | 55183 | 54811 | 55258 | 393182 | 409282 | 389034 | 7125 | 7467 | 7040 |
| 15 | Cashewnut | 89718 | 88548 | 88438 | 65867 | 66087 | 65195 | 734 | 746 | 737 |
| 16 | Tapiocca | 111189 | 104179 | 111348 | 2455880 | 2413217 | 2503558 | 22087 | 23164 | 22484 |
| 17 | Sweet Potato | 747 | 850 | 752 | 8672 | 10463 | 8769 | 11609 | 12309 | 11661 |
| 18 | Ground nut | 2437 | 2422 | 2277 | 1812 | 1801 | 1698 | 744 | 744 | 746 |
| 19 | Sesamom | 878 | 811 | 839 | 284 | 260 | 241 | 323 | 321 | 287 |
| 20 | Coconut | 905718 | 899198 | 906207 | 5479 | 5709 | 5484 | 6049 | 6349 | 6052 |
| 21 | Cotton | 3760 | 3400 | 3165 | 3165 | 6069 | 5488 | 5104 | 1614 | 1613 |
| 22 | Tubacco | 71 | 90 | 45 | 395 | 501 | 250 | 5563 | 5567 | 5556 |
| 23 | Coffee | 84795 | 83113 | 84684 | 66690 | 63322 | 63850 | 786 | 762 | 754 |
| 24 | Tea | 36899 | 37068 | 36944 | 66090 | 55348 | 55887 | 1791 | 1493 | 1513 |
| 25 | Rubber | 475039 | 476049 | 478402 | 580350 | 594917 | 655750 | 1222 | 1250 | 1371 |

Chapter III

CLIMATE

On the whole the state has a fairly salubrious cool & moderate climate. The climatic conditions of any year is broadly divided to six seasons. Usually the first season commence from March to May have hot and scanty rain at interval, next season from May to July having south west monsoon with heavy rain. Then July to September have moderate and continuous rain and proceed to north east monsoon till November. Then commence moderate or high dew which continues up to the end of January and the last season the hot season which ends till March. This season witness partial cessation and salubrious being cool and refreshing in nature.

Rainfall

In our State rainfall is occur due to South West and North East monsoons marked by near normal rain fall. During these two seasons about 90% of the annual rainfall is precipitated in the state. The south west monsoon accounts for two-third of the precipitation and during this season sky is cloudy and have continuous and heavy rainfall. The north east monsoon rain fall mostly in the afternoon and accompanied by thunder and lightening. Usually western ghats at maximum rain fall while Palakkad has less rain fall.

During the year 2003 the actual rainfall was 2369.2 mm as against normal rain fall of 2953.9 mm indicating a deviation of 20% from the normal rainfall. In Kerala the highest departure from the normal rainfall was recorded during the south west monsoon during 2002.

Table -3.1

**District wise Actual and normal rainfall (in mm)
with % deviation from Normal rainfall for 2004.**

| Sl. No | District | Rainfall | | % deviation from normal rainfall |
|--------|--------------------|----------------|----------------|----------------------------------|
| | | Actual (in mm) | Normal (in mm) | |
| 1 | Thiruvananthapuram | 1727.5 | 1685.5 | 3 |
| 2 | Kollam | 2281.7 | 2182.5 | 5 |
| 3 | Pathanamthitta | 2632.1 | 2536.6 | 4 |
| 4 | Alappuzha | 2758.9 | 2576.2 | 7 |
| 5 | Idukki | 2803.4 | 2794.3 | 0 |
| 6 | Kottayam | 3744.4 | 2807.9 | 33 |
| 7 | Ernakulam | 3067.7 | 2877.9 | 7 |
| 8 | Trissur | 2809.7 | 2863.2 | -2 |
| 9 | Malappuram | 2139.3 | 2091.2 | 2 |
| 10 | Palakkad | 3238.2 | 3264.0 | -1 |
| 11 | Kozhikode | 2538.8 | 2719.0 | -7 |
| 12 | Wayanad | 2560.6 | 3280.8 | -22 |
| 13 | Kannur | 3294.5 | 3220.4 | 2 |
| 14 | Kasargod | 3016.6 | 3494.1 | -14 |
| | State average | 27581.1 | 2742.4 | 1 |

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Table -3.2

The District wise Annual average rainfall (in mm.)

| Sl. No | District | Normal | 2000 | 2001 | 2002 | 2003 | 2004 |
|--------|----------------|--------|------|------|------|------|------|
| 1 | 2 | 3 | 6 | 7 | 8 | 9 | 10 |
| 1 | Trivandrum | 1955 | 1501 | 2101 | 1505 | 1567 | 1911 |
| 2 | Kollam | 2729 | 2353 | 2432 | 2104 | 2025 | 2427 |
| 3 | Pathanamthitta | 3087 | 2685 | 2907 | 2400 | 2575 | 2922 |
| 4 | Alappuzha | 3025 | 2638 | 2748 | 2478 | 2328 | 2804 |
| 5 | Idukki | 3047 | 2368 | 2748 | 2478 | 2328 | 2804 |
| 6 | Kottayam | 3946 | 3226 | 3686 | 3361 | 3152 | 3835 |
| 7 | Ernakulam | 3250 | 2658 | 3587 | 3018 | 2593 | 3201 |
| 8 | Trissur | 3047 | 2074 | 2761 | 2569 | 2248 | 2928 |
| 9 | Malappuram | 2363 | 1831 | 1970 | 1833 | 1728 | 2227 |
| 10 | Palakkad | 2560 | 2191 | 2508 | 2200 | 2206 | 2644 |
| 11 | Kozhikode | 3185 | 2529 | 2646 | 2845 | 2274 | 3333 |
| 12 | Wayanad | 3622 | 2344 | 1983 | 2098 | 1915 | 2608 |
| 13 | Kannur | 3375 | 2918 | 2944 | 3087 | 2865 | 3370 |
| 14 | Kasargod | 3480 | 3152 | 3854 | 3174 | 3064 | 3157 |

Statistics for Planning 2005

It is seen from the above statistics that in majority of the years there are wide variation from the normal rainfall. This would have adversely affected agriculture production in the State. The deviation from normal rainfall apart from affecting production and productivity of annual crops also affect productivity of perennial crops such as coconut, rubber, pepper etc.

Table -3.3

**Percentage departure of Rainfall from
normal rainfall (1990-2004)**

| Sl.No. | Year | Annual | South west monsoon | North East Monsoon |
|--------|------|--------|--------------------------|--------------------------|
| 1 | 2 | 3 | 4 | 5 |
| 1 | 1990 | -28 | -25 | -4 |
| 2 | 1991 | -39 | 18 | -21 |
| 3 | 1992 | -37 | 15 | 35 |
| 4 | 1993 | -8 | -12 | 32 |
| 5 | 1994 | 11 | 15 | 13 |
| 6 | 1995 | -6 | -6 | -22 |
| 7 | 1996 | -13 | -8 | 2 |
| 8 | 1997 | 3 | 6 | 31 |
| 9 | 1998 | 0 | 2 | 30 |
| 10 | 1999 | -8 | -25 | 23 |
| 11 | 2000 | -21 | -18 | -27 |
| 12 | 2001 | -6 | -13 | 0 |
| 13 | 2002 | -14 | -33 | 32 |
| 14 | 2003 | -14 | -24 | 54 |
| 15 | 2004 | 1 | -19 | 14 |

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Table-3.4

District wise Annual Rainfall from 1998 to 2004 (in m.m.)

| Sl.No. | District | Normal | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|--------|--------------------|--------|------|------|------|------|------|------|------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | Thiruvananthapuram | 1955 | 2080 | 1927 | 1501 | 2101 | 1505 | 1567 | 1911 |
| 2 | Kollam | 2729 | 2523 | 2886 | 2353 | 2432 | 2104 | 2025 | 2427 |
| 3 | Pathanamthitta | 3087 | 3128 | 3380 | 2685 | 2907 | 2400 | 2575 | 2922 |
| 4 | Alappuzha | 3025 | 3108 | 3104 | 2638 | 2748 | 2478 | 2328 | 2804 |
| 5 | Idukki | 3047 | 3371 | 2957 | 2412 | 3078 | 2634 | 2780 | 2910 |
| 6 | Kottayam | 3946 | 3833 | 4247 | 3226 | 3686 | 3361 | 3152 | 3835 |
| 7 | Ernakulam | 3250 | 3317 | 3053 | 2658 | 3587 | 3018 | 2593 | 3201 |
| 8 | Trissur | 3097 | 3315 | 2767 | 2074 | 2761 | 2569 | 2248 | 2928 |
| 9 | Malappuram | 2363 | 2407 | 2122 | 1831 | 1970 | 1833 | 1728 | 2227 |
| 10 | Palakkad | 2560 | 3019 | 2852 | 2191 | 2508 | 2200 | 2206 | 2644 |
| 11 | Kozhikode | 3185 | 3392 | 2819 | 2529 | 2646 | 2845 | 2274 | 3333 |
| 12 | Wayanad | 3622 | 2438 | 2231 | 2344 | 1983 | 2098 | 1915 | 2608 |
| 13 | Kannur | 3375 | 3484 | 3037 | 2918 | 2944 | 3087 | 2865 | 3370 |
| 14 | Kasargod | 3480 | 3778 | 3235 | 3152 | 3854 | 3174 | 3064 | 3157 |

Source: Meteorological department

Table -3.5

District wise actual and normal rainfall (in m.m.)

| Sl. No | District | 2001 | | 2002 | | 2003 | |
|--------|--------------------|--------|--------|--------|--------|--------|--------|
| | | Actual | Normal | Actual | Normal | Actual | Normal |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | Thiruvananthapuram | 2101 | 1955 | 1505 | 1955 | 1567 | 1955 |
| 2 | Kollam | 2432 | 2729 | 2104 | 2729 | 2025 | 2729 |
| 3 | Pathanamthitta | 2907 | 3087 | 2408 | 3087 | 2575 | 3087 |
| 4 | Alappuzha | 2748 | 3025 | 2748 | 3025 | 2328 | 3025 |
| 5 | Idukki | 3078 | 3047 | 2634 | 3047 | 2780 | 3047 |
| 6 | Kottayam | 3686 | 3946 | 3361 | 3946 | 3152 | 3946 |
| 7 | Ernakulam | 3587 | 3250 | 3018 | 3250 | 2593 | 3250 |
| 8 | Trissur | 2761 | 3097 | 2569 | 3097 | 2248 | 3097 |
| 9 | Malappuram | 1970 | 2363 | 1833 | 2363 | 1728 | 2363 |
| 10 | Palakkad | 2508 | 2560 | 2900 | 2560 | 2206 | 2560 |
| 11 | Kozhikode | 2646 | 3183 | 2845 | 3185 | 2274 | 3185 |
| 12 | Wayanad | 1983 | 3622 | 2098 | 3622 | 1915 | 3622 |
| 13 | Kannur | 2944 | 3375 | 3087 | 3375 | 2865 | 3375 |
| 14 | Kasargod | 3854 | 3480 | 3174 | 3480 | 3064 | 3480 |

Deficit rainfall was occurred in eight Districts during South West Monsoon and five Districts during North East Monsoon. Wayanad District alone recorded deficit rainfall to the extent of 35% and 29% respectively both SW & N.E rain fall during 2004.

Even though the state is blessed with satisfactory rainfall but 90% occurs during the two rainy seasons which are spread over a period of six months. During summer season the flow in the rivers dwindles and those rivers connected with sea or lagoons are contaminated by saline intrusion. To solve the drinking water problems water supply schemes have been widely implemented in the state.

CHAPTER IV

WATER RESOURCES

Kerala is a land rich in water resources. This report attempts to assess water resources and its optimum use for various purposes. There are 41 west flowing and 3 east flowing rivers. The Periyar is the largest rivers has a length of 244 km. It is estimated that the total run-off in all rivers are 2484 TMC and utilizable water resources is approximately 1510 TMC.

Kerala is basically an agriculture State and nearly 60% of the population of the state depend on agriculture for their livelihood. The climatic condition and fertility of the soil is suited to the growth of variety of food crops and cash crops. The main food crops grown in the state are Paddy, Pulses, tapioca, banana, plantain, vegetables etc. while the cash crops are rubber, tea, coffee, cardamom, pepper, coconut, arecanut, sugarcane, cotton optimum.

Kerala is a deficit state in the matter of food production. The neighboring southern states supply almost all food crops to meet the requirements. To increase food production, agriculture programmes such as multiple cropping, adoption of high fertilizers, plant protection measures and optimum use of irrigation are essential.

Water is an essential input for the food crops. The state is blessed with fairly high rainfall i.e. average 3000 m.m. Most of the rains are occur June to July & September to October. In the remaining eight months, there is practically no or little rain. As a result of this uneven distribution of rainfall irrigation is essential for satisfactory conduct of agriculture operations

The population of the State according to 2001 population Census was 318 lakhs and by 2021 it would be 553 lakhs. To meet the drinking need and the needs of industries in 2020, it is approximately estimated 1265 TMC of water would be required.

Most of the river basin are subject to tidal and saline intrusion in their lower reaches especially during summer. As these rivers are navigable, regulatory structures put across the rivers will check the navigation. To overcome this

situation the best course would be let down controlled discharges down the rivers to keep the tides and salinity. It is estimated that 254 TMC of water is required for this purpose. Such releases apart from arresting tidal and saline intrusion will also provide sufficient navigable depth in the rivers to facilitate inland river traffic.

Table -4.1

The utilization of water is estimated approximately as follows:

| | | | |
|----|-------------------------------|-------|------|
| 1. | Irrigation | 1020 | TMC. |
| 2. | Domestic and industrial use | 265 | TMC |
| 3. | Salinity Control & Navigation | 254 | TMC |
| 4. | Removal of Toxiary from land | 177 | TMC |
| | | ----- | |
| | | 1716 | TMC |
| | | ===== | |

According to the available estimates the total fresh water availability in Kerala is 6840.80 billion cubic metres including re-generated flow from ground water. The utilizable resources as per the assessment is around 6229 billion cubic metres whereas the requirement for water for various purpose like irrigation and domestic use is estimated at 3321.BCM.

Table- 4.2

Purpose wise % annual fresh water withdrawal

| | Agriculture | Industry | Domestic use |
|--------|-------------|----------|--------------|
| India | 92 | 3 | 4 |
| Kerala | 71 | 11 | 18 |

*Source: World Development Indicators 2003- Water Resources of Kerala
BCM- Billion cubic metre*

The availability of water in time to the required quantity has to be ensured for successful cultivation. We can't entirely depend on monsoon even though we get more than 3000 m.m. of rainfall from the south west and north east monsoons. This rainfall occurs mainly during June to August and October to November. There is practically no rain during the remaining periods of the year. In order to avert such vagaries of nature we have to preserve reservoirs and conserve water for irrigation.

Table -4.3

The projected water consumption for different categories for 2020 AD

| Sl.No. | Purpose | 1997-98 | 2020 |
|--------|------------------|---------|------|
| 1 | Irrigation | 560 | 640 |
| 2 | Domestic purpose | 30 | 50 |
| 3 | Industries | 30 | 57 |
| 4 | Power Generation | 9 | 28 |

*BAU. Business as usual (Eco.Review 2004 – Page 19)
Source: Report of the committee on India vision- 2002*

Table -4.4

The inland water spread available in the state is estimated as follows

| Sl No | Type of inland water | Area in (Hectres) |
|-------|-----------------------------------|-------------------|
| 1 | 2 | 3 |
| 1 | Rivers | 85000 |
| 2 | Tank& Ponds | 276258 |
| 3 | Reservoirs | 42890 |
| 4 | Brackish water, lake & Back water | 112962 |

Table -4.5

Main rivers, its length and approximate river basin areas in the State

| Sl. No | Name of the river | Length of the river (KM) | River basins area inside the state (Sq.Km) |
|--------|---------------------|--------------------------|--|
| 1 | 2 | 3 | 4 |
| 1 | Manjesewaram River | 16 | 90 |
| 2 | Uppala river | 50 | 76 |
| 3 | Shiriya river | 67 | 290 |
| 4 | Mogral river | 34 | 132 |
| 5 | Chandragiri river | 105 | 570 |
| 6 | Chittiri river | 25 | 145 |
| 7 | Neeleswaram river | 46 | 190 |
| 8 | Kariyamcode river | 64 | 429 |
| 9 | Kavayi river | 31 | 143 |
| 10 | Pervampa river | 51 | 352 |
| 11 | Ramapuram river | 19 | 52 |
| 12 | Kuppam river | 82 | 469 |
| 13 | Valapattanam river | 110 | 1321 |
| 14 | Anjarakandy river | 48 | 412 |
| 15 | Tallicherry | 28 | 132 |
| 16 | Mahe river | 54 | 394 |
| 17 | Kuttiyadi river | 74 | 583 |
| 18 | Korappuzha river | 40 | 624 |
| 19 | Kallayi river | 22 | 96 |
| 20 | Chaliyar river | 169 | 2538 |
| 21 | Kadalundi river | 130 | 1112 |
| 22 | Thirur river | 48 | 117 |
| 23 | Bharathapuzha river | 209 | 4400 |
| 24 | Keecheri river | 51 | 401 |
| 25 | Puzhakkal river | 29 | 234 |
| 26 | Karuvannor river | 48 | 1054 |
| 27 | Chalakkudy river | 130 | 1704 |
| 28 | Periyar river | 244 | 5284 |
| 29 | Moovattupuzha river | 121 | 2004 |
| 30 | Meenachil river | 78 | 1272 |
| 31 | Manimala river | 90 | 847 |
| 32 | Pampa river | 176 | 2235 |
| 33 | Achencoil river | 128 | 1484 |
| 34 | Pallikkal river | 42 | 220 |
| 35 | Kallada | 121 | 1919 |

| 1 | 2 | 3 | 4 |
|----|-------------------|----|-----|
| 36 | Ithikkara | 56 | 642 |
| 37 | Ayiroor river | 17 | 66 |
| 38 | Vamanapuram river | 88 | 687 |
| 39 | Mamom river | 27 | 114 |
| 40 | Karamana river | 68 | 702 |
| 41 | Neyyar | 56 | 497 |

East Flowing rivers

| | | | |
|---|---------------|-------|------|
| 1 | Kabani River | 12 KM | 1920 |
| 2 | Bhavani river | 29 KM | 562 |
| 3 | Pampar river | 13 KM | 384 |

The above list contain those rivers having 15 Km or more length and innumerable other small streams, thodu, ponds are not included.

Table -4.6

Ground Water Resources of Kerala as on 1999(GCE methodology)

| Sl. No. | Items | Ground Water Resources |
|---------|--|------------------------|
| 1 | Total annual ground water discharge | 6840.80 BCM |
| 2 | Natural discharge during non monsoon season | 611.76 BCM |
| 3 | Net annual ground water availability | 6229.04 BCM |
| 4 | Existing gross ground water draft for irrigation | 1596.02 BCM |
| 5 | Existing gross ground water for domestic & Industrial uses | 1097.36 BCM |
| 6 | Existing gross ground water draft for all uses | 2693.38 BCM |
| 7 | Allocation of domestic and industrial water supply for next 25 years | 1411.79 BCM |
| 8 | Net ground water availability for future irrigation Development | 3221.23 BCM |
| 9 | Existing stage of ground water development | 43.24 BCM |

Eco Review -2004 BCM- Billion cubic metre

Apart from irrigation and domestic consumption, large quantity of water is required for industrial use. Due to rapid industrialization in the State, the requirement of water for industries are very high. Hence based on the present consumption of water by the existing industries the planners have to estimate the future requirement.

Table- 4.7

**District wise details of Ground water resources in Kerala
(GEC 1997 methodology)**

| Sl. No. | District | Total ground water discharge | Net natural ground water available | Existing gross ground water draft for all use | Existing gross ground water draft for Irrigation | Existing gross ground water for domestic & Industrial use | Net ground water availability for future irrigation Development |
|--------------|--------------------|------------------------------|------------------------------------|---|--|---|---|
| 1 | Thiruvananthapuram | 308.51 | 278.03 | 178.79 | 84.20 | 82.25 | 94.59 |
| 2 | Kollam | 495.61 | 448.25 | 202.78 | 114.03 | 222.28 | 88.75 |
| 3 | Pathanamthitta | 347.00 | 316.56 | 91.69 | 49.66 | 208.85 | 42.03 |
| 4 | Alappuzha | 466.08 | 419.46 | 128.52 | 61.06 | 266.03 | 67.46 |
| 5 | Idukki | 521.06 | 470.86 | 130.32 | 62.89 | 315.45 | 67.43 |
| 6 | Kottayam | 269.04 | 246.32 | 83.41 | 41.77 | 147.47 | 41.64 |
| 7 | Ernakulam | 618.43 | 567.84 | 284.03 | 197.59 | 258.04 | 86.44 |
| 8 | Trissur | 774.99 | 702.80 | 329.63 | 228.27 | 344.29 | 101.36 |
| 9 | Malappuram | 823.92 | 750.37 | 300.32 | 140.47 | 418.09 | 159.85 |
| 10 | Palakkad | 557.29 | 507.63 | 280.68 | 165.45 | 185.68 | 115.23 |
| 11 | Kozhikode | 366.41 | 344.81 | 191.66 | 104.86 | 127.32 | 86.80 |
| 12 | Wayanad | 324.39 | 291.95 | 63.07 | 34.40 | 217.15 | 28.67 |
| 13 | Kannur | 591.89 | 540.62 | 183.81 | 107.29 | 331.95 | 76.52 |
| 14 | Kasargod | 376.18 | 343.54 | 244.67 | 204.08 | 96.38 | 40.59 |
| Total | | 6840.80 | 6229.04 | 2693.38 | 1596.02 | 3221.23 | 1097.36 |

We have utilized so far nearly 25% of Irrigation potential of the State which is insufficient . Most of the irrigation projects clusters in and around the high land regions. The projects taken up during 3rd & 4th Plan period are still stand incomplete. The delay in completion, escalation of costs, back log of execution are main factors hindering timely completion of projects. Government have taken it was a policy to complete all the spill over projects instead of starting new projects.

Chapter V

IRRIGATION

MAJOR IRRIGATION SCHEMES

Kerala is traditionally an agriculture state. The climatic condition & fertility of the soil is conducive for the growth of almost all crops including plantation crops. However the state is deficit in the production of food crops and depend on import to fulfill the requirements. To catch up the demand, various measures are taken up to increase food production, Agriculture programmes such as multiple cropping, adoption of high yielding varieties of seeds, application of manures & fertilizers, plant protection measures etc are adopted to increase food production.

Water is an essential input for the growth of all food crops especially paddy & Vegetable cultivation where large quantity of water is used. Rain water forms the main source of water for cultivation. But in our state 90% of rain occur in two seasons confined to approximately six month for the remaining six months practically there is no rain. As a result of this uneven distribution of rainfall, the necessity of both major/medium and minor irrigation schemes are keenly felt to provide assured supply of water.

A large part of the outlay under Five Year Plans of the State has been in the field of irrigation and multi purpose projects. The projects implemented so far shows that time taken for completion is considerably more than the period originally planned hence the benefits have been available much later than the expected time and the cost have been alarmingly high and the return from the projects are far below the targets assigned.

Table- 5.1

| Five Year Plan commenced | Major /Medium Irrigation scheme |
|--------------------------|---|
| I | First Five Year Plan (1950-51-1955-56) <ol style="list-style-type: none"> 1. Malampuzha Irrigation Project. 2. Mangalam Irrigation Project 3. Vazhani Irrigation Project. 4. Neyyar Irrigation Project. 5. Peechi Irrigation Project 6. Walayar Irrigation Project |
| II | Second Five Year Plan Period (1955-56-1960-61) <ol style="list-style-type: none"> 7. Gayathri Irrigation Project. 8. Pothundy Irrigation project. 9. Periyar Valley Irrigation Project. 10. Cheerakuzhy Irrigation Project. 11. Chalakkudy Irrigation Project. |
| III | Third Five Year Plan (1960-61-1965-66) <ol style="list-style-type: none"> 12. Pampa Irrigation Scheme. 13. Chittar Puzha Irrigation scheme. 14. Kanjirampuzha Irrigation scheme. 15. Kuttiyadi Irrigation Scheme. 16. B.C.R.Kanakkankadavu |
| | Annual Plan Period (1966-1969) No irrigation scheme commenced |
| IV | Fourth Five Year Plan 1969-70 to 1974-75) No irrigation scheme commenced. |
| V | Fifth Five Year Plan Period (1974-75 to 1979-80) <ol style="list-style-type: none"> 17. Pazhassi Irrigation Project 18. Moovattupuzha Irrigation Project 19. Chimoni Irrigation Project. 20. Attappady Irrigation Project. 21. Karappuzha Irrigation Project 21. Kakkadavu Irrigation Project. 22. Banasura sagar Irrigation project 23. Edamalayar Irrigation Project. 24. BCR Thrittala 25. BCR Chakravattom. 26. Palakkapandy Irrigation. 27. Kallada Irrigation Project. 28. Kuriyar kutty -Karappara |

Out of the 16 completed irrigation projects six projects are located in Palakkad district four projects in Thrissur one each in Thiruvananthapuram, Kozikode, Ernakulam and Pathanamthitta.

Table 5.2
District wise distribution of Irrigation projects

| Sl.No. | Districts | Number of projects | | Total |
|--------------|--------------------|--------------------|-----------|-----------|
| | | Completed | Ongoing | |
| 1 | Thiruvananthapuram | 1 | 1 | 2 |
| 2 | Kollam | 1 | - | 1 |
| 3 | Alappuzha | - | 1 | 1 |
| 4 | Pathanamthitta | 1 | - | 1 |
| 5 | Idukki | - | 1 | 1 |
| 6 | Kottayam | - | 1 | 1 |
| 7 | Ernakulam | 1 | 2 | 3 |
| 8 | Thrissur | 4 | 1 | 5 |
| 9 | Palakkad | 6 | 3 | 9 |
| 10 | Malappuram | - | 2 | 2 |
| 11 | Kozhikode | 1 | 1 | 2 |
| 12 | Wayanadu | 1 | 1 | 2 |
| 13 | Kannur | - | 1 | 1 |
| 14 | Kasargod | - | 1 | 1 |
| Total | | 16 | 16 | 32 |

The pattern of demand for water is undergoing gradual and continuous change towards increasing demand for drinking water and commercial needs, demand for irrigation which is reducing towards less water using perennial crops rather than seasonal crops.

At present there are 10 major and 7 medium irrigation projects completed in our state. and another eleven on going projects, are at different stages of implementation. These projects started long back but were completed in early seventies. In the ongoing projects eight projects are at investigation or pre-investigation stage.

Table- 5.3

The Major irrigation projects (Completed)

(Ayacut in hectares)

| Sl. No | Name of Irrigation Project | Major/ Medium | Expenditure (Rs.inlakhs) | Net Ayacut expected | Net Ayacut irregated) |
|--------------|-----------------------------------|---------------|--------------------------|---------------------|-----------------------|
| 1 | Malampuzha Irrigation Project | Major | 857.00 | 21245 | 22554 |
| 2 | Chitoorpuzha Irrigation project | Major | 2753.00 | 15700 | 14975 |
| 3 | Kuttiyadi Irrigation project | Major | 5695.00 | 14570 | 14151 |
| 4 | Chalakydy Irrigation Project | Major | 238.00 | 19690 | 18530 |
| 5 | Pampa Irrigation Project | Major | 6640.00 | 21135 | 20710 |
| 6 | Periyar Valley Irrigation Project | Major | 10174.00 | 32800 | 30567 |
| 7 | Neyyar irrigation project | Major | 471.00 | 11740 | 8300 |
| 8 | Chimoni Irigation project | Major | 6138.00 | 1300 | 13000 |
| 9 | Peechi Irrigation Project | Major | 247.00 | 17555 | 14630 |
| Total | | | 33213.00 | 155735 | 157417 |

Table- 5.4

Medium Irrigation Projects(Completed)

(Ayacut in hectares)

| Sl. No. | Name of Irrigation Project | Major/ Medium | Expenditure (lakhs) | Net Ayacut expected | Net Ayacut irregated |
|--------------|--------------------------------|---------------|---------------------|---------------------|----------------------|
| 1 | Pothundi Irrigation Project | Medium | 259.00 | 5465 | 4685 |
| 2 | Gayathri Irrigation project | Medium | 282.00 | 5465 | 5465 |
| 3 | Walayar Irrigation Project | Medium | 149.00 | 3752 | 3752 |
| 4 | Mangalam Irrigation Project | Medium | 125.00 | 3440 | 3308 |
| 5 | Vazhani Irrigation Project | Medium | 108.00 | 3560 | 2113 |
| 6 | Cheerakuzhi irrigation project | Medium | 119.00 | 1620 | 1620 |
| 7 | B.C.R. @ Kanakkankadavu | Medium | 1106.00 | 2600 | 2600 |
| Total | | | 2148.00 | 25902 | 23543 |

Table 5.5

DETAILS OF COMPLETED IRRIGATION PROJECTS IN KERALA

| Sl. No. | Name of Project | District | Year of start | Year of completion | Physical Target (area proposed) | | Achievements (area irrigated) | | Expenditure (Rs. in lakh) |
|---------|--------------------|----------------|---------------|--------------------|---------------------------------|---------------|-------------------------------|---------------|---------------------------|
| | | | | | Net | Gross | Net | Gross | |
| 1 | Peechi | Thrissur | 1947 | 1959 | 17555 | 28080 | 14630 | N.A | 247.00 |
| 2 | Malampuzha | Palakkad | 1949 | 1966 | 21245 | 42090 | 22554 | 40208 | 857.00 |
| 3 | Chalakkudi | Trissur | 1949 | 1966 | 19690 | 39380 | 18530 | 27258 | 238.00 |
| 4 | Vazhani | -do- | 1951 | 1962 | 3560 | 7130 | 2113 | 4226 | 108.00 |
| 5 | Neyyar | Trivandrum | 1951 | 1976 | 11740 | 17952 | 8300 | 16716 | 471.00 |
| 6 | Mangalam | Palghat | 1953 | 1966 | 3440 | 6880 | 3308 | 6608 | 125.00 |
| 7 | Walayar | -do- | 1956 | 1964 | 3752 | 6470 | 3752 | 6505 | 149.00 |
| 8 | Gayathri | -do- | 1956 | 1970 | 5465 | 10930 | 5465 | 10114 | 282.00 |
| 9 | Cheerakuzhi | Trissur | 1957 | 1973 | 1620 | 2828 | 1620 | 1846 | 119.00 |
| 10 | Pothundi | Palghat | 1958 | 1971 | 5465 | 10930 | 4685 | 10046 | 259.00 |
| 11 | Peiyarvally | Ernakulam | 1956 | 1994 | 32800 | 85600 | 30567 | 78325 | 10174.00 |
| 12 | Pamba | Pathanamthitta | 1961 | 1994 | 21135 | 49456 | 20710 | 48480 | 6640.00 |
| 13 | Kuttiyadi | Kozhikode | 1962 | 1994 | 14570 | 35850 | 14151 | 34710 | 5695.00 |
| 14 | Chitturpuzha | Palghat | 1963 | 1994 | 15700 | 29202 | 14975 | 29970 | 2753.00 |
| 15 | Chimoni | Thrissur | 1974 | NA | 13000 | 16000 | 13000 | 16000 | 6138.0 |
| 16 | BCR Kanakkankadavu | | 1960 | NA | 2600 | 2600 | 2600 | 2600 | 1106.00 |
| | Total | | | | 193337 | 391378 | 180960 | 333612 | 35361.00 |

Table 5.6
Ongoing Major and Medium Irrigation projects in the State
under Construction

| Sl. No | Name of Project | Expenditure (lakhs) | Ayacut proposed | Ayacut actual |
|--------|---|---------------------|-----------------|---------------|
| | Major Schemes | | | |
| 1 | Pazhassi Irrigation Project | 16158.69 | 11525 | 11525 |
| 2 | Kanjirapuzha Irrigation project | 11434.57 | 9713 | 7266 |
| 3 | Kallada Irrigation Project | 68659.00 | 53514 | 51707 |
| 4 | Moovattupuzha Irrigation project | | 54800 | 19237 |
| 5 | Kuriyarkutty-Karappara Irrigation Project | 2256.09 | 17485 | NE |
| 6 | Edamalayar Irrigation Project | | 30250 | 14394 |
| | Sub Total | 98508.35 | 177287 | 104129 |
| | Medium Schemes | | | |
| 7 | Karapuzha Irrigation Project | 21447.12 | 5221 | NE |
| 8 | Attappadi Irrigation Project | 911.46 | 4347 | NE |
| 9 | Bhanasura Sagar Irrigation project | 1433.75 | 2800 | NE |
| 10 | BCR Chamravattom | 846.00 | 3106 | NE |
| 11 | BCR Thrithala | 2644.64 | 1391 | NE |
| 12 | Palakkapandy Irrigation Project | 114.50 | NA | NA |
| 13 | Thanneermukkom Irrigation Projects | 155.51 | N.E | N.E |
| 14 | Chaliyar Irrigation Projects | 360.00 | 10803 | 7324 |
| 15 | Vamanapuram Irrigation projects | 655.84 | 16436 | 8057 |
| 16 | Meenachil Irrigation Projects | 403.39 | 14510 | 9950 |
| | Sub Total | 28972.21 | 58614 | 25311 |
| | Grand Total | 127480.56 | 235901 | 129460 |

It is found that majority of major/medium irrigation projects exist in Palakkad District which is the granary of rice. Conjunctive use of ground water and surface water resources need to be planned in the irrigation projects. There is need to take effective steps for optimum use through renovation and modernization of existing systems. Water resources development is to be seen not as a single sector objective but as a prime mover in developing larger system with multiple package.

In Kerala, the irrigation water rates are collected based on the estimates of 1974. The water rates are very low compared to the cost of maintenance of major projects. The cost including the establishment changes, maintenance work. The receipt of certain major projects for the last five years shows wide difference. It is seen that the receipt is less than 30% of the cost of the projects.

Table-5.7

Working expenses of some major projects in the State (Rs. in lakhs)

| Sl. No | Name of Project | 2001-02 | | | 2002-03 | | |
|--------|----------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | | Establishment | Work | Total | Establishment | Work | Total |
| 1 | Moovattupuzha Irrigation Project | 96.05 | 45.69 | 141.74 | 130.79 | 301.03 | 431.82 |
| 2 | Mangalam Irrigation Project | 12.69 | 11.15 | 23.84 | 20.44 | 59.83 | 80.27 |
| 3 | Walayar irrigation Project | 18.44 | 6.74 | 25.18 | 33.21 | 98.34 | 131.55 |
| 4 | Kanjirapuzha Irrigation Project | 204.57 | 846.67 | 1051.24 | 212.16 | 313.20 | 525.36 |
| 5 | Pazhassi Irrigation project | 177.58 | 926.89 | 1104.47 | 149.50 | 56.22 | 205.72 |
| 6 | Pothundy Irrigation Project | - | 32.78 | 32.78 | - | 36.34 | 36.34 |
| 7 | Chitturpuzha irrigation Project | 62.92 | 45.99 | 108.91 | - | 65.63 | 65.63 |
| 8 | Pampa Irrigation Project | - | 28.58 | 28.58 | - | 88.47 | 88.47 |
| 9 | Kuttiyadi Irrigation Project | 6.82 | 47.78 | 54.60 | 0.81 | 66.78 | 67.59 |
| 10 | Kallada Irrigation Project | 1158.30 | 1632.70 | 2791.00 | 960.28 | 338.05 | 1298.33 |
| | Total | 1737.37 | 3624.97 | 5362.34 | 1507.19 | 1423.89 | 2931.08 |

Sources: Economic Review

Table -5.8
Cost and receipt of some major projects in Kerala

| Sl.No. | Name of Project | 2001-02 | | 2002-03 | |
|--------------|---------------------------------|----------------|--------------|----------------|---------------|
| | | Cost | Receipts | Cost | Receipts |
| 1 | Malampuzha Irrigation Project | 114.74 | 25.29 | 431.82 | 42.16 |
| 2 | Mangalam Irrigation Project | 23.84 | 3.29 | 80.27 | 3.53 |
| 3 | Walayar irrigation Project | 25.18 | 6.99 | 131.55 | 2.65 |
| 4 | Kanjirapuzha Irrigation Project | 1051.24 | 0.60 | 525.36 | 24.90 |
| 5 | Pazhassi Irrigation project | 1104.47 | 17.15 | 205.72 | 13.67 |
| 6 | Pothundy Irrigation Project | 32.78 | 3.00 | 36.34 | 3.61 |
| 7 | Chitturpuzha irrigation Project | 45.98 | 6.84 | 65.63 | 8.14 |
| 8 | Pampa Irrigation Project | 28.58 | 0.71 | 88.47 | 1.06 |
| 9 | Kuttiyadi Irrigation Project | 47.78 | 1.96 | 48.91 | 1.82 |
| Total | | 2501.59 | 65.83 | 1614.07 | 101.54 |

(Eco. Review 2004.)

There are eighteen Dams intended for irrigation of which 13 have storage and five are barrages. The storage level of the monsoon period during 2003-04 & 2004-05 is furnished below.

Table 5.9

Storage level of completed Projects

| Sl.No. | Name of Reservoir | 1.6.03 | 1.10.03 | 1.1.04 | 1.6.04 | 1.10.04 | 1.1.05 |
|--------|----------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | | Storage mm 3 | Storage mm 3 | Storage mm 3 | Storage mm 3 | Storage mm 3 | Storage mm 3 |
| 1 | Malampuzha Reservoir | 13.95 | 46.12 | 22.46 | 26.45 | 180.45 | 81.95 |
| 2 | Neyyar Reservoir | 28.10 | 7.42 | 80.45 | 56.27 | 103.11 | 85.59 |
| 3 | Kallada " | 96.80 | 241.55 | 387.60 | 177.40 | 417.25 | 408.8 |
| 4 | Kanjirapuzha " | 19.82 | 57.41 | 50.60 | 25.41 | 60.21 | 48.10 |
| 5 | Kuttiyadi " | 53.66 | 83.58 | 107.42 | 70.39 | 105.69 | 108.96 |
| 6 | Pothundy " | 1.87 | 26.16 | 12.52 | 3.89 | 40.52 | 19.99 |
| 7 | Mangalam " | 1.59 | 23.46 | 9.19 | 5.63 | 24.81 | 8.34 |
| 8 | Vazhani " | 0.28 | 6.72 | 1.20 | 1.15 | 15.53 | 9.17 |
| 9 | Peechi " | 4.94 | 36.42 | 27.20 | 5.82 | 73.37 | 41.31 |
| 10 | Walayar " | 1.62 | 1.57 | 1.72 | 1.56 | 8.47 | 1.72 |
| 11 | Meenkara " | 1.16 | 1.03 | 2.05 | 1.08 | 11.72 | 4.81 |
| 12 | Chittur " | 1.34 | 0.92 | 1.09 | 1.00 | 140.10 | 4.99 |
| 13 | Meenkara " | 67.95 | 120.15 | 113.20 | 35.82 | 1188.64 | 971.16 |

Even though there is increase in the rain fall during 2004 the rise in the water level of the reservoir is not high. This is due to the reason that the storage capacity of the reservoirs are deteriorating due to sedimentation or silting. The average period for the completion on major irrigation project is 20 years and maximum of 37 years and minimum of 8 years. The estimated irrigation potential of all major irrigation schemes is worked out to be 2.56 lakh hectres (net) or 3.73 lakh hectres gross.

It is found that a full net work design may be developed in designing the irrigation projects and time bound action plan is to be drawn to monitor the various schemes. The implementation time lag may be reduced to the minimum.

The conveyance losses may be reduced and suitable remedial measures may be adopted in all the projects. The control measures may be taken in time to reduce the conveyance losses.

The self removal from the reservoirs shall be done periodically and effective control measures may be taken in all irrigation projects.

The tanks, ponds & lagoons situated in the command area of the irrigation projects are to be repaired and maintained properly to store maximum surface water.

Minor Irrigation Schemes

Along with the development of Major & Medium Irrigation schemes minor irrigation schemes have a crucial role to play in the irrigation. The role of the minor irrigation schemes are significant as they are quick yielding, low capital intensive and high employment potential. The main schemes comes under minor irrigation are

1. Construction & Restoration of tanks & Ponds.
2. Construction of diversion work across natural streams
3. Construction and restoration of salt exclusion work
4. Reclamation of Kayal and Waste land
5. Improvement of Irrigation and Drainage channels

Kerala has a wide spread net work of rivers and rivulets and springs all over the area. It is estimated that there are 910 ponds and 20 artificial reservoirs with a minimum of 0.50 hectares water spread area, and six fresh water lakes.

It is seen that minor irrigation sector received good attention during the plan period. With the introduction of decentralized planning, all minor irrigation schemes are vested with Panchayath Raj Institutions with Command area less than 15 hectares.

All other irrigation schemes having cultivable command area greater than 15 hectares have been under the control of Water Resources Department as on

medium irrigation schemes. The main irrigation schemes implemented under surface water schemes are minor irrigation class I & II ,lift irrigation, construction of check dam, cross bars, tanks etc.

Local level water resource development and management would be important for meeting the requirements of fresh water in future. There is a need to lay emphasis on local water planning and water harvesting at micro level and integrated water-shed development. There are perennial springs have less polluted drinking water. Tank irrigation is traditionally operated by user groups. Modernization of the existing tank/ponds is needed for better utilization of natural discharge of water.

| <u>Category of Schemes</u> | <u>Number</u> |
|-----------------------------------|---------------|
| 1 Class I M.I. Schemes | 558 |
| 2 Class II M.I.Schemes | 7749 |
| 3 IPD Yelah development | 1877 |
| 4 Left Irrigation Schemes | 1952 |
| 5 Community Irrigation Schemes | 1394 |
| 6 Salt Water Exclusion Schemes | 832 |
| 7 Other not else were classified. | 6424 |

According to the study conducted during the year 2005 there are 20780 Minor Irrigation Schemes in the State of which 7749 are Class II Minor Irrigation Schemes followed by 6424 other Minor Irrigation Schemes 1952 left irrigation and 1394 community irrigation. Among the District, Kollam start first followed by Ernakulam and Kozhikode. Trichur District have least number of Minor Irrigation Schemes implemented followed by Thiruvananthapuram and Alappuzha Districts.

Table -5.10

1. Category wise number of Minor Irrigation Schemes according to Project Class

| Sl.No | Category of Scheme | No. of Schemes |
|-------|----------------------|----------------|
| 1 | Class I | 558 |
| 2 | Class II | 7749 |
| 3 | IPD Yelah | 1877 |
| 4 | Lift Irrigation | 1952 |
| 5 | Community Irrigation | 1394 |
| 6 | Salt water Exclusion | 832 |
| 7 | Others | 6424 |
| 8 | Total | 20786 |

Table 5.11

2 CATEGORY WISE NUMBER OF MINOR IRRIGATION SCHEMES ACCORDING TO PROJECT TYPE

| Sl.No | Category of Scheme | No. of schemes |
|-------|----------------------|----------------|
| 1 | Well | 1108 |
| 2 | Tube well | 141 |
| 3 | Pond | 4103 |
| 4 | Lift Irrigation | 1952 |
| 5 | Side protection wall | 3817 |
| 6 | Minor Dam | 4791 |
| 7 | Salt water Exclusion | 832 |
| 8 | Others | 4042 |
| | TOTAL | 20786 |

According to project type classification there are 4791 minor Dams, lift irrigation and 4042 other minor irrigation schemes and 3817 side protection walls. There are 1108 irrigation wells and 141 Tube Wells and 1952 lift irrigation schemes in the State.

Among the minor irrigation schemes Class II Minor Irrigation schemes, IPD Yelah, lift irrigation, Community Irrigation schemes are widely implemented through out the State. Minor irrigation schemes can be used for water diversion and agronomic conservation practices.

Timely repair and renovation of all the structures is essential to increase productivity and efficiency of local water, water resources. The state has Replenishable ground water resources of 6840 million cubic metres and the net ground water availability is estimated to 6229 million cubic metres.

The district wise analysis of the ground water resources in Kerala reveals that Palakkad has the highest potential per ground water discharge (12%) followed by Thrissur (11%) Ernakulam (9%) Kannur (8%) Kottayam (7%) and Alappuzha (6.8%). Thiruvananthapuram has the lowest (4%) potential of ground water discharge. The overall stage of development in the state is (43%) which is greater than the national level.

Table 5.12

3 EXPENDITURE ON MINOR IRRIGATION SCHEMES BY GOVERNMENT ACCORDING TO PROJECT CLASS

| Sl.No | Category of Scheme | Expenditure (Rs. in lakhs) |
|-------|----------------------|-------------------------------|
| 1 | Class I | 1404.61 |
| 2 | Class II | 3612.37 |
| 3 | IPD Yelah | 1234.25 |
| 4 | Lift Irrigation | 3673.04 |
| 5 | Community Irrigation | 784.87 |
| 6 | Salt water Exclusion | 3857.29 |
| 7 | Others | 4774.31 |
| | Total | 15869.19 |

Table 5.13

4 CATEGORY WISE EXPENDITURE ON MINOR IRRIGATION SCHEMES BY LOCAL BODIES ACCORDING TO PROJECT CLASS

| Sl.No | Category of Scheme | Expenditure (Rs. In lakhs) |
|-------|----------------------|----------------------------|
| 1 | Class I | 430.37 |
| 2 | Class II | 4476.27 |
| 3 | IPD Yelah | 466.18 |
| 4 | Lift Irrigation | 1947.04 |
| 5 | Community Irrigation | 1338.59 |
| 6 | Salt water Exclusion | 277.65 |
| 7 | Others | 3529.56 |
| 8 | Total | 12465.47 |

Table 5.14

5 CATEGORY WISE EXPENDITURE ON MINOR IRRIGATION SCHEMES BY BENEFICIARIES ACCORDING TO PROJECT CLASS

| Sl.No | Category of Scheme | Expenditure(Rs. In lakhs) |
|-------|----------------------|---------------------------|
| 1 | Class I | 21.69 |
| 2 | Class II | 128.97 |
| 3 | IPD Yelah | 51.55 |
| 4 | Lift Irrigation | 161.38 |
| 5 | Community Irrigation | 131.32 |
| 6 | Salt water Exclusion | 25.83 |
| 7 | Others | 207.83 |
| | Total | 728.59 |

Table 5.15

**6 TOTAL EXPENDITURE ON MINOR IRRIGATION
SCHEMES ACCORDING TO PROJECT CLASS BY
GOVERNMENT, LOCAL BODIES AND BENEFICIARIES**

| Sl.No | Category of Scheme | Expenditure(Rs. In lakhs) |
|-------|----------------------|------------------------------|
| 1 | Class I | 1856.67 |
| 2 | Class II | 8217.61 |
| 3 | IPD Yelah | 1751.99 |
| 4 | Lift Irrigation | 5781.47 |
| 5 | Community Irrigation | 2254.59 |
| 6 | Salt water Exclusion | 689.21 |
| 7 | Others | 8511.71 |
| 8 | Total | 29063.26 |

Table 5.16

**7 TOTAL EXPENDITURE AND PERCENTAGE OF EXPENDITURE
ACCORDING TO PROJECT CLASS**

| Sl.No | Category of Scheme | Expenditure | | | |
|-------|----------------------|-----------------|-----------------|---------------|-----------------|
| | | Government | Local Bodies | Beneficiaries | TOTAL |
| 1 | Class I | 1404.60 | 430.37 | 21.69 | 1856.67 |
| 2 | Class II | 3612.36 | 4476.27 | 128.97 | 8217.61 |
| 3 | IPD Yelah | 1234.25 | 466.18 | 51.56 | 1751.99 |
| 4 | Lift Irrigation | 3673.04 | 1947.04 | 161.38 | 5781.47 |
| 5 | Community Irrigation | 784.87 | 1338.39 | 131.32 | 2254.59 |
| 6 | Salt water Exclusion | 385.72 | 277.65 | 25.83 | 689.22 |
| 7 | Others | 4774.31 | 3529.56 | 207.83 | 8511.71 |
| | TOTAL | 15869.19 | 12465.47 | 728.58 | 29063.26 |

TABLE 5.17**8 AREA PROPOSED UNDER DIFFERENT MINOR IRRIGATION SCHEMES ACCORDING TO PROJECT CLASS (HECTARES)**

| Sl.No | Category of Scheme | Area |
|-------|----------------------|---------------|
| 1 | Class I | 39331 |
| 2 | Class II | 228449 |
| 3 | IPD Yelah | 36223 |
| 4 | Lift Irrigation | 134374 |
| 5 | Community Irrigation | 19298 |
| 6 | Salt water Exclusion | 15119 |
| 7 | Others | 150366 |
| | TOTAL | 623160 |

TABLE 5.18**9 AYACUT AREA BENEFITTED BY DIFFERENT CATEGORIES OF MINOR IRRIGATION SCHEMES ACCORDING TO PROJECT CLASS (IN HECTARES)**

| Sl.No | Category of Scheme | Area |
|-------|----------------------|---------------|
| 1 | Class I | 21099 |
| 2 | Class II | 100563 |
| 3 | IPD Yelah | 23688 |
| 4 | Lift Irrigation | 80292 |
| 5 | Community Irrigation | 10790 |
| 6 | Salt water Exclusion | 7653 |
| 7 | Others | 86768 |
| | TOTAL | 330853 |

TABLE 5.19

**10 AYACUT AREA PROPOSED UNDER DIFFERENT MINOR
IRRIGATION SCHEMES ACCORDING TO PROJECT TYPE
(IN HECTARES)**

| Sl.No | Category of Scheme | Area |
|-------|----------------------|---------------|
| 1 | Well | 8645 |
| 2 | Tube well | 1607 |
| 3 | Pond | 52025 |
| 4 | Lift Irrigation | 134374 |
| 5 | Side protection wall | 97123 |
| 6 | Minor Dam | 174494 |
| 7 | Salt water Exclusion | 20896 |
| 8 | Others | 133998 |
| | TOTAL | 623162 |

TABLE 5.20

**11 AYACUT AREA ACHIEVED UNDER DIFFERENT MINOR
IRRIGATION SCHEMES ACCORDING TO PROJECT TYPE
(IN HECTARES)**

| Sl.No | Category of Scheme | Area |
|-------|----------------------|---------------|
| 1 | Well | 2494 |
| 2 | Tube well | 1205 |
| 3 | Pond | 33263 |
| 4 | Lift Irrigation | 80292 |
| 5 | Side protection wall | 60229 |
| 6 | Minor Dam | 72667 |
| 7 | Salt water Exclusion | 8208 |
| 8 | Others | 72496 |
| | TOTAL | 330853 |

Chapter VI

Comparative Report

Kerala State is traditionally an agrarian State. Age old agriculture practices are followed by agriculturists and cultivators for the cultivation of food crops and plantation crops.

The State is blessed with fertile land, good climate and plenty of water. The topography of land consists of high land which is suitable for plantation crops and midland and coastal areas for cultivation of food crops.

Rain occur in the State in two monsoons and continue for 4 to 6 months. For the remaining six months irrigation water is required for cultivation of all food crops.

There are 44 rivers in the State having 15 Km. or more length of which forty one rivers are west flowing and the other three rivers are east flowing which enrich the neighboring States of Karnataka and Tamil Nadu.

Even though agriculture is the main occupation, the state is not self sufficient in the matter of food production.

From the first Five Year Plan onwards both Centre and State Government have taken steps for development of major, medium and minor irrigation schemes in the State.

Major irrigation schemes are multipurpose schemes having the following main objectives.

- a. Storage of water in reservoirs for irrigation and production of electricity.
- b. Control flood.
- c. Control salinity.
- d. Control excessive flow of water to sea.
- e. Replenish ground water Resources

However minor irrigation schemes are micro level schemes locally developed and implemented for irrigation of crops. Minor irrigation schemes are:-

- a Less expensive
- b Quick Yielding
- c Locally managed
- d Peoples participation
- e Labour intensive
- f Eco-Friendly Schemes

It is attempted to make an analysis whether major/medium or Minor Irrigation schemes are more suited to Kerala situation. To arrive at a conclusion the following condition are to be considered.

Table 6.1

**Abstract of ground Water Resources in Kerala
(GEC Methodology)**

| Sl. No. | Details | Ground Water Resources |
|---------|--|------------------------|
| 1 | Total ground water discharge | 6840.80 |
| 2 | Net natural water available | 6229.04 |
| 3 | Existing gross ground water draft for all use | 2693.38 |
| 4 | Existing gross ground water draft for irrigation | 1596.02 |
| 5 | Existing ground water for domestic and industrial use | 1097.36 |
| 6 | Net ground water availability for future irrigation Department | 3221.23 |

Abstract

Major Irrigation Schemes

| | |
|---|---------------------|
| Major/Medium Irrigation Schemes completed/partially completed | 32 no.s |
| Total expenditure incurred | Rs, 162841.56 lakhs |
| Ayacut area proposed to be irrigated | 429238 hectares |
| Ayacut area actually irrigated | 310400 hectares |

Minor Irrigation Schemes

| | |
|---|--------------------|
| Total Minor Irrigation Schemes Working in the State | 20786 no.s |
| Total expenditure incurred | Rs. 29063.26 lakhs |
| Ayacut area proposed to be irrigated | 623160 hectares |
| Ayacut area actually irrigated | 330853 hectares |

It is observed that major/medium Irrigation Schemes have less scope for development in the State. In almost all rivers, irrigation schemes have been implemented or under implementation.

COMPARATIVE ANALYSIS

Table 6.2

Major Irrigation

| Sl.No | Schemes | Expenditure(Rs. In lakhs) | Ayacut proposed | Ayacut irrigated |
|-----------------------------|--------------------------------|---------------------------|-----------------|------------------|
| Completed Schemes | | | | |
| 1 | Major irrigation – 9 Schemes | 33213.00 | 167435 | 157417 |
| 2 | Medium irrigation - 7 Schemes | 2148.00 | 25902 | 23543 |
| Under implementation | | | | |
| 3 | Major irrigation- 6 Schemes | 98508.35 | 177287 | 104129 |
| 4 | Medium irrigation – 10 schemes | 28972.21 | 58614 | 25311 |
| | TOTAL | 162841.56 | 429238 | 310400 |

Table 6.3

Minor Irrigation

| Sl.No | Schemes | Number | Expenditure (Rs. in lakhs) | Ayacut area (in hectares) | |
|-------|----------------------|--------------|----------------------------|---------------------------|---------------|
| | | | | Proposed | Irrigated |
| 1 | Class I | 558 | 1856.67 | 33391 | 21099 |
| 2 | Class II | 7749 | 8217.61 | 228449 | 100563 |
| 3 | IPD Yelah | 1877 | 1751.99 | 36223 | 23688 |
| 4 | Lift irrigation | 1952 | 5781.47 | 134374 | 80292 |
| 5 | Community irrigation | 1394 | 2254.59 | 19298 | 10790 |
| 6 | Salt water exclusion | 832 | 689.21 | 15119 | 7653 |
| 7 | Others | 6424 | 8511.71 | 150366 | 86768 |
| | Total | 20786 | 29063.25 | 617220 | 330853 |

Table 6.4**District wise area proposed and actual area irrigated by
Minor Irrigation Schemes**

| Sl.No | Schemes | Expenditure (Rs. in lakhs) | Ayacut area (in hectares) | |
|-------|--------------------|-------------------------------|---------------------------|---------------|
| | | | Proposed | Irrigated |
| 1 | Kasaragod | 1174.37 | 20439 | 12956 |
| 2 | Kannur | 1422.55 | 85060 | 13556 |
| 3 | Wayanad | 1823.97 | 15351 | 4563 |
| 4 | Kozhikode | 3265.65 | 16430 | 5132 |
| 5 | Malappuram | 1789.01 | 73127 | 22739 |
| 6 | Palakkad | 2708.12 | 34260 | 27489 |
| 7 | Thrissur | 1715.54 | 57893 | 31801 |
| 8 | Ernakulam | 2978.34 | 91815 | 50432 |
| 9 | Idukki | 1761.77 | 39270 | 26582 |
| 10 | Kottayam | 3415.73 | 37464 | 22288 |
| 11 | Alappuzha | 1343.62 | 62913 | 57093 |
| 12 | Pathanamthitta | 2104.62 | 32945 | 25309 |
| 13 | Kollam | 2516.52 | 39006 | 18386 |
| 14 | Thiruvananthapuram | 1043.42 | 17187 | 12527 |
| | TOTAL | 29063.26 | 623160 | 330853 |

Surface water is available in all most all places and agriculture operations are carried out in tiny or marginal plot hence minor irrigation is more convenient and profitable. Peoples participation is more possible and financial investment is less. Hence Minor Irrigation schemes will be implemented in all places even to remote and inaccessible area.

- 1 General condition of soil and average land holding
- 2 Main food crops cultivated
- 3 Agriculture practices
- 4 Topography and general condition of land
- 5 Availability of finance

Table- 6.5

| Sl.No | Category | No.of projects | Status of the projected | Expenditure (Rs. in lakhs) | Area irrigated(hectres) |
|-------|---------------------------|----------------|---------------------------------------|----------------------------|-------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | Major Irrigation schemes | 9 | Completed & Commissioned | 33213.00 | 157417.00 |
| 2 | Medium irrigation schemes | 7 | Completed & Commissioned | 2148.00 | 23543.00 |
| | Sub Total(A) | 16 | - | 35361.00 | 180960 |
| 3 | Major Irrigation schemes | 6 | Under Implementation or Investigation | 98508.35 | 104129 |
| 4 | Medium irrigation schemes | 10 | Do | 28972.21 | 25331 |
| | Sub Total(B) | 16 | | 127480.56 | 129460 |
| | Grand Total | 32 | | 162841.56 | 310420 |

Table -6.6

**Five Year plan based expenditure incurred for implementation
of Minor Irrigation schemes in the state**

| Sl.No | Five year plans | Expenditure | Gross area irrigated (in Hectres) |
|-------|---|-------------|------------------------------------|
| 1 | 1 st Five Year Plan(1951-56) | Rs 327.60 | NA |
| 2 | 2 nd Five year plan(1956-61) | Rs 216.58 | Do |
| 3 | 3 rd Five Year Plan(1961-66) | Rs 564.69 | Do |
| 4 | Annual Plans(1966-69) | Rs 653.02 | Do |
| 5 | 4 th Five Year Plan (1969-74) | Rs 1132.83 | Do |
| 6 | 5 th Five Year Plan (1974-78) | Rs 1340.08 | 79723 |
| 7 | Annual Plans (1978-80) | Rs 1107.80 | 4753 |
| 8 | 6 th Five Year Plans (1980-85) | Rs 3993.40 | 23683 |
| 9 | 7 th Five Year Plans (1985-90) | Rs 4463.02 | 41875 |
| 10 | Annual Plans (1990-92) | Rs 3501.08 | 18795 |
| 11 | 8 th Five year plans | Rs 16004.72 | 72646 |
| | | Rs 33304.92 | 241495 |

Sources: Ninth Five Year Plan, 1997-2002 Report of the Steering Committee on Water Resources published by State Planning Board, June, 1998 Page.4

CONCLUSION

It is a post - facto evaluation study on all irrigation projects in the state and attempt is made to highlight which one is more suited to Kerala situation on cost factors. It is hoped that the findings and suggestions of this study would definitely help to evolve appropriate decisions in the future policy for irrigation projects.

It is estimated that so far 25% of irrigation potential have been utilized which is insufficient to meet our various demand. Most of the irrigation projects cluster in and around highland regions. The delay in completion, escalation of cost, back log of executions are the main factors under the timely completion of projects, some of which taken up during 2nd or 3rd Five Year Plans. Government has taken it as a policy matter to complete all the spill over projects instead of starting new ones.

Even though a number of major irrigations schemes and large number of minor irrigation schemes have been implemented in the state the area under paddy cultivators is reducing year by year as it is not profitable and farmers are not ready to adopt new cropping pattern.

The paddy cultivation in the command area of all the major and medium irrigation schemes are diminishing. There is general tendency among the cultivators to change over to cultivate remunerative crops. It is found that production and productivity of various agriculture crops has increased considerably. Majority of the farmers in the command are not getting sufficient water during critical period. The farmers in the tail end of the canals are worst effected due to various seasons. The farmers are not co-operative among themselves in the consumption of water and uniform agricultural operations. Most of the irrigations structures and sluices are defective and conveyance losses are common phenomena. The slit treatment in the reservoirs are not done periodically.

The irrigation schemes are to be re-adjusted according to the requirements of crops and area. Considering the present intensive cropping pattern, water requirements of various crops are to be re-estimated. It is to be considered that the social and economic benefits achieved in these projects are clear evidence of the success of the projects.

The irrigation potential in the state is estimated at 16 lakh hectares of which 6.39 lakh hectares have been brought under irrigations. This shows that there is further scope for irrigation projects. Though we are receiving an average annual rainfall over 3000 m.m in the state faces acute scarcity of water during summer season.

The area that is to be brought under irrigation scheme is estimated at 10 lakh hectres. The average period now take for the completion of a project comes to about 20 years. Out of the 16 ongoing schemes, 4 projects have been started providing water for irrigation.

The area brought under irrigation by minor irrigation schemes was estimated to be 3.30 lakhs hectres. The average cost per hectres of minor irrigation scheme is worked out to be about Rs.25,000/-.

A large part of the outlay under Five Year Plan of the state has been utilised for irrigation and multipurpose projects. The projects implemented so far shows that the time taken for completion is considerably more than the initially estimated, hence consequently the benefits have been released much later than expected and cost have been escalated.

The following are the suggestions made by the study group

- (1) Slit treatments in reservoirs may be studied periodically and effective measures may be introduced to minimize the same.**
- (2) Irrigation projects shall be designed in such a way as to give emphasis to irrigate the garden land.**

- (3) The defects in the sluice and structures may be rectified for the smooth flow of the water.**
- (4) The silt deposit in the canal net work may be properly removed in summer season.**
- (5) The leakage in the control structures canals may be reduced to the maximum entered.**
- (6) The quantity of water release may be measured at strategic points and ensure equity in water release according to requirements.**
- (7) The tanks, ponds and water lagoons located in the command area may be repaired during summer season and water may be preserved properly.**
- (8) Water schedule may be revised periodically depending upon cropping pattern.**

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