

## TABLE OF CONTENTS

	<u>Page</u>
Preface	
Location Map	
Summary .....	i
Photographs .....	xlvii
List of Abbreviations .....	lxv
<b>CHAPTER 1 PROJECT BACKGROUND .....</b>	<b>1</b>
<b>CHAPTER 2 PRESENT CONDITIONS OF THE PROJECT AREA</b>	
2.1 Natural Conditions .....	11
2.1.1 Location .....	11
2.1.2 Topography and Geography .....	11
2.1.3 Soil .....	15
2.1.4 Meteorology, Hydrology and Water Resources .....	17
2.2 Society and Economy .....	23
2.2.1 Administration .....	25
2.2.2 Population of the District .....	28
2.2.3 Land Resources .....	35
2.2.4 Industry and Agriculture .....	37
2.2.5 The Greater Colombo Economic Commission .....	51
2.3 Agriculture .....	55
2.3.1 General .....	55
2.3.2 Land Use .....	59
2.3.3 Irrigation and Drainage .....	65
2.3.4 Productivity and Management .....	93
2.3.5 Agricultural Machinery .....	119
2.3.6 Inland Fisheries .....	123
2.3.7 Farmer's Organizations .....	125
2.3.8 Agricultural Supporting Services .....	127
2.3.9 Marketing .....	130

2.4	Social Infrastructure .....	133
2.4.1	Rural Society .....	133
2.4.2	Roads .....	136
2.4.3	Domestic Water Supply .....	142
2.4.4	Rural Electrification and Communications .....	147
2.4.5	Health and Medical Services .....	152
2.4.6	Human Resources Development .....	161
2.4.7	Social Welfare .....	169
2.5	Rural Industries .....	171

### CHAPTER 3      CONCEPTUAL APPROACH TO INTEGRATED RURAL DEVELOPMENT

3.1	Importance and Objectives of Integrated Rural Development .....	179
3.2	Government Guidelines .....	180
3.3	Problems Existing in Rural Area of Gampaha District, .....	181
3.3.1	Agriculture and Agricultural Production .....	181
3.3.2	Agricultural Infrastructure .....	183
3.3.3	Employment Opportunities .....	185
3.3.4	Social Infrastructure .....	186
3.4	Basic Objectives of Integrated Rural Development in Gampaha District .....	187
3.4.1	Future Rural Concept .....	187
3.4.2	Objectives of Integrated Rural Development in Gampaha District .....	187
3.5	Basic Strategy for Integrated Rural Development in Gampaha District .....	193
3.6	Points for Careful Consideration in Scheme Formulation .....	194
3.7	Participation of Farmers and Other Rural Residents .....	195

## CHAPTER 4 SECTORAL-WISE DEVELOPMENT CONCEPTS

4.1	Agriculture .....	199
4.1.1	Agricultural Production .....	199
4.1.2	Inland Fisheries .....	213
4.1.3	Farm Mechanization .....	214
4.1.4	Agricultural Supporting Services .....	214
4.1.5	Farmers Organizations .....	215
4.1.6	Marketing .....	216
4.1.7	Irrigation and Drainage .....	217
4.2	Rural Industries .....	222
4.3	Human Resources Development .....	225
4.4	Social Infrastructures .....	227
4.4.1	Roads .....	227
4.4.2	Domestic Water Supply .....	228
4.4.3	Rural Electrification and Communications .....	229
4.4.4	Medical and Health Services .....	231
4.4.5	Social Welfare .....	233

## CHAPTER 5 COMPONENTS OF MASTER PLAN

5.1	Master Plan .....	237
5.1.1	Long-Term Targets .....	237
5.1.2	Short-Term Schemes .....	239
5.2	Development of Agricultural Production .....	245
5.2.1	Agricultural Technology Demonstration and Transfer Scheme .....	245
5.2.2	Minor Export Crop Promotion Scheme .....	249
5.2.3	Scheme for Improvement of Farmer Support System .....	249
5.2.4	Scheme for Improvement of Agricultural Training System .....	250
5.2.5	Livestock Development Scheme (Poultry Hatchery) .....	251
5.2.6	Inland Fisheries Development Scheme .....	252
5.3	Development of Agricultural Infrastructure .....	254
5.3.1	Attanagalu Oya Irrigation Scheme .....	254
5.3.2	Morenna Model Irrigation Scheme .....	256
5.3.3	Minor Irrigation Scheme .....	257
5.3.4	Minor Flood Protection Scheme .....	257

5.4	Development of Rural Industries .....	268
5.4.1	Scheme for Improvement of Vocational Training Programs .....	268
5.5	Development of Human Resources .....	269
5.5.1	Scheme for Improvement of Core Schools .....	269
5.5.2	Scheme for Establishment of Vocational Training Center .....	269
5.6	Development of Social Infrastructure .....	272
5.6.1	Scheme for Improvement of Road Maintenance System .....	272
5.6.2	Rural Electrification Scheme .....	273
5.6.3	Telecommunications Development Scheme .....	273
5.6.4	Scheme for Monitoring and Improvement of Shallow Wells .....	274
5.6.5	Scheme for Improvement of Base Hospitals .....	274
5.6.6	Scheme for Improvement of Divisional Health Care Program .....	275
5.6.7	Scheme for Improvement of Social Welfare Facilities .....	276

## CHAPTER 6 ESTIMATED PROJECT COST

6.1	Cost Estimate Criteria .....	279
6.2	Estimated Costs .....	279

## CHAPTER 7 PROJECT IMPLEMENTATION

7.1	Implementing Agencies .....	283
7.2	Implementation Schedule .....	283

## CHAPTER 8 PROJECT BENEFITS

8.1	Outline .....	291
8.2	Improvement of Agricultural Production and Farm Income .....	292
8.3	Employment Creation .....	292
8.4	Improvement of Living Standards .....	292

## CHAPTER 9 SELECTION OF PRIORITY SCHEMES

9.1	Selection Criteria .....	297
9.2	Selection of Priority Schemes .....	297

## CHAPTER 10 IMPLEMENTATION PLAN FOR PRIORITY PROJECTS

10.1	Model Project for Improvement of Agricultural Production .....	303
10.1.1	Agricultural Technology Demonstration and Transfer Scheme .....	303
10.1.2	Minor Export Crop Promotion Scheme .....	313
10.1.3	Scheme for Improvement of Farmer Support System .....	318
10.1.4	Scheme for Improvement of Agricultural Training System .....	321
10.1.5	Morena Model Irrigation Scheme .....	326
10.2	Development of Human Resources .....	334
10.3	Development of Social Infrastructure .....	336
10.3.1	Scheme for Improvement of Base Hospitals .....	336
10.3.2	Scheme for Monitoring and Improvement of Shallow Wells .....	338
10.4	Preliminary Project Cost Estimate .....	340
10.5	Project Implementation .....	341
10.5.1	Implementing Agencies .....	341
10.5.2	Project Office .....	342
10.5.3	Project Implementation .....	344
10.5.4	Implementation Schedule .....	345
10.6	Operation and Maintenance .....	346
10.7	Project Benefit .....	350
10.7.1	Effect on Production Increase .....	350
10.7.2	Minor Export Crop Promotion Scheme .....	351
10.7.3	Social Benefit .....	352
10.7.4	Ripple Effect .....	354

CHAPTER 11	CONCLUSIONS AND RECOMMENDATIONS .....	359
------------	---------------------------------------	-----

## List of Tables

	<u>Page</u>
Table 1.1	5
2.1.1	13
2.1.4.1	17
2.1.4.2	18
2.1.4.3	18
2.1.4.4	19
2.1.4.5	20
2.1.4.6	21
2.1.4.7	23
2.2.2.1	28
2.2.2.2	29
2.2.2.3	30
2.2.2.4	31
2.2.2.5	32
2.2.2.6	33
2.2.3.1	35
2.2.4.1	38
2.2.4.2	41
2.2.4.3	42
2.2.4.4	42
2.2.4.5	43
2.2.4.6	46
2.2.4.7	47

Table 2.2.4.8	Distribution of Paddy Land Holdings .....	48
2.2.4.9	Poor Relief Scheme (Food Stamps) .....	49
2.2.4.10	Income Distribution for Gampaha District .....	50
2.2.5.1	GCEC Population Forecast .....	52
2.2.5.2	Industrial Investments Approved and Contracted by GCEC .....	53
2.3.1.1	Supply of Food Crops in Gampaha .....	55
2.3.1.2(1)	Paddy, Area, Yield, Production in Gampaha: 1980-1986 .....	56
2.3.1.2(2)	Field Crops, Cultivated Area, and Production in Gampaha: 1980-1986 .....	57
2.3.1.3	Population and Labor Power .....	58
2.3.2.1	Land Use in Gampaha .....	60
2.3.3.1	Catchment Area and Paddy .....	67
2.3.3.2	Estimated Irrigation Water .....	70
2.3.3.3	Design Discharge of Attanagalu Oya Scheme .....	71
2.3.3.4	Features of Irrigation in Sample Area .....	72
2.3.3.5	Number of Anicuts .....	74
2.3.3.6	Irrigation Canal and Designed Duty of Water Under Attanagalu Oya Scheme .....	76
2.3.3.7	List of Anicuts Under the Attanagalu Oya Scheme .....	77
2.3.3.8	Catchment Area vs. Irrigated Area .....	78
2.3.3.9	Field Water Requirement and Effective Rainfall .....	79
2.3.3.10	Percentage of Irrigable Area .....	82
2.3.3.11	Minor Irrigation Scheme in Gampaha .....	84

Table 2.3.3.12	Proposed Rehabilitation Work Under Minor Irrigation Scheme .....	84
2.3.3.13	Minor Irrigation Tanks .....	85
2.3.4.1	Age Distribution of Coconut Trees .....	96
2.3.4.2	Size, Number and Acreage of Coconut Holding .....	98
2.3.4.3	Average Yield of Paddy .....	100
2.3.4.4	Paddy Cultivated Acreage and Variety By Cultivation .....	102
2.3.4.5	Minor Export Crops -- Cultivated Area .....	103
2.3.4.6	Paddy Labor Requirements .....	107
2.3.4.7	Paddy Production Cost .....	108
2.3.4.8	Pepper Labor Requirements .....	109
2.3.4.9	Pepper Production Cost .....	110
2.3.4.10	Coffee Labor Requirements .....	111
2.3.4.11	Coffee Production Cost .....	112
2.3.4.12	Farm Income (A) .....	113
2.3.4.13	Farm Income (B) .....	114
2.3.4.14	Farm Management -- Present A .....	115
2.3.4.15	Farm Management -- Present B .....	116
2.3.5.1	Number of Agricultural Machinery Owned .....	120
2.3.5.2	Number of Cattle and Buffaloes by Type of Purpose .....	121
2.3.8.1	Peoples Bank Loans Outstanding, Gampaha District, 1985 .....	130
2.4.2.1	Road Kilomereage in Gampaha District .....	137
2.4.2.2	Road Conditions .....	140
2.4.2.3	Proposed Construction of Bridges .....	141



Table 2.4.3.1	Sample Water Quality Analysis .....	143
2.4.3.2	Priority Area .....	144
2.4.3.3	Water Supply Consumption Standard .....	145
2.4.4.1	Electrification Status in Gampaha District .....	150
2.4.5.1	Health Indicators .....	155
2.4.5.2	Sanitation Indicators .....	156
2.4.5.3	Medical Facilities in Gampaha .....	157
2.4.5.4	Key Health Personnel, 1984 .....	158
2.4.6.1	General Education in Gampaha District .....	164
2.4.6.2	Core Schools in Gampaha District .....	165
2.4.6.3	Number of Technical Trainees .....	167
2.5.1	Industries and Employees in Gampaha District .....	172
2.5.2	Rural Industries and Employees in Gampaha District .....	173
4.1.1.1	Expected Returns .....	200
4.1.1.2	Target Production and Income of MEC .....	202
4.1.1.3	Paddy Production Cost (Tentative) .....	211
4.1.1.4	Farm Management Plan (Tentative) .....	212
4.2.1	Agrobased Industry .....	224
5.1.1	Long-Term Targets and Short-Term Schemes .....	242
5.3.1	Salient Features of 70 Priority Minor Irrigation Schemes .....	264
5.3.2	Minor Flood Protection Scheme .....	267
5.5.1.1	Equipment for Core Schools .....	270
5.6.1.1	Equipment for District Level .....	272

Table 5.6.1.2	Equipment for Division Level .....	273
6.2.1	Estimated Cost of Short-Term Schemes .....	279
7.1.1	Authorities Related to Short-Term Schemes .....	285
9.2.1	Selection of Priority Projects .....	299
10.1.3.1	Equipment and Facilities .....	320
10.1.4.1	1986 Training Accomplishment at Walpita District Training Center .....	322
10.1.4.2	1986 Training Accomplishment at Ambepussa District Training Center .....	323
10.1.4.3	Proposed Facilities and Equipment for DTC .....	324
10.1.5.1	Proposed Facilities for Morenna Model Irrigation Scheme .....	327
10.4.1	Costs for Priority Projects .....	340
10.5.2.1	Project Office Construction Cost .....	344
10.6.1	Staffing for the Project (Additional) .....	348
10.6.2	Nos. of Vehicle and Farm Machinery .....	348
10.6.3	Operation and Maintenance Cost per Year (Additional Cost) .....	349
10.7.2.1	Farm Income With and Without Project .....	352

## List of Figures

	<u>Page</u>
	Location Map
Fig. 1.1	Districts under the Integrated Rural Development Project ..... 6
1.2	Project Area ..... 7
2.1.1	Geological Map ..... 13
2.1.2.2	Geological Map of Gampaha ..... 14
2.1.3.1	Soils of Gampaha ..... 16
2.2.1.1	Multiplicated Administrative Setups ..... 27
2.2.2.1	Population Density In Gampaha District by AGA Division and Urban Council ..... 34
2.2.5.1	GCEC Land Use Plan ..... 54
2.3.2.1	Gampaha District Land Use ..... 63
2.3.3.1	Monthly Average Rainfall for 10 Years in Gampaha (1976~1985) ..... 68
2.3.3.2	Flow of Existing Irrigation System -- Attanagalu Oya ..... 73
2.3.3.3	Existing Irrigation System (Sample Area) ..... 75
2.3.3.4	Monthly Discharge of Attanagalu Oya ..... 80
2.3.3.5	Plan of Drainage Scheme ..... 88
2.3.4.1	Cropping Calendar (Pepper) ..... 94
2.3.4.2	Cropping Calendar (Coffee) ..... 95
2.3.4.3	Existing Cropping Calendar (Paddy) ..... 101
2.4.2.1	Road Network and Maintenance Office ..... 139
2.4.4.1	Power Distribution Network in Gampaha District ..... 149
2.4.5.1	Location of Medical Facilities ..... 159

Fig. 2.4.5.2	Proposed "Three Tier" PHC Complex .....	160
2.4.6.1	Education System of Sri Lanka .....	163
2.5.1	Location of Small Scale Industries Training Centers .....	175
3.1	Formulation of Development Targets .....	189
4.1.1.1	Proposed Cropping Pattern (Paddy and Field Crops in the Paddy Field) .....	210
5.2.1.1	Agricultural Technology Demonstration and Training Center (ATDTC) Organization .....	248
5.3.1	Existing Irrigation System of Upstream Anicut -- Attanagalu Oya .....	259
5.3.2	Existing Irrigation System in the Morenna Area .....	260
5.3.3	Diagram of Existing Irrigation System in the Morenna Area .....	261
5.3.4	Tentative Plan of the Unit Irrigation Block in the Morenna Area .....	262
5.3.5	Tentative Plan of Irrigation System in the Morenna Area .....	263
7.1.1	Implementation Organization .....	284
7.2.1	Implementation Schedule of Short Term Schemes .....	287
10.1.1.1	ATDTC Organization and Staffing .....	312
10.1.2.1	MEC Nursery Center Organization and Additional Staffing .....	317
10.1.5.1	Morenna Model Irrigation Scheme, Location Map .....	332
10.1.5.2	Diagram of Proposed Irrigation System in the Morenna Area .....	333
10.5.2.1	Project Office Organization and Staffing .....	343

## ABBREVIATIONS AND ACRONYMS

AGA	-	Assistant Government Agent
ADB	-	Asian Development Bank
AI	-	Agricultural Instructor
ASC	-	Agrarian Service Center
BC	-	Bank of Ceylon
DAS	-	Department of Agrarian Services
DCB	-	Decentralized Capital Budget
DCC	-	District Coordinating Committee
DDC	-	District Development Council
DLG	-	Department of Local Government
DMEC	-	Department of Minor Export Crops
DSI	-	Department of Small Industries
DTI	-	Department of Textile Industries
ERR	-	Economic Rate of Return
ESCAP	-	Economic and Social Commission for Asia and the Pacific
FAO/IC	-	Food and Agriculture Organization/Investment Center
FOB	-	Free on Board
GOSL	-	Government of Sri Lanka
GDP	-	Gross Domestic Product
GPS	-	Guaranteed Price Scheme
IFAD	-	International Fund for Agricultural Development
LETI	-	Light Engineering Training Institute
MEC	-	Minor Export Crops
MLG	-	Ministry of Local Government
MPCS	-	Multi-Purpose Cooperative Societies
MPI	-	Ministry of Plan Implementation
NORAD	-	Norwegian Agency for International Development
O&M	-	Operation and Maintenance
PB	-	People's Bank
RDD	-	Regional Development Division
RD	-	Rural Development
SMO	-	Subject Matter Officer
TCCS	-	Thrift and Credit Cooperative Society

## G L O S S A R Y

anicut	-	stream diversion scheme or its headworks
district	-	principal administrative unit in the country; there are 25 districts in Sri Lanka
maha	-	northeast monsoon season (October to February)
paddy	-	unhusked rice
tank	-	impounding reservoir for irrigation
yala	-	southwest monsoon season (April to September)

CURRENCY EQUIVALENTS

US\$ 1	=	Rs 28.0	= ¥ 160
Rs 1	=	US\$0.0357	= ¥ 5.7

WEIGHTS AND MEASUREMENTS

1 long ton = 2,204 pounds (lb)	=	1.016 metric ton
1 hundredweight (cwt)	=	50.8 kg
	=	112 lb
1 bushel (bu) of paddy	=	46 lb
1 kilogram (kg)	=	2.205 lb
1 acre (ac)	=	0.405 hectare (ha)
1 mile (mi)	=	1.609 kilometers (km)
1 square mile (sq. mi)	=	640 ac (259 ha)
1 foot (ft)	=	30.5 centimeters (cm)

GOSL FISCAL YEAR

January 1 - December 31







# CHAPTER 1

## PROJECT BACKGROUND

### 1.1 Study Background

The Government of Sri Lanka is actively moving forward with five major programs to spur national economic development. These programs are: i) the Mahaweli Ganga development project; ii) promotion of export oriented manufacturing industries; iii) urban development; iv) vitalization of the export industry; and v) integrated rural development. The Mahaweli Ganga development project specifically aims at food self-sufficiency, power development and expansion of employment opportunities. From an agricultural development standpoint, the project includes a large scale irrigation component.

From 1965 to 1968, the master plan for the Mahaweli Ganga development project was formulated under assistance from the United Nations Development Programme (UNDP) and the United Nations Food and Agriculture Organization (FAO). In order to expedite realization of the master plan, priority schemes were selected and included within the Accelerated Mahaweli Ganga Development Project for which implementation was commenced in 1977. At present, Victoria, Maduru Oya, Kotmale and Randenigala dams have been completed and facilities for downstream irrigation systems B,C,G and H are under construction.

On the other hand, integrated rural development projects (IRDP) have been undertaken in underdeveloped rural areas not benefited by Mahaweli development. Such integrated rural development projects as well as large scale irrigation projects similar to the Mahaweli scheme have been accorded priority in the Public Investment Plan (1986-90). In 1979, the first integrated rural development project was implemented in Kurunegala district under financial assistance from the World Bank. This was followed by similar projects in Matara district (cooperation from Sweden), Hambantota district (cooperation from Norway), etc. To date, such schemes have been carried out in thirteen districts (see Table 1.1 and Fig. 1.1).

Focal points of integrated rural development schemes implemented in Sri Lanka may be enumerated as follows:

- Direct production investment
- Direct participation of area population in project
- Rectification of regional imbalances in development

- Extension of benefits to maximum number of beneficiaries
- Maximum incorporation of restoration and rehabilitation of existing facilities
- Schemes which are labor intensive
- Schemes which are readily implementable with rapid realization of benefits

Emphasis of such projects has been placed on low cost, labor intensive schemes which yield prompt benefits. Projects have incorporated rehabilitation and restoration of existing agricultural related facilities and have been aimed at improvement of farm management, amelioration of the rural living environment, as well as identification of latent development potentials in rural areas. In contrast to large scale, dynamic engineering projects such as the Mahaweli Ganga project, the integrated rural development projects although highly important have tended to be low key. Nevertheless, these projects have made significant contributions to improvement of rural standard of living.

Gampaha district specifically was at one time part of Colombo district. It also contains a Free Trade Zone (FTZ) also referred to as the Greater Colombo Economic Commission (GCEC) area. For these reasons, the district may be considered as a suburban area. In this regard, district-wide levels of industrial, and educational and other social infrastructure development are on an average higher than those for the nation as a whole. However, new development investment has been limited in more rural sections of the district resulting in lagging development in comparison with the district's more urbanized, industrialized portions.

Land use in Gampaha district is extremely well progressed and there is almost no room for development of new agricultural land. Land ownership scale is fragmented and small, with overall average size of agricultural land holding at 0.48ha (1.2ac). Average holding for paddy field specifically is 0.35ha. (0.88ac). Coconut cultivation is pursued on 75% of farmland in Gampaha district. Paddy field comprises 17% of total farmland and is utilized primarily for cultivation of rice for home consumption. Only a very small amount of rice is marketed.

The following conditions apply to rural sectors of Gampaha and highlight the problems afflicting the district: i) income is comparatively less than urban sectors; ii) superannuation of irrigation facilities is severe; iii) introduction of new appropriate farm management and cultivation technology has lagged behind; iv) rural social infrastructure remains underdeveloped; v) farm management scale is small, with large numbers of farm households engaged in non-agricultural

pursuits as well; vi) the unemployment rate is high (unemployment is at 26.9% which is twice the national average).

In light of the above background, the Government of Sri Lanka requested technical cooperation from the Government of Japan for the Master Plan Study on the Integrated Rural Development Project for Gampaha district. In response to this request, the Government of Japan through the Japan International Cooperation Agency dispatched a preliminary study mission to Sri Lanka from March 31 to April 13, 1986. The said mission met with concerned officials of the Government of Sri Lanka and on the basis of these discussions agreement was reached on a Scope of Work for the Study. The Team for the Master Plan Study has been dispatched to the field during July 12 to September 24, 1986 for Phase I Study and December 1, 1986 to January 14, 1987 for Phase II Study on the basis of this Scope of Work. The Team submitted a Draft Final Report to the Sri Lankan Government in June 1987. This Final Report reflects the comments of the concerned Sri Lankan officials following their review of the said Draft Final Report.

## 1.2 Study Objectives

The purpose of the subject Study is in Phase I to formulate a Master Plan for integrated rural development in Gampaha district on the basis of survey of agricultural production, agricultural production infrastructure, rural social infrastructure, etc., and in Phase II, to formulate a specific implementation program for priority projects identified under the Master Plan.

Fundamental target of the integrated rural development project is to aim at increasing farmers income, expansion of employment opportunity, and improvement of rural living conditions, as a step towards correcting the rural development imbalance and providing equal socio-economic benefits to the farmers and other rural residents.

The Master Plan seeks to orient rural development in Gampaha district as it moves into the 21st century. The Plan strives for maximum incorporation of the aspirations and participation of the area population and includes both a comprehensive strategy for development as well as a specific program for co-ordinated implementation of priority projects.

### 1.3 Project Area

The Project area comprises the rural sectors of Gampaha district (see Fig. 1-2).

Table 1.1 Integrated Rural Development Program

District	Project Cost (Mn. Rs)	Aid organization	Implementation Schedule									
			1979	80	81	82	83	84	85	86		
1. Kurunegala	516	World Bank (L)										
2. Matara*	175	S I D A (G)										
3. Hambantota*	400	N O R A D (G)										
4. Nuwara Eliya*	205	Netherlands (G)										
5. Matale	357	World Bank (L)										
6. Puttalam	397	World Bank (L)										
7. Badulla	375	I F A D (L)										
		S I D A (G)*										
8. Mannar	321	World Bank (L)										
9. Vavuniya	363	World Bank (L)										
10. Moneragala*	529	N O R A D (G)										
11. Ratnapura *	75	Netherlands (G)										
12. Kegalle	454	I F A D (L)										
13. Mulliativu*	360	Netherlands (G)										

\* Funds provided on annual basis, \* Open ended.

Notes L : Loan

G : Grant

S I D A : Swedish International Development Agency

N O R A D : Norwegian Aid for Development

I F A D : International Fund for Agricultural Development

Fig. 1.1 Districts under the Integrated Rural Development Project

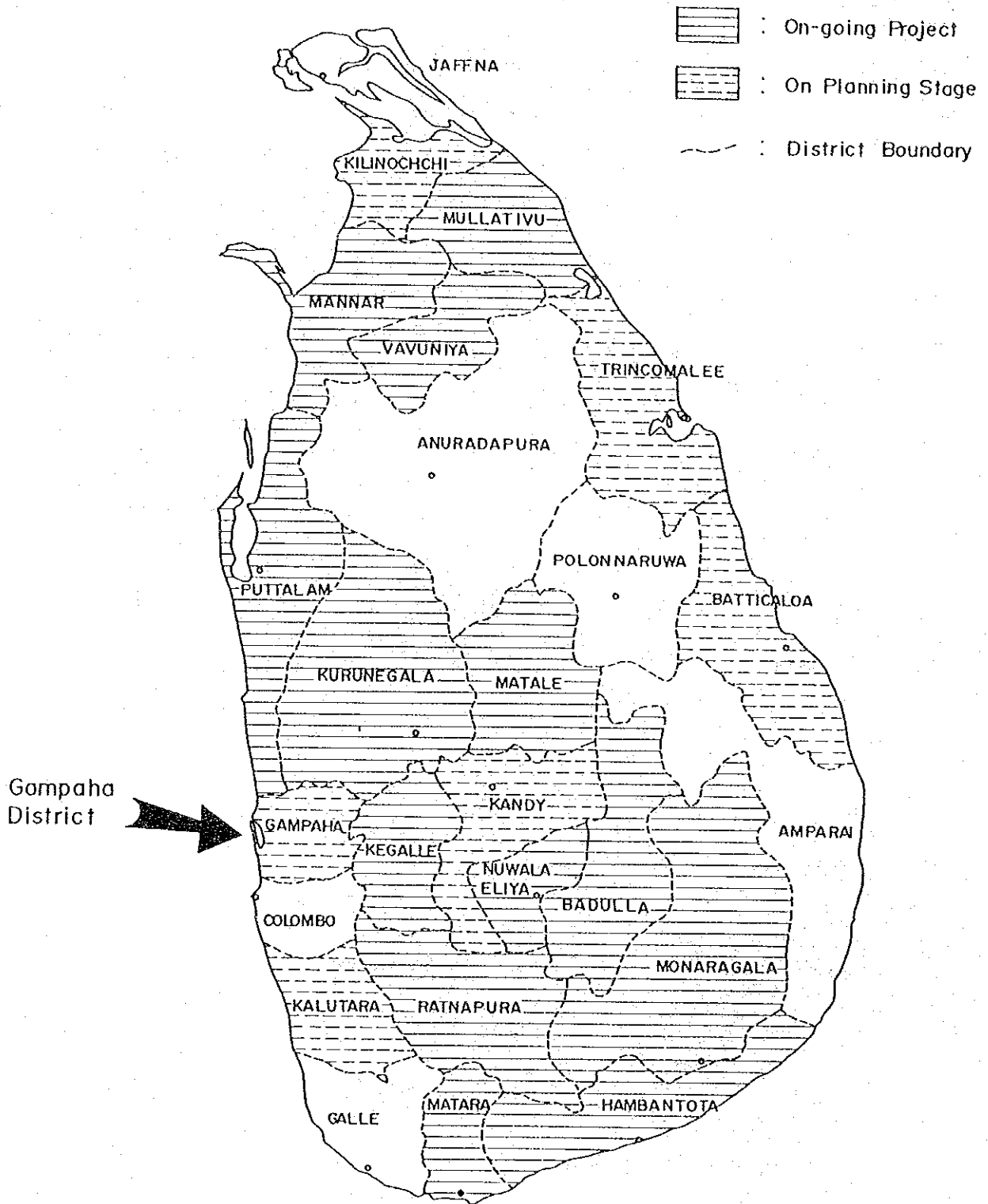
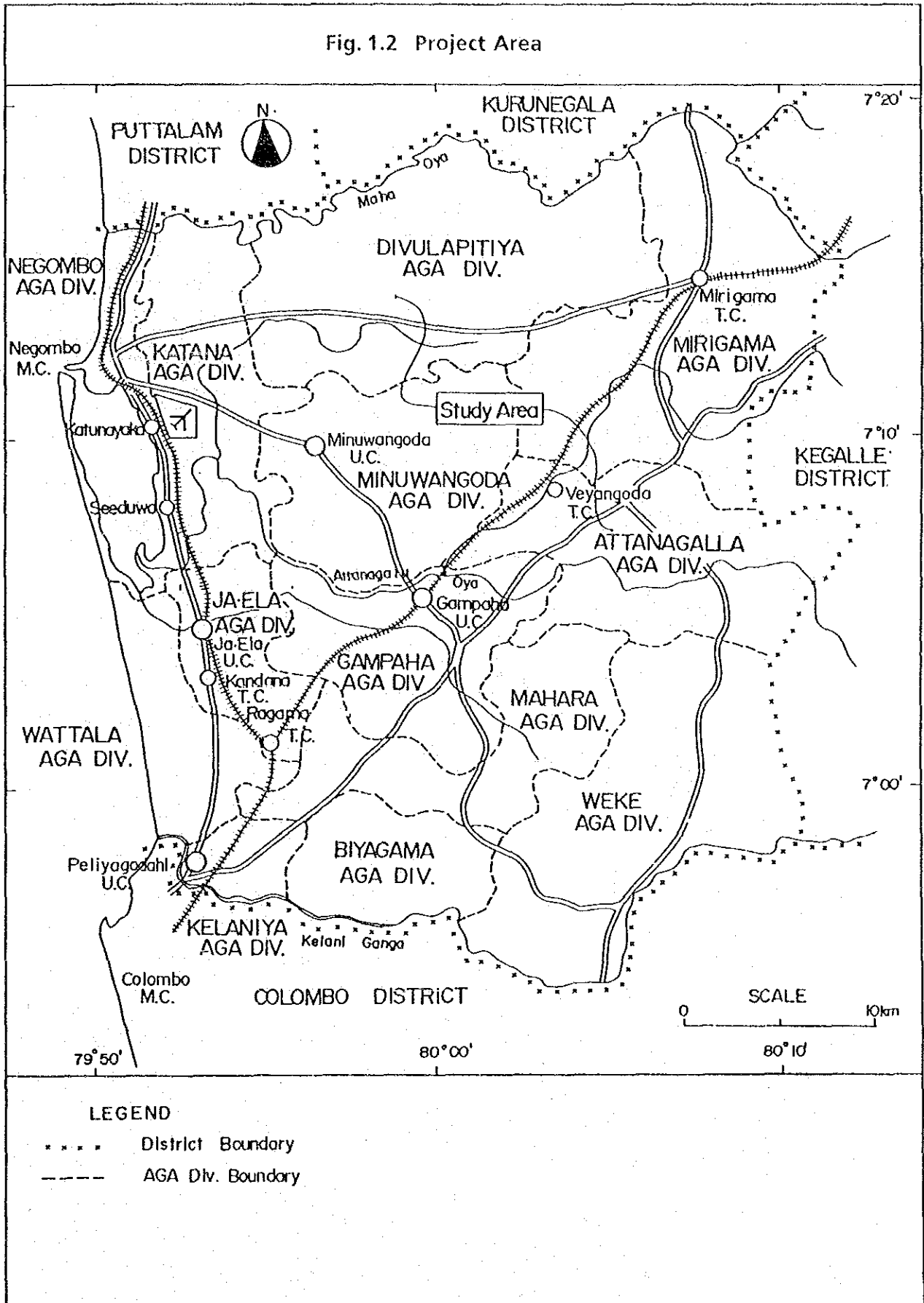


Fig. 1.2 Project Area







## CHAPTER 2

### PRESENT CONDITIONS OF THE PROJECT AREA

#### 2.1 Natural Conditions

##### 2.1.1 Location

Gampaha district is situated adjacent to the north of the Sri Lankan capital of Colombo. The district is essentially square in configuration, measuring 40 km from north to south and 35 km from east to west. Land area is 1,399 km<sup>2</sup>. The Kelani river constitutes the southern boundary of the district, while the Maha river forms the boundary in the north. In the east, a mountainous zone establishes the boundary with the adjacent Kegalle district. To the west, Gampaha borders on the Indian ocean. A GCEC Area has been established in the western part of Gampaha district. The area has been designated by the Greater Colombo Economic Commission for promotion of export oriented industries. Colombo International Airport as well as two investment promotion zones are included in the area. The Study area itself comprises the rural portion of Gampaha district.

The Project area is indicated in Fig. 1-2.

##### 2.1.2 Topography and Geology

A hilly area of around EL 150m is situated in the eastern part of Gampaha on its border with Kegalle district. Moving westward, land elevation steadily decreases with lagoons and marshland in the vicinity of the coast. With the exception of the one above mentioned section in the east, most parts of the district are under 30m elevation. Low areas along rivers and their tributaries are paddy field. The Maha and Kelani rivers flow along the northern and southern borders, respectively, and the Attanagalu river courses through the center of the district. These rivers and their tributaries dissect the district, establishing undulating topography.

The Study area can be broadly classified into alluvial lowland along the major rivers (Maha oya, Kelani ganga, etc.) and their tributaries, and hilly terrain well dissected by these flows. Hilly terrain roughly features two types of topography whose dividing line is an axis running NNW-SSE connecting Kotadeniyawa and Bopagama. To the west of this line, erosion is well progressed and topography consequently extremely gentle. To the east, topography is sharper

and characterized by monadnocks. West of the line, rivers meander gently as they flow westward, while to the east sharp changes in river course direction are present. Topography of the eastern portion is delineated by folding and faulting. Furthermore, to the east of this topographical dividing line, alluvial lowland is less present.

As shown in Table 2-1, geology of Sri Lanka consists of pre-Cambrian~Neogene (Miocene) strata covered by Quaternary formation. These geologic units are referred to as the Highland series (pre-Cambrian), Vijayan series (lower Paleozoic), Southwest group (upper Paleozoic), etc. Geologic classifications are briefly outlined in Fig. 2-1-1.

As indicated in Fig. 2-1-1, the Southwest group is distributed in the west of the Study area, the Highland series in the east, and the Vijayan series in the north. The NNW~SSE dividing line discussed above with regard to topography can be considered as comprising the boundary between the Southwest group and the Highland series, and between the Highland series and the Vijayan series.

The highland series consists primarily of charnockite interbedded with quartzite, schist, and gneiss. The principal formation of this Highland series is an antiform axis extending NNW~SSE from Ambepussa to Parakaduwa. Small-scale folding axis running parallel to the antiform axis results in sharp alteration of strike and dip of bedding. The axis of this formation is cut perpendicularly in a number of places by faulting.

The Southwest group comprises mainly granite and granite gneiss. As outcropping of this formation in the Study area was limited, details on precise structure and continuity of the formation were not discernable. Strike of bedding is NNW~SSE, NE~SW, essentially conforming to the folding axis of the area geology. Dip is  $40^{\circ}$ ~ $50^{\circ}$ . Large-scale faulting is not in evidence.

The Vijayan series is largely gneiss. Limited deposits are found on a NNW~SSE axis in the vicinity of Witagedara, consisting of biotite hornblende gneiss. Bedding strike is NNW~SSE, and dip is  $60^{\circ}$ ~ $80^{\circ}$ .

Surface bedding of the above discussed formations in the Study area displays advanced weathering, and consist of reddish sandy silt ~ sandy clay. This condition particularly applies to the hilly area to the west of the topographical/geological boundary line.

Alluvial lowland consists of river deposits comprising clayey soil, sandy soil, humic soil, etc.

Table 2.1.1 Formations Present in Sri Lanka

ERA	PERIOD		EPOCH		FORMATION	
GENOZOIC	QUATERNARY		Younger Group	Coral reefs Alluvium; lake deposits Lagunal and Estuarine beds Unconsolidated sands (beach and dune) Littoral sandstone	Ratnapura Beds	
			Older Group	Red Earth Group Terrace Gravels Basal ferruginous gravel		
			Miocene	Jaffna Limestones: Minihagalkanda Beds		
MESOZOIC	CRETACEOUS			Dolomito dykes		
	JURASSIC (Upper Gondwana)			Tabbova Beds; Andigama Beds		
PALAEOZOIC	UPPER			Granites and granite gneisses of South-western region Pegmatites		
		Lower		VIJAYAN SERIES - Bintenne Gneisses, Wannu Gneisses, Tongala Complex Pegmatites		
PRE-CAMBRIAN				HIGHLAND SERIES - Khondalite Group, Charnockites, Kadugannawa Gneiss, Kataragama Complex		
				1. Basement rocks (not seen)		

Map of Ceylon showing the main geological divisions and locations of one-inch geological sheets that had been or were being mapped at the end of 1966.

- (28) Puttalam, (29) Calgamuwa, (31) Polonnaruwa,
- (34) Battulu Oyu, (35) Wariyapola, (37) Elebora, (40) Chilaw,
- (41) Dundungamuwa, (42) Kurunegala, (43) Rangala,
- (47) Gampaha, (48) Kandy, (53) Avissawella, (54) Hutton,
- (58) Panadura, (59) Horana, (60) Ratnapura, (65) Rakwana,
- (69) Ambalangoda (71) Ambalantida

Fig. 2.1.1 Geological Map

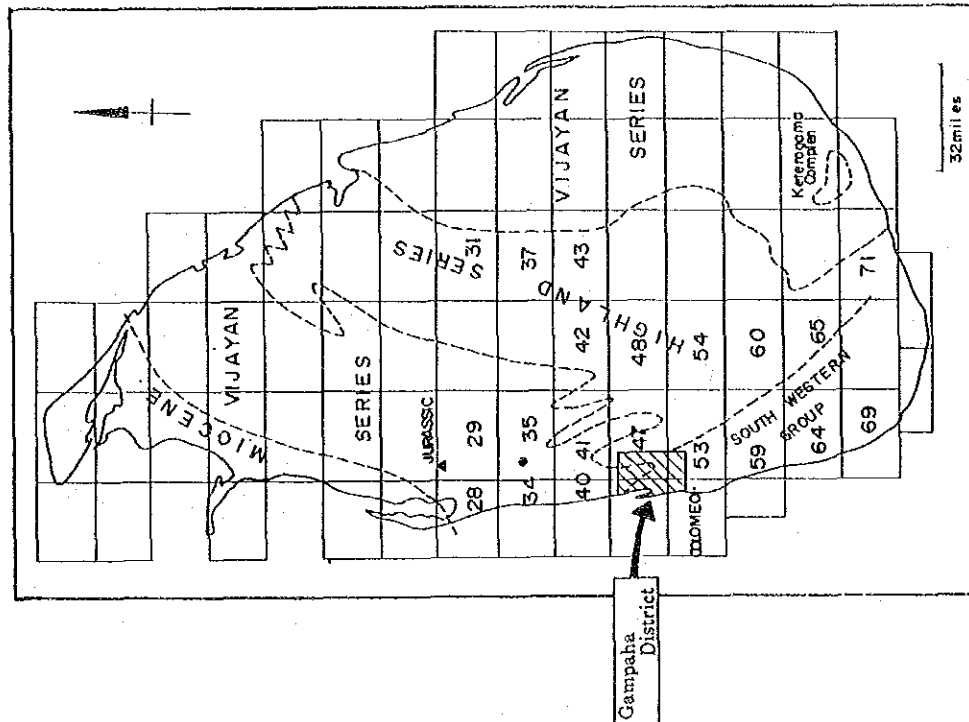
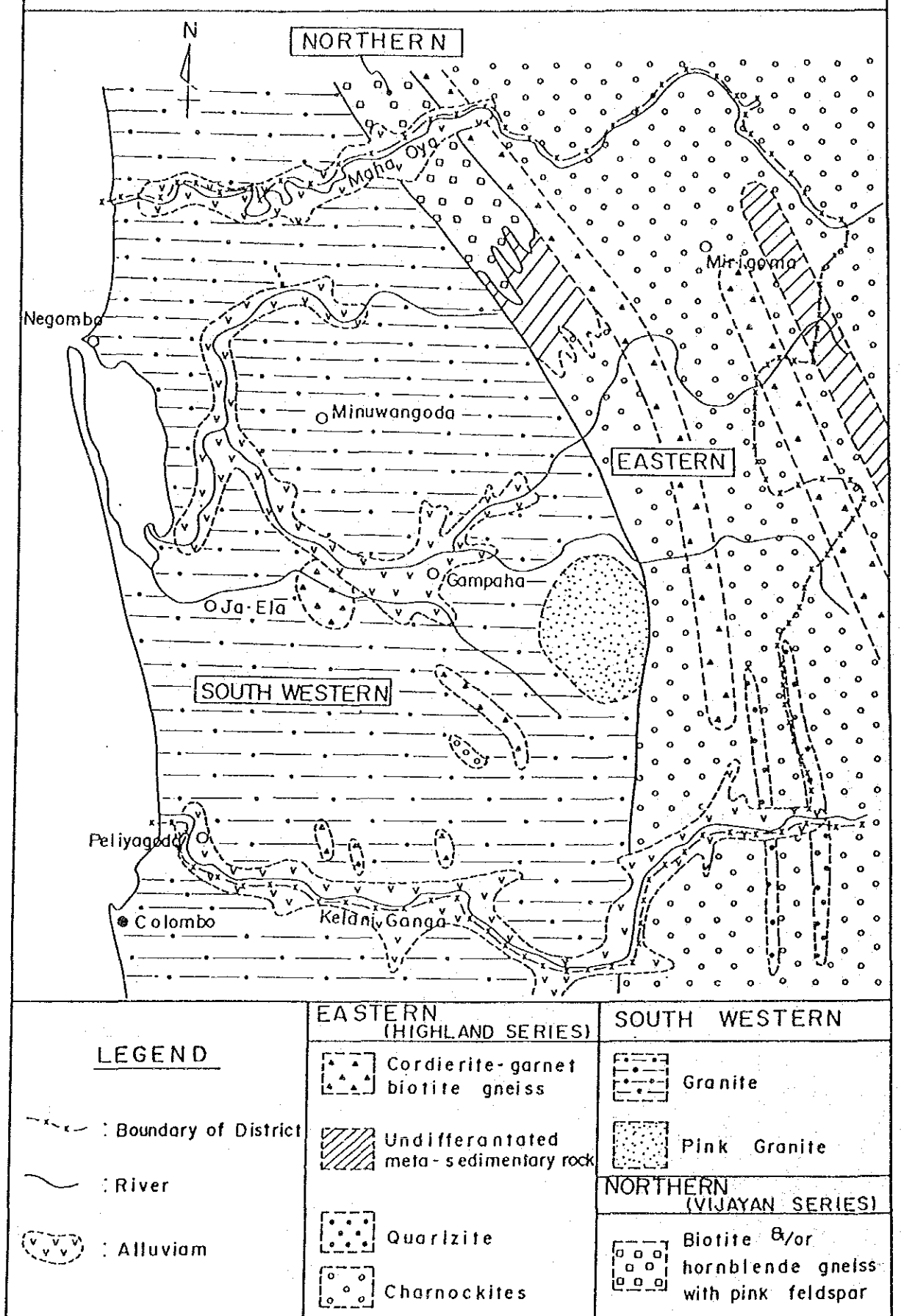


Fig. 2.1.2.2 Geological Map of Gampaha



### 2.1.3 Soil

Sri Lanka is divided into the following three agro-ecological zones on the basis of factors of rainfall, vegetation, soil and land use:

- Wet zone
- Intermediate zone
- Dry zone

These above zones are further subdivided into six agro-ecological regions: ultra-wet, wet, semi-wet, semi-dry, dry and very dry.

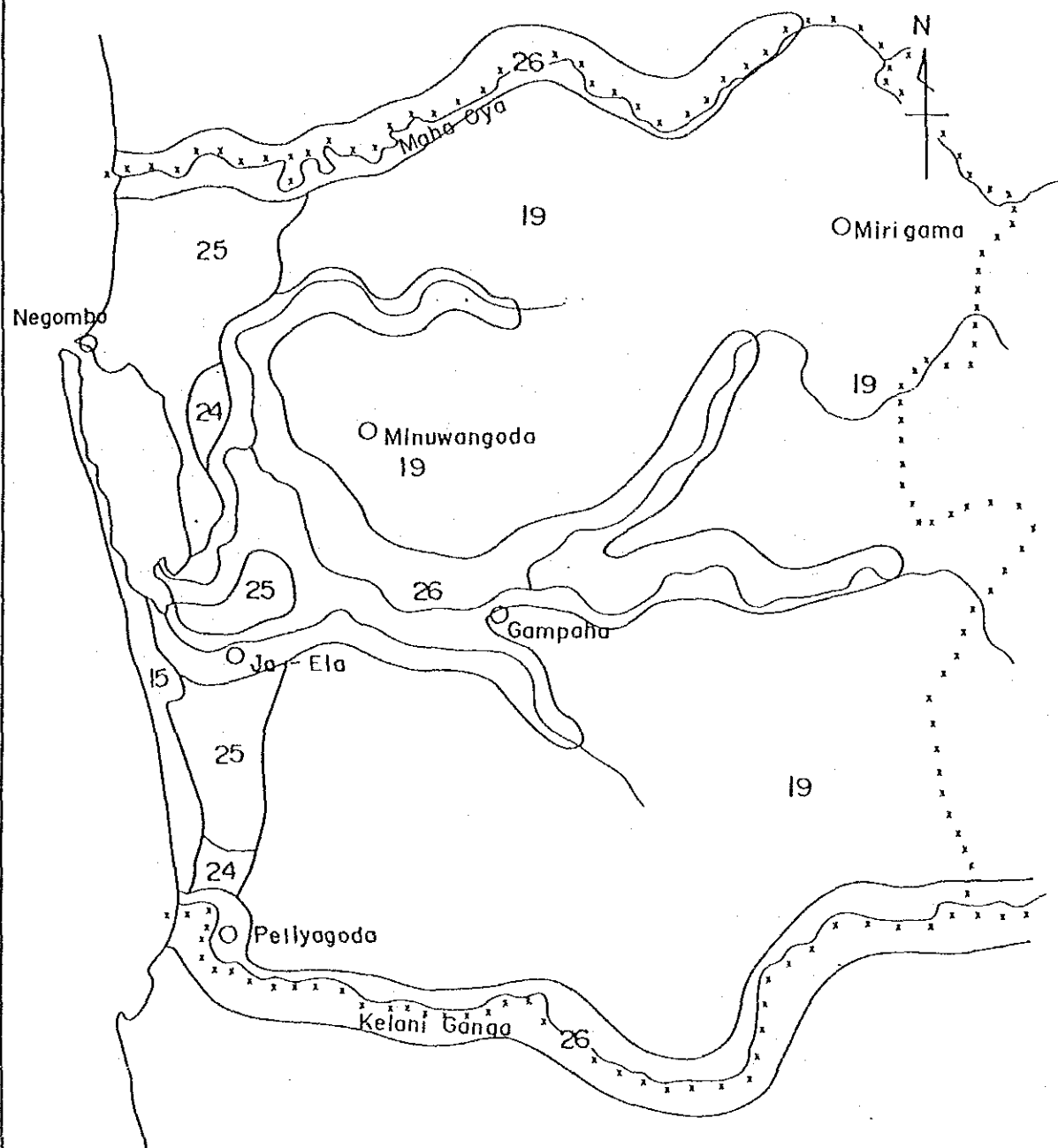
The entirety of Gampaha district lies within the wet-zone. Most of the district belongs to the WL<sub>3</sub> (wet-lowland, laterite region) classification. However, the extreme eastern portion is WL<sub>2</sub> while the lagoon and estuary area in the extreme western portion of the district is WL<sub>4</sub> (wet lowland, ill-drained region).

Soil in Gampaha district falls within the three following classifications:

- Regosols: distributed in coastal area (sand dune, etc.)
- Alluvial soil: distributed in lowland along rivers and streams
- Red-yellow podzolic soils: widely distributed throughout the district with the exception of the central area and coastal area in the west

In addition to the above, bog and half bog soils, and reddish latosols are also present.

Fig. 2.1.3.1 Soils of Gampaha



- 15 Regosols on Recent beach and sand dune sands, flat terrain
- 19 Red-Yellow Podzolic soils with soft or hard laterite, rolling and undulating terrain
- 24 Bog and Half bog soils, flat terrain
- 25 Latosols and Regosols on old red and yellow sands, flat terrain
- 26 Alluvial soils of variable drainage and texture, flat terrain

--- : District Boundary

## 2.1.4 Meteorology, Hydrology and Water Resources

### (1) Meteorology

Sri Lanka is located within the tropical climatic zone. Temperatures and rainfall are governed by the monsoons. The north-eastern and south-western monsoons are referred to as Maha and Yala, respectively. Temperatures throughout the year are warm and fluctuate only slightly.

Gampaha district falls within the wet zone, with annual rainfall at 2,000~2,600mm. Rainfall occurs primarily during the two yearly monsoons. The Maha from October to December accounts for 40% of annual rainfall, while 30% occurs during the Yala from April to June.

Annual mean temperature in the district is 23~31°C. Lower temperatures occur in December~January and higher temperatures in March~April. Annual mean humidity is 79%, with humidity higher in periods of heavy rainfall.

Table 2.1.4.1 RAINFALL AND TEMPERATURE AT KATUNAYAKE AND GAMPAHA

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Katunayake rainfall (mm)	36	76	145	187	327	189	65	102	159	337	376	100	2,099
Daily maximum temperature (°C)	31.4	32.2	32.3	32.1	31.1	30.3	30.1	30.2	30.3	30.1	30.8	30.6	31.0
Daily minimum temperature (°C)	21.6	21.8	23.0	23.9	25.0	25.1	24.8	24.8	24.2	23.6	22.7	22.3	23.6
Humidity (%)	78	79	80	80	81	80	80	73	80	81	80	79	79
Gampaha UC rainfall (mm)	97	116	160	235	425	287	96	133	213	320	368	150	2,600

### (2) Water Resources

#### 1) Rivers in the Study Area

There are three large rivers in Gampaha district. These are

the Maha oya flowing along the northern boundary of the district, the Kelani ganga coursing along the southern boundary, and the Attanagalu oya which flows from south to west through the center of the district. Sizes of catchment areas are as follows:

Table 2.1.4.2 CATCHMENT AREA

River	Area (km <sup>2</sup> )
Attanagalu oya	688
Kelani ganga	302
Maha oya	409
TOTAL	1,399

Features of these rivers are presented below.

Table 2.1.4.3 RIVER CHARACTERISTICS

	Attanagalu oya	Maha oya	Kelani ganga
Catchment area (km <sup>2</sup> )	727	1,510	2,278
Catchment area in Gampaha (km <sup>2</sup> )	688	409	302
Annual precipitation ( $\times 10^6\text{m}^3$ )	1,850	3,644	8,658
Annual runoff ( $\times 10^6\text{m}^3$ )	740	1,260	5,570
Runoff rate (%)	40	34	64
Guage station	Karasnagala	Badalgama	Hanwella
Catchment area at the station (km <sup>2</sup> )	53.0	1,360	1,782
Daily average flow (m <sup>3</sup> /s)	5.01	51.99	188.7
Average maximum flow (m <sup>3</sup> /s)	141.4	698.8	1,601.2
Average minimum flow (m <sup>3</sup> /s)	0.59	1.36	23.1
Maximum flow (m <sup>3</sup> /s)	458.8	1,574.4	2,348.5
Minimum flow (m <sup>3</sup> /s)	0.11	0.17	8.5



2) Attanagalu Oya

The Attanagalu oya has its headwaters in the hilly area of Galapitamada of the neighboring Kegalle district to the east. The river flows westward, confluing with the Diyaella oya in the vicinity of Gampaha UC. At its further lower reaches it joins with the Mapalam and Kimbulapitiya oyas and at this point the river name changes to Dandugan oya. The river subsequently meanders northward and southward to finally debouche into Negombo lagoon. The Uruwal oya flows parallel to the Attanagalu oya, joining it at one portion, undergoing a name change to Ja Ela and ultimately emptying into Negombo lagoon as well.

A river gauge station is located at Karasnagala on the upper reaches of the Attanagalu oya. Daily average, maximum and minimum discharges over the past 11 years as recorded at Karasnagala are given in the table below.

Table 2.1.4.4 DISCHARGE OF ATTANAGALU OYA AT KARASNAGALA

	Daily average (m <sup>3</sup> /s)	Maximum flow (m <sup>3</sup> /s)	Minimum flow (m <sup>3</sup> /s)
1975	6.25	112.3	0.28
1976	2.48	72.8	0.20
1977	5.76	143.8	0.28
1978	2.82	130.5	0.25
1979	3.21	120.3	0.23
1980	2.29	60.8	0.14
1981	1.89	35.1	0.11
1982	n.a.	n.a.	n.a.
1983	3.35	123.9	0.14
1984	10.75	458.8	0.88
1985	11.33	155.7	3.40
Average	5.01	141.4	0.59

The Attanagalu, Diyaella and Uruwalu oyas compose the Attanagalu oya catchment area. Ten irrigation schemes have been implemented within the catchment area, with headworks for diversion located at 34 sites. These 10 schemes collectively are referred to as the Attanagalu Oya Irrigation Project. Total benefit area for the project is 3,870 ha.

Table 2.1.4.5 ATTANAGALU OYA IRRIGATION SCHEME

Scheme	River	No. of anicut	Irrigation area (ha)	Intake discharge (m <sup>3</sup> /s)
Muruthawala	Diyaella oya	5	575	1.62
Kumbaloluwa	Diyaella oya	4	319	0.98
Panugala	Diyaella oya	4	270	1.18
Hellawala	Diyaella oya	1	391	0.70
Morenna	Attanagalu oya	3	453	0.53
Ketawala	Attanagalu oya	2	623	0.11
Thammita	Attanagalu oya	4	319	0.53
Opatha	Attanagalu oya	1	81	0.31
Kinigama	Uruwalu oya	6	313	1.15
Welikada	Uruwalu oya	4	526	1.26
TOTAL		34	3,870	8.37

In addition to the irrigation requirement indicated above, discharge is also diverted from the Attanagalu oya for water service to Gampaha city (600,000 gal./day = 0.03m<sup>3</sup>/s, diversion from Morenna by pump), and for domestic water to Minuwangoda town (approx. 200 households, diverted volume not known), and Opatha Anicut (new community of approx. 2,000 households at the upper reaches of the river).

### 3) Kelani Ganga

The headwaters of the Kelani ganga originate in the mountainous area of Nuwara Eliya. The river flows westward through a portion of Sri Lanka with the heaviest rainfall in the country (over 5,000mm yearly), to finally empty into the Indian Ocean north of Colombo. The Kelani ganga is next in size of discharge in the country to the Mahaweli and Kalu gangas.

In the vicinity of Gampaha district, a river gauge station is located on the Kelani ganga near Hanwella. Daily average, maximum and minimum discharges for the past 12 years as recorded at the station are given below:

Table 2.1.4.6 Discharge of Kelani Ganga at Hanwella

	Daily average (m <sup>3</sup> /s)	Maximum flow (m <sup>3</sup> /s)	Mininum flow (m <sup>3</sup> /s)
1974	242.1	2,348.5	10.5
1975	299.0	2,307.4	22.7
1976	114.1	614.4	14.5
1977	196.0	1,864.7	22.5
1978	193.8	2,089.6	29.2
1979	155.8	1,329.4	12.2
1980	90.7	513.2	8.5
1981~83	n.a.	n.a.	n.a.
1984	206.8	1,979.2	60.0
1985	199.7	1,364.4	28.0
Average	188.7	1,601.2	23.1

On the Kelani ganga itself there are no water use facilities (dams, weirs, etc.). However, there are reservoirs on two tributaries of the river, namely the Labugama and the Kalatuwawa, from which a total of  $30 \times 10^6$  gal/day (113,700m<sup>3</sup>) of service water is diverted to

Colombo city. Accordingly, the river system serves as an important water source for Colombo. A large-scale transbasin channel project is currently under planning to construct a dam in the vicinity of Avissawella on the upper reaches of the Kelani ganga and divert discharge for irrigation to Kurunegala district. The said dam would also provide flood control for the Kelani ganga.

4) Maha Oya

The Maha oya has its source in the vicinity of the boundary between Kegalle and Nuwara Eliya districts. After flowing northward, the river alters direction to the west, emptying into the Indian Ocean on the north side of Negombo. As the entire catchment of the river lies in proximity to a dry zone, specific discharge is relatively small. In terms of discharge size, the river ranks seventh in the country.

In the vicinity of Gampaha district, a river gauge station is located on the Maha oya at Badalgama. Daily average, maximum and minimum discharges over the past 16 years as recorded at Badalgama are given in Table 2.1.4.7.

5) Groundwater

A groundwater survey has been implemented for Gampaha district by the National Water Supply and Drainage Board in the course of the Minuwangoda Town Water Supply Project. According to the survey, wells of 60m depth and 15 in. diameter yield a discharge of 270~540ℓ/min. Although boring logs are not available, these wells appear to be dug in alluvial formation judging from their location. As alluvial deposits are greater in the western half of the district, this area would be expected to offer more extensive groundwater development than the eastern sector. Wells will provide an effective means of water supply given the current state of water service infrastructure in rural area. In this regard, a groundwater survey merits implementation.

Table 2.1.4.7 DISCHARGE OF MAHA OYA AT BADALGAMA

	Daily average flow (m <sup>3</sup> /s)	Maximum flow (m <sup>3</sup> /s)	Minimum flow (m <sup>3</sup> /s)
1970	52.21	511.2	2.21
1971	57.03	592.1	2.61
1972	47.03	579.2	1.53
1974	51.40	455.9	1.70
1975	60.63	482.9	1.33
1977	56.32	497.2	1.42
1978	42.12	1,574.4	0.45
1981	42.50	917.4	0.17
1982	49.88	635.9	0.45
1985	60.52	741.9	1.75
Average	51.99	698.8	1.36

Data for 1973, 76, 79, 80, 83, 84 are not available.

## 2.2 Society and Economy

Gampaha is the largest industrialized district in Sri Lanka. The Gampaha - Colombo industrial belt produces 64% of national industrial production and employs 32% of the sector's labor force. In terms of production, Gampaha is ranked first while in terms of employment, Colombo ranks first.

Of the district's labor force, 13% is employed in agriculture, 30% in industry, 15% in commerce and 42% in services. The share of agriculture is high in comparison to industrialized countries; however, the district is basically industrialized.

With urbanization progressing along the western coastal zone, the southern zone adjacent to the capital of Colombo, and the Kandy road and railroad, Gampaha, the second most densely populated district, partially constitutes an extended metropolitan area, while purely rural areas remain in the north and east. The number of commuters to the urbanized area is increasing, traveling one to two

hours and utilizing the developed traffic network including public and private bus services.

Of the 289,000 households in Gampaha district, an estimated 30,000~32,000 are engaged mainly in agriculture as a livelihood, of which 16,000 may be described as full time farmers. With the significant growth of modern sectors in the district, income sources outside of agriculture have become available and the number of part-time farmers availing themselves of off-farm income has correspondingly increased significantly. This trend is spurred by the fragmentation of land holdings due to traditional inheritance practices whereby land is equally divided among surviving children, which has resulted in an average land holding of 1.2 acres (0.48ha) for both full and part time farmers of the district.

Fragmentation of holdings tends to be marked in areas of greater urbanization. In these areas, employment in off-farm sectors is generally more profitable, and residents exhibit a waning interest in agriculture as a livelihood. However, in lesser developed portions of the district in the north and east, employment opportunities are severely limited and the population out of necessity must rely on farming as a means of living. Despite generally larger average land holdings in these lesser developed sections of the district, agriculture is of low productivity and a high rate of food stamp recipiency is seen.

Sri Lanka has the highest rates of school enrollment and literacy (virtually 100%), life expectancy (70 years) and family planning participants, and the lowest rates of infant mortality and population growth among the low income countries (excluding China). The Government, which had previously taken the major role in determining economics, changed its policy, encouraging the public to enter the economic milieu with due respect for individual incentives and market principles. However, government expenditure once inflated cannot be easily reduced, and the people have become accustomed to following the government's initiative and enjoying services without active participation on their own part. It is noted in Gampaha that the people tend to depend on food stamps or other government programs and are reluctant to create or take advantage of employment opportunities. Also, ethnic and caste prejudices prevent them from engaging in certain specific occupations in the informal sector.

Gampaha is a district of in-migration and hence population concentration. Urban concentration of population is gradually increasing due to an extension of

modern agriculture in the highland districts (Mahawelli project), quick growth of private commercial and service sectors under new economic policies, and decline of labor emigration to the Middle East. It is therefore anticipated that migration into the Gampaha district will accelerate in view of its well developed living and working environments. Urbanization taking place in the western and southern parts of the district will expand to other areas, encroaching particularly on upland farm fields where fragmentation and coinciding integration of agricultural land holdings will also progress.

### 2.2.1 Administration

As one of 25 districts in Sri Lanka, the Gampaha district has 13 Electorate divisions, each of which elects a Member of Parliament (MP). Assistant Government Agent (AGA) divisions coincide with these 13 Electorates.

The district is administratively represented by the Government Agent (GA), who is appointed by the Ministry of Home Affairs, and presiding 13 Assistant Government Agents (AGAs) stationed at the 13 AGA offices. Each AGA division has 15 to 55 Grama Sewaka (GS) divisions where Village Level Officers are stationed. There are 444 GS divisions in the district.

Apart from the above, the Local Authorities are organized under the jurisdiction of the Ministry of Local Government, Housing and Construction. Local authorities such as the Municipal Council (MC), Urban Councils (UC) and Town Councils (TC) were organized in urban areas and Village Councils (VC) were placed in rural areas. The MC and the 6 UCs each have an elected assembly and are administratively represented by the secretary who is dispatched from the said ministry. The TCs and VCs were similarly organized, but were unified into one District Development Council (DDC) in 1981.

The DDC consists of 13 Members of Parliament and 12 other members separately elected from the district, and is chaired by the District Minister who is nominated from among the district's MPs. The secretary to the DDC is also assigned to the Government Agent who directs 37 Sub-Officers stationed at ex-TC and VC territories. The DDC's objective is to develop the district, except those areas under the MC and UCs.

Local administration of the district is thus carried out by two separate ministries. Line ministries such as education, health, agricultural development and research, land and land development, regional development, rural

development, etc. also assign local officers and independently carry out administration of their own fields. Therefore, the District Minister and the Government Agent are delegated to coordinate the line organizations of various ministries.

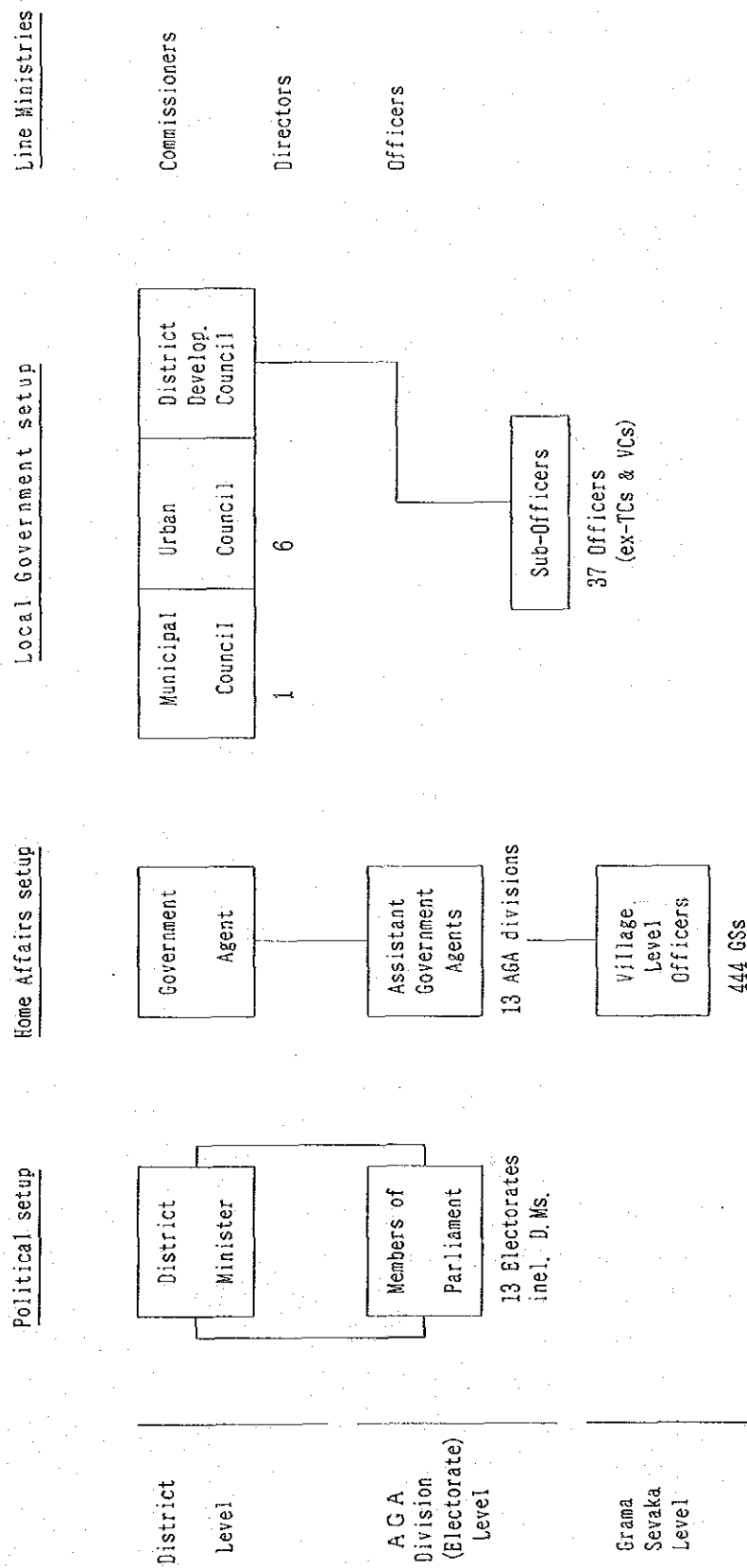
The Decentralized Capital Budget (DCB) and the District Development Council Budget (DDCB) are the main financial sources for local administration. Each AGA division or Electorate is allocated an annual DCB of Rs 2.75 million and the DDCB of Rs 2.125 million. Both funds are used mainly for capital investment and improvement of schools, electrification, roads, irrigation, water supply, drainage facilities, etc., however amounts are reported to be insufficient.

Constraints to public administration are lack of unified and coordinated administration. The Government Agent with his secretariate "Kacheri" is required to coordinate multiple line activities such as those of the Ministry of Home Affairs - GA - AGA - Village Level Officers, those of the Ministry of Local Government, Housing and Construction - local authorities (MC, UC and DDC) - Sub-Officers, and those of the line ministries - local officers. The District Development Council, which is the sole representative assembly of the district, does not necessarily administer the MC and UC. The District Minister and Government Agent are supposed to formulate the core of the district's general consensus; however, they are not necessarily well informed of the activities of the line ministries.

The Integrated Rural Development Project (IRDP) aims to comprehensively combine coherent activities for long-term development of the district's potential by eliminating and coordinating discordant activities of the above sectoral administration. For this purpose, an implementing body is required for the processes of formulation, implementation and operation of the IRDP. The Ministry of Plan Implementation, therefore, delegated its Division of Regional Development (RDD) to undertake the IRDP. Accordingly the RDD posted its officers to the Planning Unit of the district.



Fig. 2.2.1.1 Multiplicated Administrative Setups



## 2.2.2 Population of the District

National population censuses of 1971 and 1981 show an average annual growth rate of 1.7% which consists of 2.1% of natural growth and -0.34% of net migration (ref. Table 2.2.2-5). Gampaha district's population was approximately 1,175,000 in 1971 and 1,391,000 in 1981 and the average growth rate is similar to that of the country as a whole. Due to the separation of Gampaha from Colombo district in 1978, Gampaha's trend of growth is not easily traceable. Some data on natural growth are shown in the following table.

Table 2.2.2.1 Natural Growth Rate of Population (%)

	Sri Lanka	Colombo	Gampaha
1977	2.05	1.75	
1978	1.19	1.76	
1979	2.24	1.97	1.56
1980	2.22	1.93	1.44
1981	2.23	1.98	1.53
1982 <sup>1/</sup>	2.07	1.72	1.33
1983 <sup>1/</sup>	2.01	1.64	1.21
1984 <sup>1/</sup>	1.83	1.50	1.08
1985 <sup>1/</sup>	1.81	1.51	1.00

<sup>1/</sup> provisional

Source: Registrar General's Department

A sharp upward change in Colombo's natural growth rate at the separation of Gampaha implies a low rate in the Gampaha area before the separation. It is estimated that the natural growth of Gampaha is 1.4 to 1.5% and the in-migration rate is 0.2 to 0.3% when compared to the total growth rate of 1.7%. In view of the low rates after 1982, the future population growth may be forecasted as 1.2 to 1.3% due to natural growth and 0.2% due to in-migration, for a total growth rate of 1.4 to 1.5%.

Table 2.2.2.2 Estimated Population Forecast  
(‘000)

	<u>1.4% growth</u>	<u>1.5% growth</u>
1981	1,391	1,391
1986	1,491	1,498
1991	1,598	1,614
1996	1,713	1,739
2001	1,836	1,873

---

Table 2.2.2.3 Census of Gampaha -- 1971 and 1981

AGA Division	Area (km <sup>2</sup> )	1971	1981	Growth per year (%)
Mirigama	190.0	70,056	111,294	4.7
Divulapitiya	193.0	82,113	96,746	1.6
Minuwangoda	139.2	103,049	107,277	0.4
Attanagalla	151.8	65,007	105,781	5.0
Weke	164.2	85,080	98,575	1.5
Gampaha	94.8	151,084	116,297	4.0
Mahara	103.3		108,391	
Wattala	63.9	99,254	109,635	1.0
Ja-Ela	65.3	122,012	119,520	-0.2
Negombo	30.8	157,080	103,706	3.1
Katana	114.7		109,476	
Biyagama	64.7	239,836	94,237	-1.6
Kelaniya	23.1		109,927	
<b>TOTAL</b>	<b>1,399</b>	<b>1,174,571</b>	<b>1,390,862</b>	<b>1.7</b>

SOURCE: Department of Census and Statistics

NOTE: Gampaha district was separated from Colombo district in 1979, before that there were 10 AGA divisions (Electorates). However, change in division boundary (except for the separation of 3 divisions) did not take place. It is considered that decrease or extreme increase of population was derived from erroneous sampling or other unknown reason.

Table. 2.2.2.4 Population Density of Gampaha District  
1981

AGA Division	Area ( km <sup>2</sup> )	P o p u l a t i o n			Density ( / km <sup>2</sup> )
		Rural	Urban	Total	
Divulapitiya	193.0	96,746	—	96,746	501
Mirigama	190.0	107,772	3,522	111,294	586
Weke	164.2	98,575	—	98,575	600
Attanagalla	151.8	101,878	3,903	105,781	697
Minuwangoda	139.2	100,877	6,400	107,277	771
Katana	114.7	77,985	31,491	109,476	954
Mahara	103.3	108,391	—	108,391	1,049
Gampaha	94.8	105,641	10,656	116,297	1,227
Biyagama	64.7	94,237	—	94,237	1,457
Wattala	63.9	25,981	83,654	109,635	1,716
Ja-Ela	65.3	51,135	68,385	119,520	1,830
Negombo	30.8	33,302	70,404	103,706	3,367
Kelaniya	23.1	—	109,927	109,927	4,759
District	1,398.7	1,002,520	388,342	1,390,862	994

Note : Urban population includes that of 1 M C , 6 U C and 9 T C .  
Source : Census of Population and Housing, 1981

Table 2.2.2.5 Population and Vital Statistics

Sri Lanka

Year	Population Mid-Year ( ' 000 )	Birth Rate ..... ( per thousand ) .....	Death Rate ..... ( per thousand ) .....	Net Migration Rate ..... ( per thousand ) .....	Annual Natural Growth Rate ( % )
1963	10,651	34.1	8.6	-1.0	2.55
1964	10,889	33.2	8.8	-1.0	2.44
1965	11,133	33.2	8.2	-0.5	2.50
1966	11,439	32.3	8.3	-0.5	2.40
1967	11,703	31.6	7.5	-0.6	2.41
1968	11,992	32.0	7.9	-0.7	2.41
1969	12,252	30.4	8.1	-0.9	2.23
1970	12,516	29.4	7.5	-0.8	2.19
1971	12,608	30.4	7.7	-2.7	2.27
1972	12,861	30.0	8.1	-3.2	2.19
1973	13,091	28.0	7.7	-3.8	2.03
1974	13,284	27.5	9.0	-4.0	1.85
1975	13,496	27.8	8.5	-2.3	1.93
1976	13,717	27.8	7.8	-3.8	2.00
1977	13,942	27.9	7.4	-3.7	2.05
1978	14,190	28.5	6.6	-2.8	2.19
1979	14,472	28.9	6.5	-3.0	2.24
1980	14,747	28.4	6.2	-4.6	2.22
1981	15,011	28.2	5.9	-3.3	2.23
1982	15,189	26.8	6.1	-6.0	2.07
1983	15,416	26.2	6.1	-6.8	2.01
1984	15,599	24.8	6.5	-4.9	1.83
1985	15,837	24.3	6.2	n. a.	1.81

Note: Figures for 1982-85 are provisional.  
Source: Registrar General's Department

It is observed that the population is densely distributed along the Colombo - Puttalam road, Colombo - Kandy road and railroads parallel to these main highways. Population density of the district in 1985 is estimated at 1,038/km<sup>2</sup>, second to the most-densely populated Colombo district (2,773/km<sup>2</sup>). However, the population density is below 700 persons/km<sup>2</sup> in AGA divisions of Divulapitiya, Mirigama, Weke and Attanagalla. These north and east areas represent purely rural area except the belts along main highways.

The population census in 1981 includes distribution of religion and ethnicity. Religious distribution of the population shows a higher concentration of Christians and a lower percentage of Hindus in comparison to the national average. The lower Hindu concentration may coincide with the sparsity of Tamils in the ethnic distribution. Christians consisting mainly of fishermen are also concentrated along the coastal zone.

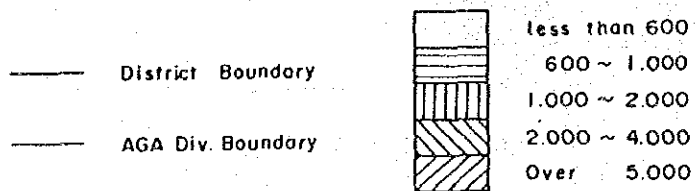
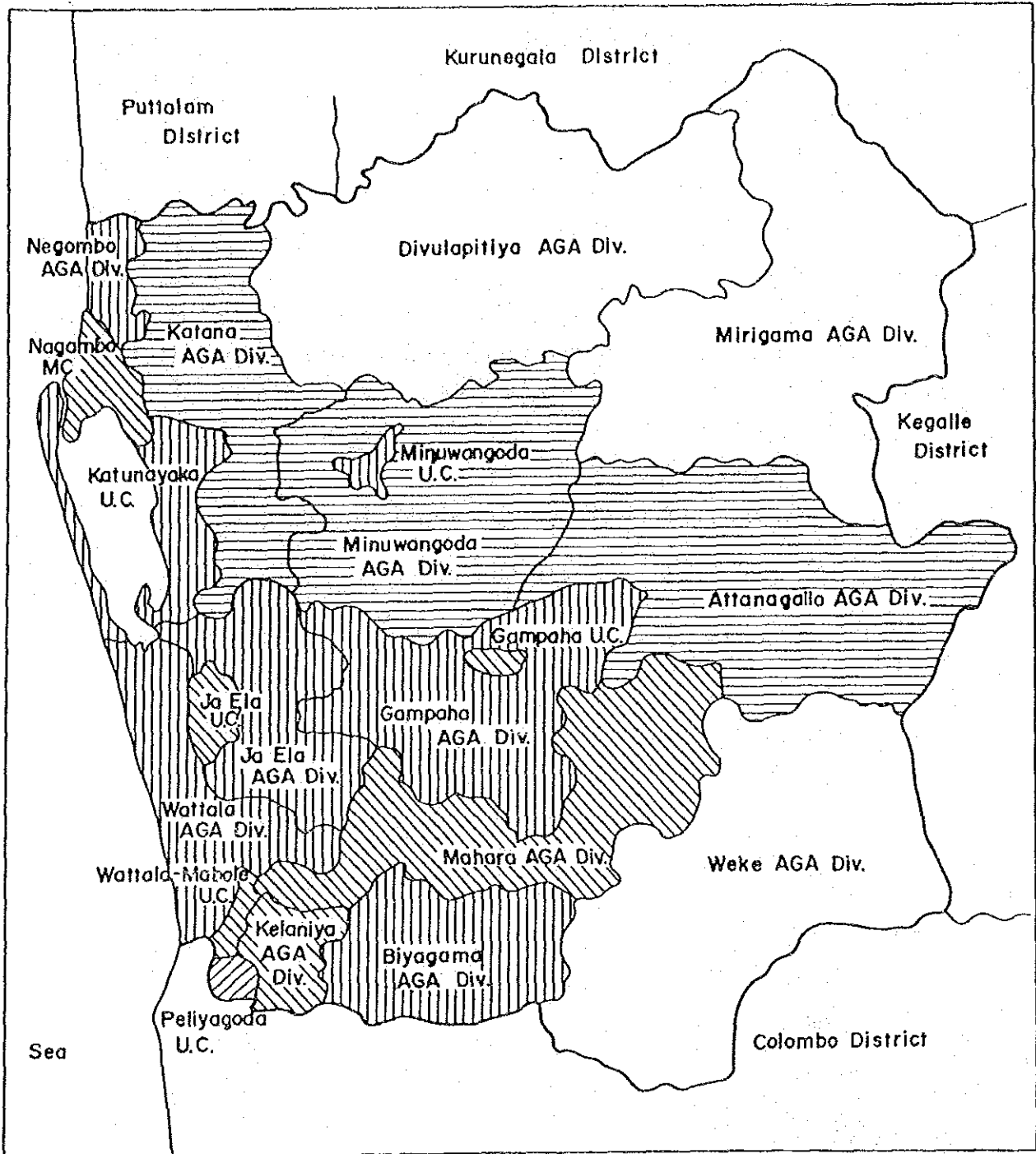
Table 2.2.2.6 Distribution of Religion and Ethnicity

	<u>Religion</u>			
	<u>Gampaha</u>	<u>Colombo</u>	<u>Sri Lanka</u>	
Buddhist	71.1 (%)	70.8 (%)	69.3 (%)	
Hindu	1.9	7.6	15.5	
Muslim	3.4	9.9	7.6	
Christian	23.4	11.4	7.5	
Others	0.1	0.2	0.1	
	<u>Ethnicity</u>			
	Sinhalese	92.2	77.9	74.0
	Tamils	3.7	11.1	18.2
	Moors	2.8	8.3	7.1
	Burgers	0.6	1.1	0.3
	Malays	0.6	1.1	0.3
	Others	0.5	0.5	0.1

Source: Department of Census and Statistics

Fig. 2.2.2.1 Population Density In Gampaha District  
by AGA Division and Urban Council

1981





## 2.2.3 Land Resources

### (1) Current Status of Land Resources

The land area of Gampaha district is 1,399km<sup>2</sup>. This represents only 2.1% of the total land area of the country, and the district ranks fifth lowest out of 25 in size. However, nearly 10% of the national population, or 1.4 million persons reside within the district.

Current land use in Gampaha district is as follows:

Table 2.2.3.1 LAND USE

Land use	Area (ha)
1. Agricultural land use	97,370
(1) Upland crops	80,300
Coconut	73,000
Rubber	5,000
Others	2,300
(2) Paddy land	17,070
Major irrigation land	3,870
Minor irrigation land	5,600
Rainfed land	7,600
2. Other land use	42,530
<b>Total land</b>	<b>139,900</b>

Note: "Other land use" includes urban and housing area, forest, marsh, lake, etc.

### (2) Development of New Agricultural Land

Development in Gampaha district has been underway for a long period of time, and almost all land is currently utilized. There accordingly exists little potential for development of new agricultural land. In order to increase agricultural productivity, more intensive utilization of existing farmland will be necessary.

Paddy field with irrigation facilities in the Project area totals 9,470 ha including both major and minor irrigation. However, superannuation aggravated by inadequate maintenance has drastically reduced the

performance of many of these facilities. Such facilities require urgent rehabilitation.

Rainfed paddy in the Study area totals 7,600 ha. Much of this is located in fingers of lowland jutting into upland, and fields are long and narrow in configuration. As rainfall in Gampaha district is an abundant 2,000mm per annum, in many cases rain runoff from uplands can be collected at the upstream portion of fields in canals for distribution. Where this cannot be done, irrigation facilities must be provided.

Lowland paddy field along the Kelani ganga is inundated with flood water during the rainy season preventing natural drainage and converting portions of the area into marshland. In such areas drainage and backwater sluice facilities require rehabilitation and strengthening to permit stabilized agriculture.

Effective utilization of coconut fields which comprise 75% of cultivated area will be extremely important. Although further survey is required, it is conceivable that certain crops of high water consumption may be introduced. In such cases irrigation facilities would have to be provided for such fields. As the present average land holding for coconut field is 0.5ha. (1.4Ac.), one possible irrigation method would be to supply water from shallow wells.

### (3) Improvement of Land Use Rate

Increased land use rate would be achieved through introduction of intercropping to coconut fields. Promotion of intercropping is currently being pursued by the Coconut Cultivation Board, the Department of Agriculture, the Department of Minor Export Crops, and the National Livestock Development Board.

The Department of Agriculture is promoting the intercropping of pineapple, passion fruit and other upland crops, while the Department of Export Crops promotes intercropping of pepper, coffee, cacao, cloves, cinnamon, betel leaf vine, and other spices, etc. The National Livestock Development Board encourages livestock grazing, and the Coconut Cultivation Board encourages intercropping of pepper and coffee, as well as livestock grazing.

Area which would be subject to intercropping would comprise 180,000ac. (73,000ha.) of coconut field, which is equivalent to 52% of the

total land area of Gampaha district. Nevertheless, all coconut field is not planted with as much coconut as possible, and 4% of the said area under cultivation is of low productivity with trees in excess of 60 years age. On the other hand, 6 ~7% of area under coconut cultivation is already intercropped, (banana, pineapple: 600ha.; export crops:1,800ha.; fruit and livestock grazing: 2,000~3,000ha.). The overall land use rate for coconut field is accordingly estimated at 103 ~ 110%.

Area which can be developed with intercropping in Gampaha district comprises that which is planted with trees 16~45 years old, or 45% (79,000ac. or 32,000ha.) of the total coconut cropped area.

Paddy field area is 42,000ac. (17,070ha.). If cropping season for paddy is shortened through introduction of short day varieties, land use rate could be upgraded. For example, double cropping of 3 month varieties of paddy would permit introduction of upland crop cultivation during the interim season between the two monsoons. This is discussed in greater detail in section 4.4.1.

#### 2.2.4 Industry and Agriculture

Gampaha and Colombo districts form the largest industrial area in Sri Lanka. Gross industrial production of Gampaha was Rs17.1 billion (36% of national industrial production), while that for Colombo was Rs13.2 billion (28% of the same) according to the 1982 industrial census.

Production value in the sectors of chemical and rubber manufacturing and oil refining (including the country's only petroleum refinery) is the largest for Gampaha district, totaling 12.9 billion rupees (78% of the total national production value in these sectors). Other major manufacturing sectors are textiles and garments at 1.7 billion rupees (31% of the national total) and food and tobacco at 1.4 billion rupees (8% of the national total).

Among the district's population of 1,391,000 in 1981, 474,500 are economically active, 73% of which (i.e. 347,000) are employed. An average of 1.2 persons per household are thus employed among the district's 289,000 households. Percentage of sector-wise employment is compared with the national structure of employment and gross domestic production (GDP) in the following table.

Table 2.2.4.1 Share of Labor and GDP

Sector	Sri Lanka				Gampaha
	Labor		G D P		Labor
	1965	1980	1965	1984	
Agriculture	56 (%)	53	28	28	13.4
Industry (Manufacturing)	14	14	21 (17)	26 (14)	29.4 (23.3)
Services (Commercial) (Public servant, etc.)	30	33	51	46 (19)	57.2 (15.3) (19.4)

Source : World Development Report, 1986 ; Gampaha District  
Report, 1981

The manufacturing sector of Gampaha employs nearly 14% of national employment in the same sector. In consideration of the fact that the district's population accounts for only 9.4% of the total population, industrial employment is remarkably high. The total 81,000 workers in the manufacturing sector may be broken down as follows:

Textile, clothing, etc.	36,000
Non-metallic mineral	11,000
Chemicals, petroleum, etc.	8,900
Fabricated metal, machinery	6,600

Growth of GDP shows that a 4-5% growth rate was sustained in the industrial sector before 1973, and thereafter by the services sector. A 4% growth rate was achieved in the agricultural sector by rapid growth in the Mahaweli project area while in other areas, the agricultural growth rate has remained at a lower level. In view of the fact that 84% of the employed population are in the industrial and services sectors which exhibit higher productivity and growth, the district's GDP is estimated to be very high compared to other rural districts.

According to the 1981 census of population, 127,000 or 27% of the economically active population are unemployed. This unemployment rate is said to be very high in comparison with the national unemployment rate of 11.7% in the same year. However, the industrial census shows the district's employment rate to

be higher than the national average. It is plausible that some employment was not reported from informal sectors. Also noticeable is that 46% of the unemployed are women, while the employed women account for only 17% among the total employed.

Of the 39,000 population engaged in the agricultural and livestock sectors (defined in their strictest sense), a breakdown shows principal segments engaged in paddy cultivation (15,000), and coconut cultivation (9,000). The low productivity of the coconut sector can be seen that 75% of district farmland is being utilized for coconut farming as opposed to 18% for paddy. At the same time, a large portion of area registered as under coconut cultivation consists of home garden type farming, fragmented and small scale in nature. As this type of cultivation does not permit self-sufficiency, these farmers are engaged primarily in off-farm occupations and consequently do not appear within the agricultural sector in employment statistics. Such part-time farmers are extremely numerous and are better thought of in actuality as non-farmers engaged in only very limited agriculture.

The employed in the livestock sector totals less than 1,000. This can be said to reflect Buddhist influence (71% of the district population is Buddhist), and almost all livestock husbanders are Christian. However, in recent years religious taboos regarding poultry raising, etc. are seen to be loosening.

According to the 1982 agricultural survey, there exist 165,000 persons referred to as "agricultural operators" Of these, 149,000 (90%) are reported to possess holdings of less than 3 acres (1.2ha). The said survey makes no distinction between farmers and non-farmers, nor on size of holding with some agricultural operators cultivating land of less than 1/8 acre (Table 2.2.4.7). Consequently, as hobby gardeners and extremely small scale farming are included, survey figures are misleading for a district like Gampaha where in reality relatively few persons are engaged in agriculture in a strictly defined sense (11% of all employed). The survey makes no distinction between part-time farmers who sustain themselves not through agriculture but rather from off-farm income, and full-time farmers engaged solely in agriculture.

According to the 1981 census, the employed population in agriculture and livestock husbandry is 39,493 on a sectoral-wise basis, and 38,300 on an occupational-wise basis. Of these totals, approximately 20% is considered to be supplementary help from within the same household, yielding a farm household estimate of 30,000~32,000. These households are engaged in cultivation of 2 acres

or more, although those where holdings are less than 3 acres are considered as relying on additional off-farm income for their livelihood. In more urbanized areas, off-farm income sources are comparatively available; whereas in purely rural areas, the absence of such aggravates poverty conditions.

Table 2.2.4.2 Industry and Employment --1982

Major industry division	Persons engaged (Nos)			Value of output (million rupees)		
	Gampaha	Colombo	Sri Lanka	Gampaha	Colombo	Sri Lanka
Mining and quarrying	2,688 (10.2)	2,081 (7.9)	26,363	32 (6.2)	48 (9.3)	516
Manufacturing	83,514 (13.9)	110,428 (18.4)	600,804	17,092 (35.9)	13,188 (27.7)	47,626
Food, beverages and tobacco	13,270 (6.1)	17,317 (8.0)	215,866	1,428 (8.1)	5,231 (29.5)	17,706
Textile, wearing apparel and leather	36,039 (23.8)	28,679 (18.9)	151,492	1,727 (31.3)	1,854 (33.7)	5,508
Wood and wood products	4,542 (10.3)	12,232 (27.9)	43,894	112 (7.0)	967 (60.2)	1,607
Paper and paper products, printing and publishing	929 (6.4)	8,401 (58.2)	14,433	93 (5.8)	845 (52.6)	1,441
Chemicals, petroleum, coal, rubber and plastic products	8,877 (12.7)	19,384 (27.8)	69,704	12,879 (78.2)	2,380 (14.4)	16,476
Non-metallic mineral products	11,063 (17.9)	9,761 (15.8)	61,683	443 (17.2)	589 (22.9)	2,571
Basic metal industries	344 (9.0)	2,945 (76.8)	3,833	16 (4.0)	371 (93.0)	399
Fabricated metal products, machinery and equipment	6,588 (23.1)	9,510 (33.4)	28,483	276 (21.1)	733 (56.2)	1,305
Other manufacturing industries	1,862 (16.3)	2,199 (19.3)	11,416	117 (19.1)	218 (35.5)	613

Note : Figures in brackets show each division's percentage to the national total.

Source : Census of Industry, 1983, Department of Census and Statistics

**Table 2.2.4.3 Employed Population**

Gampaha 1981

	<u>District</u>		<u>Urban</u>		<u>Rural</u>	
		( % )		( % )		( % )
Agriculture	46,626	13.4	4,346	4.2	42,280	17.4
Mining	2,485	0.7	129	0.1	2,356	1.0
Manufacturing	80,874	23.3	24,346	23.3	56,528	23.3
Electricity, Gas, Water	2,419	0.7	814	0.8	1,605	0.7
Construction	16,002	4.6	3,805	3.6	12,197	5.0
Commerce	53,162	15.3	20,791	19.9	32,371	13.3
Transportation	34,137	9.8	11,046	10.6	23,091	9.5
Money and insurance	8,128	2.3	3,383	3.2	4,745	2.0
Services	67,340	19.4	22,576	21.6	44,764	18.4
Others	35,798	10.3	13,052	12.5	22,746	9.4
<b>Total</b>	<b>346,971</b>	<b>100</b>	<b>104,288</b>	<b>100</b>	<b>242,683</b>	<b>100</b>

Source : Census of Population and Housing 1981

**Table 2.2.4.4 Growth Rate of GDP**

Sri Lanka (%)

	<u>1965 - 1973</u>	<u>1973 - 1984</u>
G D P	4.2	5.2
Agriculture	2.7	4.1
Industry (manufacturing)	7.3 (5.5)	4.8 (3.6)
Service	3.8	6.0

Source : World Development Report, 1986



Table 2.2.4.5 Employed Population in Agricultural Sector  
Gampaha District, 1981

	<u>District</u>	<u>Urban</u>	<u>Rural</u>
<u>Agricultural &amp; Livestock production</u>	39,468	1,231	38,237
Paddy (rice) cultivation	14,493	384	14,109
Other field grains	611	19	592
Vegetable and fruit	4,104	153	3,951
Tea cultivation	66	24	42
Rubber cultivation	3,037	44	2,993
Coconut cultivation	8,488	191	8,297
Cinnamon cultivation	99	2	97
Cocoa, Cardamon & Pepper	9	2	7
Tobacco cultivation	236	6	230
Citronella cultivation	9	1	8
Other crops	7,245	204	7,041
Toddy tapping	297	60	237
Livestock production	774	141	633
<u>Agricultural Services</u>	1,015	57	958
<u>Hunting, Trapping &amp; Game propagation</u>	1	-	1
<u>Forestry</u>	53	4	49
<u>Logging</u>	127	2	125
<u>Fishing</u>	5,962	3,052	2,910

Source: Census of Population and Housing, 1981

### Agricultural Land Holding

AGA division-wise distribution of population density and land holding status is as shown in the following table.

	Popula- tion density (rank)	Farmer/ popula- tion (rank)	Average area (rank)	Ratio of agr. land (rank)	Average paddy (rank)	Gini coeff. (rank)
Divulapitiya	13	<u>2</u>	<u>2</u>	<u>2</u>	11	11
Mirigama	12	<u>3</u>	<u>4</u>	<u>4</u>	12	<u>4</u>
Weke	11	<u>1</u>	<u>1</u>	<u>3</u>	10	10
Attanagalla	10	<u>5</u>	<u>5</u>	<u>5</u>	13	8
Minuwangoda	9	<u>4</u>	<u>3</u>	<u>1</u>	8	8
Katana	8	8	8	10	<u>4</u>	<u>6</u>
Mahara	<u>7</u>	<u>6</u>	<u>7</u>	8	9	13
Gampaha	<u>6</u>	<u>7</u>	6	<u>7</u>	<u>7</u>	<u>7</u>
Biyagama	<u>5</u>	8	9	9	<u>6</u>	12
Wattala	<u>4</u>	12	13	13	<u>3</u>	<u>5</u>
Ja-Ela	<u>3</u>	11	10	11	<u>5</u>	<u>3</u>
Negombo	<u>2</u>	10	12	6	<u>1</u>	<u>1</u>
Kelaniya	<u>1</u>	13	11	12	<u>2</u>	<u>2</u>

It is generally observed that the 7 divisions with higher population density have lower rates of farmers and farmland, and smaller average farmland holdings. However, the average paddy land holding, as well as the disparity of paddy land distribution in these divisions is greater. Since 6 out of these 7 divisions belong to the GCEC area, urbanization is marked. It is therefore likely that farmland and farm households have decreased due to urbanization, and that farmland has declined faster than the number of farm households.

The average paddy holding in the areas undergoing urbanization is larger than that in the more rural areas, since development of housing, siting of industrial plants, etc. was carried out on the upland area. Gini coefficients which show the rate of disparity in farmland distribution among cultivators is as high as 0.652 for the whole district. In other words, 67% of farmers with holdings of less than 1 acre or 0.4ha cultivate only 18% of farmland, and 3% of large-scale farmers with holdings of more than 5 acres or 2ha occupy 28% of land.

Available data on AGA division-wise distribution of paddy land holdings show that the disparity is higher in the urbanized area. This implies a certain relation between inequitable distribution of land holdings and rate of urbanization.

Table 2.2.4.6 Agricultural Land Holding - Gampaha District (Area in acres)

ASA division	All Operational Holdings				Paddy Holdings			Gini Coeff.	
	Number	Area	Average Holding/Population (%)	Agricultural Land/Total Land (%)	Number	Area	Average area		
Weke	17,075	27,825	1.63	17.3	75.1	5,725	4,959	0.87	0.443
Divulapitiya	16,654	26,002	1.56	17.2	77.0	4,637	3,965	0.86	0.435
Minuwangoda	17,139	26,172	1.53	16.0	81.3	5,298	4,920	0.93	0.446
Mirigama	18,789	27,373	1.46	16.9	73.2	7,131	5,313	0.75	0.472
Attanagalla	15,218	22,084	1.45	14.4	72.8	5,755	4,221	0.73	0.446
Gampaha	13,866	15,334	1.11	13.1	67.1	4,376	4,176	0.95	0.448
Mahara	14,744	15,402	1.04	13.6	65.8	3,375	2,960	0.88	0.310
Katana	11,734	12,035	1.03	10.7	57.1	1,143	1,462	1.28	0.452
Biyaagama	10,086	9,086	0.90	10.7	58.1	1,865	1,819	0.98	0.431
Ja-Ela	9,670	6,169	0.64	8.1	42.3	967	1,041	1.08	0.500
Kelaniya	3,784	2,259	0.60	3.4	39.6	270	400	1.48	0.518
Negombo	8,722	5,110	0.59	8.4	70.5	101	202	2.00	0.568
Wattala	7,353	4,173	0.57	6.7	27.3	402	581	1.45	0.467
District	164,834	199,024	1.21	12.1	67.6	41,045	36,019	0.88	0.453

Source : Census of Agriculture, 1982

Table 2.2.4.7 Distribution of Operational Holdings

Gampaha District (Average : 1.2)	Number of holdings		Area (acre)	
	Number	percent	Area	percent
Less than 1/8	13,257 (13,257)	(8.0)	1,026 (1,026)	(0.5)
1/8 to less than 1/4	27,048 (40,305)	(24.5)	4,063 (5,089)	(2.6)
1/4 ——— 1/2	37,350 (77,655)	(47.1)	10,397 (15,486)	(7.8)
1/2 ——— 1	32,496 (110,151)	(66.8)	19,471 (34,957)	(17.6)
1 ——— 2	27,984 (138,135)	(83.8)	35,181 (70,138)	(35.2)
2 ——— 3	10,943 (149,078)	(90.4)	24,969 (95,107)	(47.8)
3 ——— 4	5,169 (154,247)	(93.6)	16,993 (112,100)	(56.3)
4 ——— 5	3,009 (157,256)	(95.4)	12,905 (125,005)	(62.8)
5 ——— 7	3,239 (160,495)	(97.4)	18,339 (143,344)	(72.0)
7 ——— 10	1,849 (162,344)	(98.5)	14,893 (158,237)	(79.5)
10 ——— 20	1,941 (164,285)	(99.7)	25,406 (183,643)	(92.3)
20 and over	550		15,380	
All holdings	164,835	100	199,023	100

Source : Census of Agriculture, 1982.

Note : Figures in brackets are cumulative.

Gini Coefficient : 0.652

Table 2.2.4.8 Distribution of Paddy Land Holdings

Gampaha District (Average : 0.88)		Number of holdings		Area (acre)	
		Number	percent	Area	percent
Less than	1/8	1,083 ( 1,083)	( 2.6 )	77 ( 77)	( 0.2 )
1/8 to less than	1/4	3,612 ( 4,695)	(11.4 )	571 ( 648)	( 1.8 )
1/4	1/2	9,356 ( 14,051)	(34.2 )	2,838 ( 3,486)	( 9.7 )
1/2	1	13,237 ( 27,288)	(66.5 )	7,961 ( 11,447)	(31.8 )
1	2	9,691 ( 36,979)	(90.1 )	11,681 ( 23,128)	(64.2 )
2	3	2,537 ( 39,516)	(96.3 )	5,554 ( 28,682)	(79.6 )
3	4	970 ( 40,306)	(98.2 )	2,513 ( 31,195)	(86.6 )
4	5	311 ( 40,617)	(98.95)	1,295 ( 32,490)	(90.2 )
5	7	250 ( 40,867)	(99.56)	1,376 ( 33,866)	(94.0 )
7	10	76 ( 40,943)	(99.75)	597 ( 34,463)	(95.7 )
10	15	63 ( 41,006)	(99.9 )	710 ( 35,173)	(97.65)
15	20	15 ( 41,021)	(99.94)	268 ( 35,441)	(98.4 )
20 and over		24		578	
All holdings		41,045	100	36,019	100

Source : Census of Agriculture, 1982.

Note : Figures in brackets are cumulative.

Gini Coefficient : 0.458

Table 2.2.4.9 Poor Relief Scheme (Food Stamps)

AGA division	Households receiving kerosine stamps		Individuals receiving food stamps	
	Number	share (%)	Number	share (%)
Divulapitiya	14,588	72.4	46,605	48.2
Mirigama	13,912	60.0	49,135	44.1
Minuwangada	12,277	54.9	41,066	38.3
Katana	12,152	53.3	38,674	35.3
Weke	10,817	52.7	38,501	39.1
Mahara	10,893	48.3	44,336	40.9
Attanagalla	9,776	44.4	33,791	31.9
Biyagama	8,180	41.7	32,521	34.5
Gampaha	10,037	41.4	37,548	32.3
Negombo	8,129	37.6	26,689	25.7
Ja-Ela	8,088	32.5	29,948	25.1
Wattala	5,889	25.8	20,845	19.0
Kelaniya	4,323	18.9	16,505	15.0
District	129,061	44.6	456,164	32.8

Source: M P I

Table 2.2.4.10 Income Distribution for Gampaha District

Average : Rs. 926

Income group	Number of households		Income	
	Number	Percent	Amount (Rs. '000)	Percent
Less than 200	9,170	3.3	1,137	0.4
200 — 400	46,170 (55,340)	(19.9)	15,131 (16,268)	(6.3)
400 — 600	63,422 (118,762)	(42.6)	31,542 (47,810)	(18.5)
600 — 800	50,204 (168,966)	(60.7)	34,606 (82,416)	(32.5)
800 — 1,000	31,424 (200,390)	(71.9)	27,781 (110,197)	(42.7)
1,000 — 1,400	34,736 (235,126)	(84.4)	40,671 (150,868)	(58.5)
1,400 — 1,800	20,318 (255,444)	(91.7)	32,356 (183,224)	(71.1)
1,800 and over	23,110		74,619	
All groups	278,554	100	257,843	100

Note: Figures in brackets are cumulative.

Source: Income Statistics, Gampaha

Gini Coefficient: 0.394



### 2.2.5 The Greater Colombo Economic Commission

The Greater Colombo Economic Commission (GCEC) was established in 1978 as the main organ of the new economic policy which is targeted to promote export oriented industries in the place of import substitution industries. To promote foreign capital investment, the GCEC started construction of the Investment Promotion Zone (IPZ), supporting facilities and industrial infrastructures in the hinterland. For this purpose the Area of Authority of the GCEC (GCEC area) was demarcated within Gampaha district consisting of 400km<sup>2</sup> including the AGA divisions of Negombo, Katana, Ja-Ela, Wattala, Kelaniya, Biyagama and a part of Mahara.

The GCEC was delegated the authority to suspend effects of all or part of laws on tax, customs, foreign exchange, corporation, banking, etc. within the said area. It also terminated the authority of the local administrative bodies (MC, UC, TC and VC) under the Ministry of Local Government, Housing and Construction. The GCEC itself assigned officers to these local authorities. Upon establishment of the District Development Act, administrative authority was returned to the said Ministry, while planning authority is still retained by the GCEC. However, authority for Biyagama VC remains under the GCEC.

The GCEC has so far established 2 IPZ at Katunayake and Biyagama, in which industrial plants enjoy a tax haven with regard to import and re-export of capital, materials and products. However, licensed manufacturers within the GCEC area may enjoy the same privileges even if they are located outside of the IPZ.

The GCEC is formulating a structural development plan to develop industrial promotion zones within the area, while a portion of the rural area is envisioned to be retained in the GCEC area. Under the said development plan, a population forecast was undertaken as outlined in the following table.

Table 2.2.5.1 GCEC POPULATION FORECAST

	<u>1981</u>	<u>1991</u>	<u>2001</u>
Urban	361,543	462,802	564,150
Rural	335,651	409,153	523,748
Total	697,194	871,955	1,087,898

Source: Draft Regional Structure Plan of the GCEC

As to future employment, the GCEC planned 46,000 employment opportunities in and around Katunayake IPZ and 30,000 at Biyagama IPZ. Up to 1985, 212 industries with a capital investment of Rs10,196 million and 88,000 potential employment opportunities have been approved by the GCEC. Out of these, 119 industries with a gross investment of Rs7,167 million and employment of 59,000 people were contracted (see Table 2.2.5.2). As of early 1986, however, only 77 manufacturing units are in operation and 18 units are under construction. Only 35,786 workers are reported to be actually employed.

Most of the units actually in operation are light industries engaged in , rubber processing, and manufacturing of garments, PVC tips, wood and furniture, etc. Management and finance are mostly provided by Sri Lankan and foreign investors including 13 from Hong Kong, 10 from West Germany, 8 from the USA, 6 from the UK, 6 from Singapore, 5 from India, and so on.

Table 2.2.5.2 Industrial Investments Approved  
and Contracted by GCEC  
1978-1985

Category	No. of Units			Foreign Investment (Rs. Million)				Total Investment (Rs. Million)				Employment Potential (Nos.)				
	1978 1983	1984	1985	Cumulative 1978 1983	1984	1985	Cumulative 1978 1985	1978	1984	1985	Cumulative 1978 1985	1978	1984	1985	Cumulative 1978 1985	
				Total			Total				Total				Total	
<b>Approvals</b>																
(1) Food, Beverage & Tobacco	5	—	1	6	50	—	14	64	80	—	27	107	2,189	—	449	2,638
(2) Textiles, Wearing Apparel & Leather Products	61	4	5	70	1352	95	104	1551	1930	167	178	2,275	38,689	2441	3834	44,964
(3) Wood & Wood Products - (Including furniture)	3	1	—	4	17	2	—	19	28	4	—	33	494	129	—	623
(4) Paper & Paper Products	4	—	—	4	34	—	—	34	42	—	—	42	385	—	—	385
(5) Chemicals, Petroleum, Coal, Rubber & Plastic Products	20	1	1	22	386	5	19	410	549	10	27	586	3523	248	812	4583
(6) Non-Metallic Mineral Products (except Petroleum & Coal)	25	—	—	25	702	—	—	702	881	—	—	861	6677	—	—	6677
(7) Fabricated Metal Products and Transport Equipment	15	3	—	18	424	74	—	498	572	91	—	663	3461	357	—	3,818
(8) Manufactured Products (n.e.s.)	45	4	5	54	1385	234	17	1636	2220	342	38	2,600	18,766	542	939	20,247
(9) Services	6	2	1	9	2442	26	13	2481	2949	64	16	3,029	4,035	293	44	4,372
<b>Total</b>	184	15	13	212	6792	436	167	7395	9232	678	286	10,196	78,219	4010	6078	88,307
<b>Contracted</b>																
(1) Food, Beverage & Tobacco	1	—	1	2	2	—	14	16	5	—	28	33	56	—	449	505
(2) Textiles, Wearing Apparel & Leather Products	42	1	3	46	896	38	98	1032	1267	103	139	1,509	28,353	1487	2984	32,824
(3) Wood & Wood Products (including furniture)	4	1	—	5	1	2	—	3	2	4	—	6	250	129	—	379
(4) Paper & Paper Products	—	1	—	1	—	25	—	25	—	29	—	29	56	—	—	56
(5) Chemicals, Petroleum, Coal, Rubber & Plastic Products	12	2	1	15	230	11	05	246	327	19	08	254	2,215	877	522	3614
(6) Non-Metallic Mineral Products (except Petroleum & Coal)	13	—	—	13	498	—	—	498	595	—	—	595	4,882	—	—	4,882
(7) Fabricated Metal Products and Transport Equipment	2	2	1	5	67	22	16	105	111	30	20	161	1,043	143	96	1,282
(8) Manufactured Products (n.e.s.)	20	5	1	26	876	263	2	1141	1274	374	5	1,653	10,409	1098	24	11,531
(9) Services	5	1	—	6	2342	18	—	2360	2789	38	—	2,827	3,830	243	—	4,073
<b>Total</b>	99	13	7	119	4812	379	135	5426	6370	597	200	7,167	51,038	4033	4075	59,146

Source: Greater Colombo Economic Commission.



## 2.3 Agriculture

### 2.3.1 General

Agricultural land use in Gampaha is intense, occupying 70% or approximately 97,300ha of the entire area of the district (139,900ha). Recent yield of paddy and coconut has remained level since 1980, while a slight increase has been observed in the production of some upland crops and other export crops like pepper and coffee. However, except for coconut, the production of food crops within the district is not self-sufficient as shown in the following table.

Table 2.3.1.1 SUPPLY OF FOOD CROPS IN GAMPAHA  
(1985)

Crop	Production (tons)	Per Capita Consumption (kg)	Total Consumption (tons)	Supplied (%)
Coconut	384 Million Nuts	97.2 Nuts	136 Million Nuts	282.3
Paddy	81,296	105.0	146,790	55.4
Chillies	160	3.88	5,424	2.9
Cassava	1,009	9.91	13,854	7.3
Sweet Potato	385	1.25	1,747	22.0
Potato	n/a	2.93	4,096	n/a
Yams	723	0.65	908	79.6
Egg Plant	451	3.68	5,145	8.8
Ladies Fingers	265	1.37	1,915	13.8
Bitter Gourd	126	0.69	965	13.1
Cabbage	14	1.94	2,712	0.5
Cucumber	33	0.38	531	6.2
Raddish	53	0.89	1,244	4.2
Tomato	n/a	0.82	1,146	n/a

Source: District agriculture Office, 1985; Report of Consumer Finance and Socio-Economic Survey, 1981; Statistic Dept., 1985

Table 2.3.1.2(1) Paddy, Area, Yield, Production in Gampaha: 1980-1986

	1980		1981		1982		1983		1984		1985		1986		Average			
	Yield	1980/81 Haha	Yield	1981/82 Haha	Yield	1982/83 Haha	Yield	1983/84 Haha	Yield	1984/85 Haha	Yield	1985/86 Haha	Yield	1986	Ha	Acres	Ha	
Major Irrigation	Area (Ac)	1,091	4,569	1,962	4,721	3,431	4,849	4,720	4,063	4,990	4,012	4,971	2,506	1,014	4,820	1,951		
	Yield (B)	(441)	(1,849)	(1,911)	(5,388)	(2,003)	(2,003)	(1,910)	(1,644)	(2,019)	(1,624)	(2,012)	(2,012)	56.95	64.78	3,325		
	Production (B)	(47,819)	(84,386)	(37,768)	(25,551)	(7,076)	(9,708)	(9,076)	(8,887)	(10,000)	(6,465)	(7,967)	(7,967)					
Minor Irrigation	Area (Ac)	1,816	7,043	1,840	4,126	2,371	3,557	4,519	3,458	4,793	2,752	4,944	2,204	892	4,829	1,938		
	Yield (B)	(734)	(2,760)	(1,745)	(4,667)	(1,440)	(1,440)	(1,859)	(1,400)	(1,940)	(1,114)	(2,001)	(2,001)	51.27	62.20	3,207		
	Production (B)	(13,350)	(19,443)	(32,113)	(19,428)	(3,428)	(5,140)	(8,428)	(8,428)	(6,666)	(9,076)	(3,428)	(3,428)					
Rainfed	Area (Ac)	14,829	23,373	22,539	23,985	22,269	33,734	32,407	35,839	31,904	24,363	31,186	19,815	8,056	29,432	12,565		
	Yield (B)	(6,002)	(9,459)	(9,121)	(13,755)	(8,417)	(13,652)	(13,115)	(10,465)	(12,911)	(9,760)	(12,621)	(12,621)	54.44	60.29	3,089		
	Production (B)	(8,906)	(22,227)	(20,597)	(33,000)	(18,955)	(45,355)	(42,434)	(37,197)	(41,173)	(23,904)	(30,909)	(30,909)					
Total	Area (Ac)	36,732	142,712	142,712	142,712	142,712	142,712	142,712	142,712	142,712	142,712	142,712	142,712	142,712	142,712	142,712		
	Yield (B)	(1,224,847)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)		
	Production (B)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)	(1,438,327)		

Yield (B): Yield/Bushels/Acre -Yield(MT): Yield/Metric ton/Hectare (Source: Agriculture Extension Gampaha.

Table 2.3.1.2(2) Field Crops, Cultivated Area, and Production in Gampaha: 1980-1986

	1980 Yala		1981 Yala		1982 Yala		1983 Yala		1984 Yala		1985 Yala		1986 Yala	
	(ha)	(MT)	(ha)	(MT)	(ha)	(MT)	(ha)	(MT)	(ha)	(MT)	(ha)	(MT)	(ha)	(MT)
1. Manioc	372	4,371	717	8,342	736	8,649	379	4,453	620	7,286	391	4,595	288	3,156
2. Yams	155	1,547	274	2,748	268	2,684	689	6,890	317	3,171	117	1,178	254	2,537
3. Sweet Potato	65	455	193	1,388	224	1,569	315	2,205	225	1,572	127	852	241	1,689
4. Luffa	30	508	62	1,033	41	692	73	1,223	75	1,266	70	1,172	58	981
5. Ladiesfinger	54	304	77	431	52	290	129	721	100	559	122	681	117	642
6. Egg plant	34	571	54	917	42	697	74	1,236	81	1,364	63	1,053	61	1,030
7. Radish	15	250	24	407	25	418	60	1,007	50	835	44	725	39	647
8. Cowpea	7	3	7	3	21	10	29	14	6	3	13	8	11	5
9. Chillies	26	177	55	377	107	738	65	446	35	238	54	372	56	387
10. Bittergourd	32	49	49	653	36	481	59	796	61	821	61	816	64	857
11. Snakegourd		260		734		620		1,378		929		1,030		1,007
12. Ginger	155	1,085	-	-	175	1,222	-	-	177	1,222	-	-	193	1,349
13. Turric	310	3,100	-	-	273	2,725	-	-	158	1,561	-	-	236	2,364
14. Banana		-		-		-		-		-		-	279	6,696
15. Pineapple	103	1,130	71	781	243	2,673	299	3,291	218	2,402	131	1,443	405	4,454
16. Passion Fruit	43	512	57	689	69	828	111	1,388	307	8,687	114	1,368	95	1,140

Source: Agriculture Extension-Gampaha.

In contrast to lagging agricultural production, population has been steadily increasing resulting in a clear excess of labor. Agronomists, administrators and farmers have been experimenting with various approaches towards absorbing this excess labor into intensive agriculture such as through more intensive cropping patterns and new crop technologies.

Table 2.3.1.2 Population and Labor Power ('000)

Year	1981	1982	1983	1984	1985
Population	1,391	1,407	1,423	1,439	1,452
Labor power	471	482	488	493	498

Source: Economic, Social Statistics of Sri Lanka

Despite the plentiful average precipitation, heavy seasonal and annual fluctuations of rainfall adversely affect agriculture as irrigation facilities are insufficient. The overall level of agricultural infrastructures and supporting services is also unsatisfactory.

Located in proximity to the capital city of Colombo, Gampaha is the second most densely populated of the 25 districts in the country, and appears to be a typical suburban agricultural zone. Nearly one-third of the area along the western coast is designated as an Area of Authority under the Greater Colombo Economic Commission (GCEC). Within this area the planned development of two Investment Promotion Zones with supporting industrial and town development is underway.

Gampaha district is square in shape. Starting at the capital of Colombo, Kandy road runs westward through the district. If the district is evenly divided into four portions by the Kandy road and a line extending at a right angle to the same, the southern and western portions (coastal zone) are especially heavily populated. There are no large stretches of farmland in these portions although small plots of cultivated land are observed beside houses. In the northern portion and in the hilly zone of the eastern portion, cultivated land occupies the majority of land area, and the northern and eastern highlands are dominantly agricultural. Paddy fields in this area are scattered in small plots in the low-lying valleys. As indicated in the land use map, 75% of cultivated land is coconut field, 18% is paddy, and 5% is rubber plantation.



Land holdings are so fragmented and skewed that the average is 1.2 acre (0.48ha) while 67% of farm households are operating on less than 1 acre (0.4ha). As such small landholdings are insufficient to support a family, 60 to 80% of farmers are estimated to depend on income sources other than agriculture. As a result, many farmers practice weekend farming which invites low efficiency in the use of land and agricultural inputs.

With respect to agriculture in general in Gampaha district, 70% of land is cultivated and no further expansion of agricultural land is expected. With fairly easy access to non-agricultural income sources due to the proximity to the capital and the GCEC area, agricultural achievement is not eagerly pursued by many farmers and consequently farm technology remains conventional. However, intensive agriculture may be applicable by introducing profitable cash crops combined with high productivity and high-yielding cultivation techniques, if such can be demonstrated to be satisfactory to the majority of farmers.

A shift from the present traditional agriculture to emphasis on the cultivation of cash crops such as pepper and coffee is important for agricultural development in Gampaha district in order to achieve a higher land productivity than at present. The introduction of modernized cultivation techniques will be necessary for this purpose.

### **2.3.2 Land Use**

Land use in Gampaha district is as shown in the Table 2.2.3.1.

Table 2.2.3.1

## LAND USE IN GAMPAHA

Land Use	Area		Share	
	Acre	Hectare	(%)	(%)
District Total Area	345,000	139,900	100	
Cultivated	240,000	97,370	69.5	100
(Upland)	(198,000)	(80,300)	-	(82)
Coconut	180,000	73,000	-	75
Rubber	12,400	5,000	-	5
Mixed Tree	5,600	2,300	-	2
(Lowland: Paddy)	(42,200)	(17,070)	-	(18)
Major Irrigation	9,600	3,870	-	4
Minor Irrigation	13,800	5,600	-	6
Rainfed	18,800	7,600	-	8
Other	105,000	42,530	30.5	-

Source: JICA Survey Team

Among the total area of 345,000 acres (139,900ha) some 70% or 240,000 acres (97,300ha) accounts for cultivated agricultural land, in that coconut, paddy and rubber account for 75, 18 and 5%, respectively. Coconut plantations which produce the most significant crop in the district, occupy as much as 17% of the entire coconut land in the country (1,030,000 acres or 416,800ha). The second largest area falls in paddy cultivation, of which 44% is rainfed, 33% is under minor irrigation schemes, and 23% is under major irrigation schemes.

Upland crops other than coconut consist of rubber and other mixed perennial tree crops, and the remaining land area of 105,000 acres (42,530ha) comprises housing area, roads, rivers, marsh land, mangrove and forests. It is difficult to reclaim such marshland for cultivation due to salinity intrusion.

According to the Census of Agriculture of 1982, agricultural land holdings are classified into two categories, i.e. the small holding sector and the estate sector. The latter is defined as a holding of 8ha (20 acres) or more under a single operator. There are 668 estate operations run mostly by the government or private corporations. The estate sector in Gampaha occupies nearly 15% of total agricultural land with average holdings of approximately 20.7ha (52 acres).

Table 2.3.2.1

## LAND USE IN GAMPAHA

Land Use	Area		Share	
	Acre	Hectare	(%)	(%)
District Total Area	345,000	139,900	100	
Cultivated	240,000	97,370	69.5	100
(Upland)	(198,000)	(80,300)	-	(82)
Coconut	180,000	73,000	-	75
Rubber	12,400	5,000	-	5
Mixed Tree	5,600	2,300	-	2
(Lowland: Paddy)	(42,200)	(17,070)	-	(18)
Major Irrigation	9,600	3,870	-	4
Minor Irrigation	13,800	5,600	-	6
Rainfed	18,800	7,600	-	8
Other	105,000	42,530	30.5	-

Source: JICA Survey Team

Among the total area of 345,000 acres (139,900ha) some 70% or 240,000 acres (97,300ha) accounts for cultivated agricultural land, in that coconut, paddy and rubber account for 75, 18 and 5%, respectively. Coconut plantations which produce the most significant crop in the district, occupy as much as 17% of the entire coconut land in the country (1,030,000 acres or 416,800ha). The second largest area falls in paddy cultivation, of which 44% is rainfed, 33% is under minor irrigation schemes, and 23% is under major irrigation schemes.

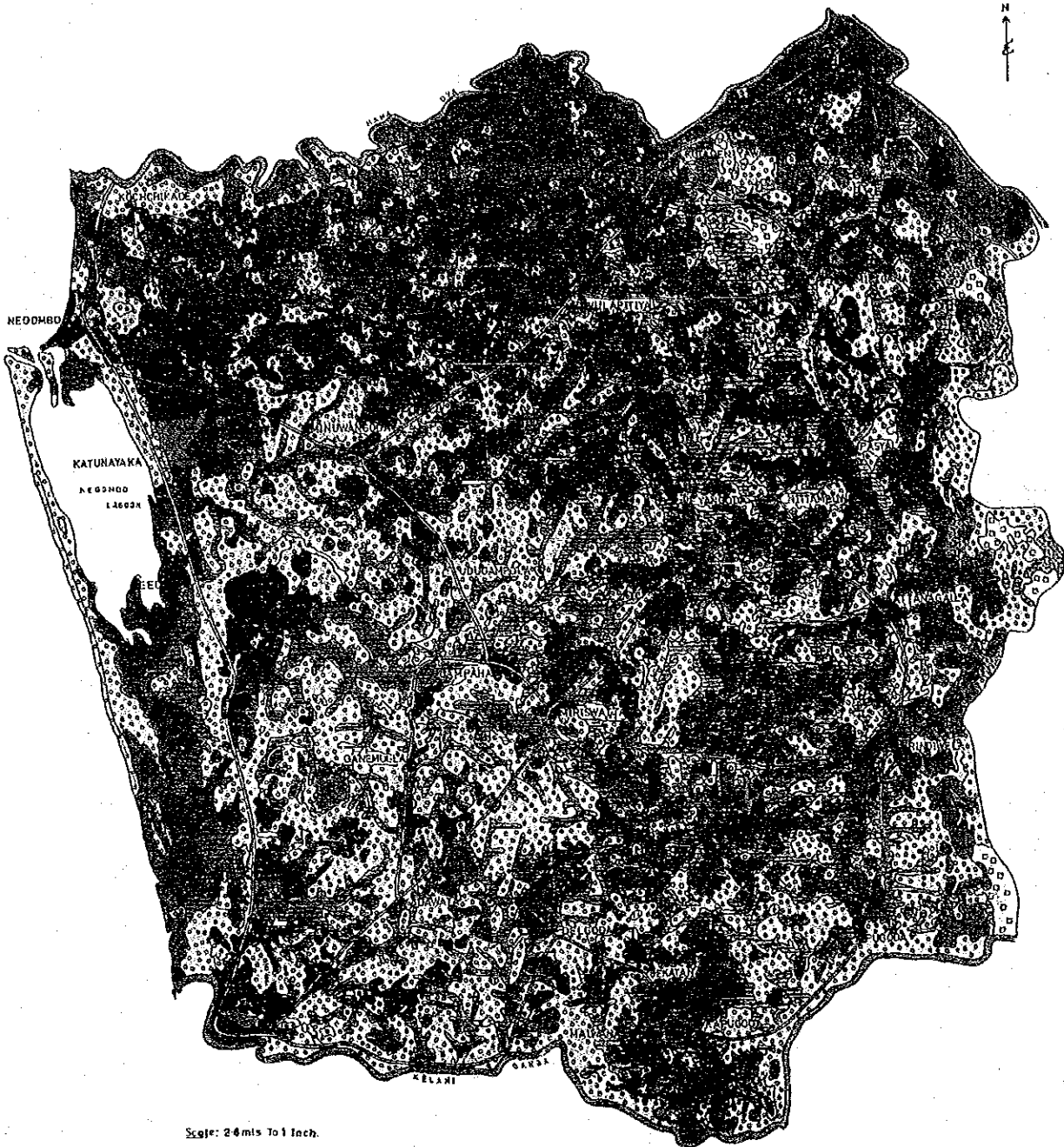
Upland crops other than coconut consist of rubber and other mixed perennial tree crops, and the remaining land area of 105,000 acres (42,530ha) comprises housing area, roads, rivers, marsh land, mangrove and forests. It is difficult to reclaim such marshland for cultivation due to salinity intrusion.

According to the Census of Agriculture, 1982, agricultural land holdings are classified into two categories, i.e. the small holding sector and the estate sector. The latter is defined as a holding of 8ha (20 acres) or more under a single operator. There are 668 estate operations run mostly by the government or private corporations. The estate sector in Gampaha occupies nearly 15% of total agricultural land with average holdings of approximately 20.7ha (52 acres).

Land holding in Gampaha district among smallholders is very fragmented and average size of holdings is 0.48ha (1.2 acres) as compared to the national average of 0.78ha (1.94 acres). It is said that some 67% of holdings are below 0.4ha (1 acre) in size, accounting for only approximately 18% of the operated area. This fragmentation of land is seen more specifically in that operators having home gardens only account for about 55% with an average acreage of 0.12ha (0.3 acre).

Land holding classification by AGA divisions shows that fragmentation is relatively progressed in sub-urbanized areas adjoining to or in the GCEC area and Colombo.

Fig. 2.3.2.1 Gampaha District Land Use



Scale: 2.6 mls To 1 Inch.

Land use mapping by Photo Interpretation.

LAND USE	
	COCONUT.
	RUBBER
	PADDY.
	HOMESTEAD GARDEN

REFERENCE	
	CINNAMON.
	FOREST PLANTATION.
	LOW-YIELD WETZONE FOREST.
	NON PRODUCTIVE WETZONE FOREST.

	UNUSED LAND.
	SWAMP AND MARSH.
	SETTLEMENTS.
	MAIN ROADS.

SOURCE: SURVEY DEPARTMENT  
DIVISION OF LAND USE. 1980



### 2.3.3 Irrigation and Drainage

#### (1) Present Conditions

##### 1) General

The general state of irrigation in Gampaha district over the past 10 years (1976~1985) can be outlined as follows:

- a) Between 1976 and 1985, area under irrigated agriculture increased 45%. In the same period, area under rainfed cultivation decreased 8%.
- b) During the said period, area under irrigated cultivation increased 43% due to major irrigation schemes and 15% due to minor schemes.
- c) Irrigation success rate is not known as this is expressed as the ratio of cropped area to yield area.

Irrigation in Gampaha district is directed at paddy field. According to 1985 statistics, total paddy area was 17,000ha. and total area under irrigated cultivation was 28,666ha. (total for both Yala and Maha seasons). This total cropped area under irrigation represents 3.2% of the national total of 882,000ha. Of the 25 districts in the country, Gampaha ranks fifteenth in this regard.

##### 2) Irrigation Scale and Paddy Area

Paddy field in Sri Lanka in general and Gampaha district in particular may be classified according to type and scale of irrigation in the following manner:

- a) Major irrigation: 80ha. and over; direct water management by the Irrigation Department
- b) Minor irrigation: Under 80ha.; management by Agrarian Services Department
- c) Rainfed: although under nominal management of Agrarian Services Dept., farmer acts on own initiative

At present, paddy field area in Gampaha district is 17,000ha. (see Table 2.2.3.1).

The major irrigation area of Attanagalu oya represents 4% of total farm area in the district. Including minor schemes, irrigated area is a low 10% of total farm area in the district.

### 3) Irrigation Implementing Agencies

Irrigation projects (paddy field) are implemented in Gampaha district by the following two agencies:

- Department of Irrigation of the Ministry of Lands and Land Development: major irrigation (Attanagalu area)
- Department of Agrarian Services of the Ministry of Agricultural Development and Research: minor irrigation (sites scattered throughout the district)

#### a) Projects of the Department of Irrigation

The following projects have been carried out by the Department of Irrigation:

- Attanagalu Oya Irrigation Project (4,355ha. including the Oruthota Yagoda Scheme)
- Kalu Ela-Dandugam Oya Drainage Project
- Mudum Ela Drainage Project (600ha. in the GCEC area)
- Minor Flood Protection (along the Kelani ganga)

The Attanagalu Oya Irrigation Project includes headworks at 10 locations and irrigation canals (including secondary canals) totalling 115km. Kalu ela-Dandugam oya is an area of poor drainage located within the Attanagalu oya catchment. At times the said area suffers inundation lasting up to one month. Insufficient capability of the drainage pump station at Mudum Ela results in inadequate drainage and numerous inundated locations. This area features no irrigation facilities and cultivation is solely rainfed.

In the case of the Minor Flood Protection Project, all the gates of the backwater sluice are out of operation and floodwater from the Kelani ganga freely enters the area inundating farmland. Over 50 years have elapsed since construction of the project facilities and they subsequently suffer from superannuation. Adequate operation and maintenance cannot be effected, resulting in flood damage to farmland. Rehabilitation of these facilities is urgently required.



b) Projects of the Department of Agrarian Services

The Department of Agrarian Services undertakes construction of facilities for minor irrigation schemes benefiting 200ac (80ha.) or less. Projects implemented include 612 utilizing headworks as the water source, 63 employing tanks and 75 relying on small regulators, for a total of 750 schemes. However, these facilities are superannuated and require urgent rehabilitation. The above 750 minor irrigation schemes are scattered throughout the district.

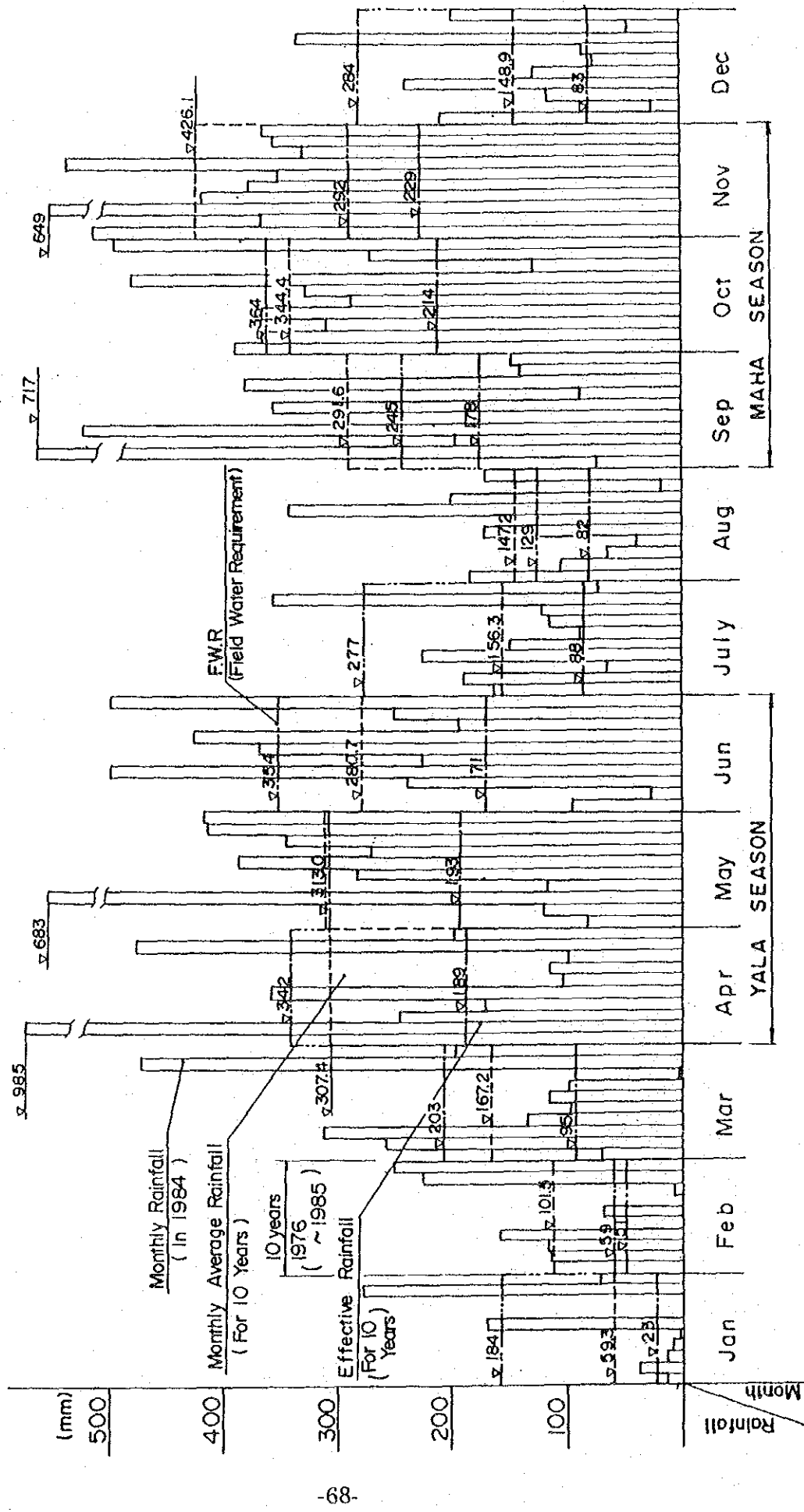
4) Irrigation Water Source

Irrigation is dependent on rainfall and runoff as its water source. Tanks are utilized for minor irrigation and reservoir dams for major irrigation schemes. Tapping of groundwater is not performed. Gampaha district is situated within three large catchment areas: Maha oya in the north, Attanagalu oya in the central portion, and Kelani ganga in the south. The portion of these total three catchments located outside the district (3,116km<sup>2</sup>) is greater than that contained within the district (1,399km<sup>2</sup>). (see Table 2.3.3.1)

Table 2.3.3.1 Catchment Area and Paddy

River	Catchment area (km <sup>2</sup> )			Mode of paddy field
	Outside district	Inside district	Total	
Maha oya	822	688	1,510	Minor irrigation, rainfed
Attanagalu oya	425	302	727	Major irrigation
Kelani ganga	1,869	409	2,278	Minor irrigation, rainfed
Total	3,116	1,399	4,515	

Fig. 2.3.3.1 Monthly Average Rainfall for (1976 ~ 1985)  
10 Years in Gampaha



The Maha oya in the north is not currently utilized as a water source for irrigation. This is due to the fact that the riverbed is lower than surrounding farmland, precluding direct diversion. The Attanagalu oya in the central portion of the district serves as a water source for minor irrigation. At its upper reaches, the river also supplies service water for Gampaha district. In regard to the Kelani ganga in the south, there exists a transbasin canal project including a reservoir dam in the catchment area portion outside Gampaha district, while inside the district there is a pump station which sends service water to Colombo. Diversion from the river for agriculture in Gampaha is not being done at present.

#### 5) Rainfall

Paddy cultivation in Gampaha relies heavily on rainfall. Commencement of puddling fluctuates yearly in response to the timing of the Yala and Maha seasons. Average annual rainfall over the past 10 years (1976~1985) is 2,743mm, with 33% of that total occurring during the Yala season (April~June) and 39% in the Maha season (October~December). A total of 72% of annual precipitation is consequently concentrated in the two monsoon seasons.

However, as can be seen in Fig. 2.3.3.1, even during the irrigation period rainfall fluctuation is marked and paddy cultivation is subsequently unstable.

#### 6) Water Management

##### Major Irrigation

The District Agriculture Committee (DAC) convenes once each month for discussions, and holds cultivation meetings twice a year. In addition, special meetings are held when pressing problems arise.

Actual water management is performed by the branch irrigation office of the Department of Irrigation and is executed on a per 10 principal headworks sites basis. The management jurisdiction of the irrigation office extends only to the headworks sites, with water management responsibility for irrigation canals falling under the Department of Agrarian Services. Superannuation of gates and diversion facilities makes management difficult, and

principal emphasis is given to management during periods of flooding.

### Minor Irrigation

The jurisdiction of the Department of Agrarian Services includes headworks, tanks, regulators and terminal turnout facilities. However, as there is no institutional structure as in the case of major irrigation, water management on minor irrigation schemes is left to the farmers themselves. Extension workers of the Department of Agriculture have begun recently to conduct water management training at the on-farm level. This is one component of the Block Demonstration Scheme, and is being carried out at three locations in the district.

#### (2) Present Status of Irrigation

##### 1) Estimation of Present Irrigation Discharge

Irrigation discharge records for the Attanagalu major irrigation scheme are indicated in Table 2.3.3.3. These records indicate a fluctuation of  $q=0.2\sim 4.4\ell/s/ha$ , with an average unit discharge of  $q=2.1\ell/s/ha$ . This unit discharge corresponds to the design discharge based on the cropping pattern for 1930s~1950s.

Although present irrigation discharge is not precisely clear, calculations on the basis of current cropping pattern as indicated in Table 2.3.3.2 show an average unit discharge of  $2.1\ell/s/ha$ .

Table 2.3.3.2 Estimated Irrigation Water

	J	F	M	A	M	J	J	A	S	O	N	D
Average (mm/d)	7.3	2.0	6.8	11.4	10.4	11.8	9.2	4.3	8.2	12.1	9.7	9.5
Maximum (mm/d)	9.5	3.0	9.0	11.6	11.4	12.0	12.1	5.7	9.5	12.8	9.8	9.6
Maximum ( $\ell/s/ha$ )	1.6	0.5	1.5	1.9	1.9	2.0	2.0	0.9	1.6	2.1	1.6	1.6

Table 2.3.3.3 Design Discharge of Attanagalu Oya Scheme

	No.	Anicuts	Area	Design discharge	Unit consumption
Diyael-la Oya	①	Muruthawela	575ha	1.62m <sup>3</sup> /s	2.8ℓ/s/ha
	②	Kumbaloluwa	319	0.98	3.1
	③	Panugala	270	1.18	4.4
	④	Idellawala	391	0.70	1.8
Atta-nagalu Oya	⑤	Moreнна	453	0.53	1.2
	⑥	Ketawala	623	0.11	0.2
	⑦	Thammita	319	0.53	1.7
	⑧	Opatha	81	0.31	3.8
Urmal Oya	⑨	Kinigama	313	1.15	3.7
	⑩	Welikada	526	1.26	2.4
TOTAL			3,870ha	8.37m <sup>3</sup> /s	2.2ℓ/s/ha

2) Present Status of Attanagalu Major Irrigation Scheme

a) Current Irrigation System

The major irrigation scheme comprises anicuts (headworks) at 34 sites on the Attanagalu river. A 115km canal network conveys irrigation discharge to 3,870ha. (Fig.2.3.3.2)

Irrigated area per anicut site averages 100ha. Irrigation canal density averages 30m/ha. Although anicut and canal density is relatively high, these facilities in reality provide irrigation for a little over half the total irrigated area.

### b) Performance of Current Irrigation System

Details of the layout of a sample anicut scheme are given in Fig. 2.3.3.3. Although there exists some variation in topographical conditions and size of irrigated area, all of the anicut schemes are essentially laid out in similar fashion to the sample scheme. The irrigation performance within the sample scheme area is shown in the table below. (Table 2.3.3.4)

TABLE 2.3.3.4 FEATURES OF IRRIGATION IN SAMPLE AREA

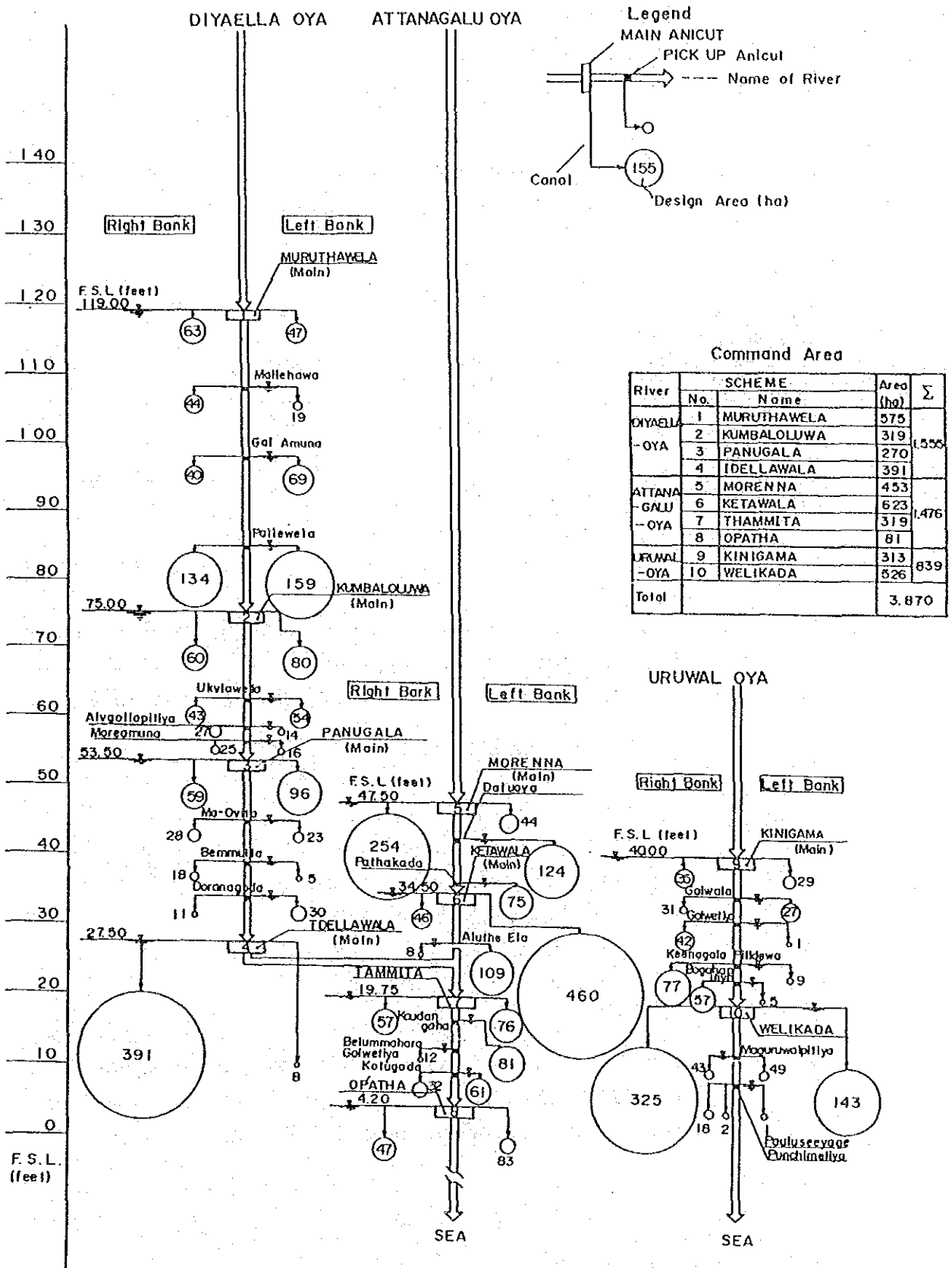
Efficiency of Irrigation	Area (ha)
1) Well irrigated utilizing irrigation facilities	50.7 (17%)
2) Intermittently irrigated due to fluctuation of precipitation and runoff	73.5 (26%)
3) Rainfed without irrigation facilities	161.9 (57%)
Total	286.1 (100%)

Sample area: 286ha with 3 anicuts and 8.5km of canals

As can be seen from the above figures, the area actually utilizing the scheme facilities is only 43% of the total. The remaining 57% of the area is not irrigated despite the presence of canals. The reasons for this are as follows:

- Poor performance of anicut and canal facilities due to superannuation
- Lack of sufficient knowledge among farmers of proper use of facilities
- Farmers are traditionally accustomed to a cropping pattern which is governed by natural rainfall and naturally available water sources

Fig. 2.3.3.2 Flow of Existing Irrigation System -- Attanagalu Oya



c) Irrigation Facilities

Three rivers flow through the 3,870ha. of the Attanagalu oya irrigated area. Anicuts are located at 34 sites on these rivers, and divert discharge into canals totalling 115km.

Anicuts:

Anicuts are closely placed at an average interval of 1.8km, with the minimum interval being 0.4km.

TABLE 2.3.3.5 NUMBER OF ANICUTS

	Irrigated Paddy (ha)	Main Anicut	Sub-anicut	Total
Diyaella Oya	1,555	4	10	14
Attanagalu Oya	1,476	4	6	10
Uruwal Oya	839	2	8	10
Total	3,870	10	24	34

Canals:

Conveyance canals are situated on both right and left banks at anicut sites. Total canal length is 116km. Main canals total 92.5km and branch canals 37.2km. (See Table 2.3.3.6)

Anicut scale and mode of gate operation:

Scale of anicut structures varies in relation to river width. Maximum wier length is 35m, the minimum is 5m and the average is 10m. Gate types are as set out below (These gates are almost all wooden sluice gates. See Table 2.3.3.7)

- Hand operated screw type      27 locations
- Stop plank                              5 locations
- Gear wheel                              1 location

Canal size and canal type:

Canal floor ranges in width from 2.0 to 0.5m. Canal gradient is 1/800~10,000. Total canal length is 116m and benefit area is 3,870ha. Canal density is high at 30m/ha.



Fig. 2.3.3.3 Existing Irrigation System  
(Sample Area)

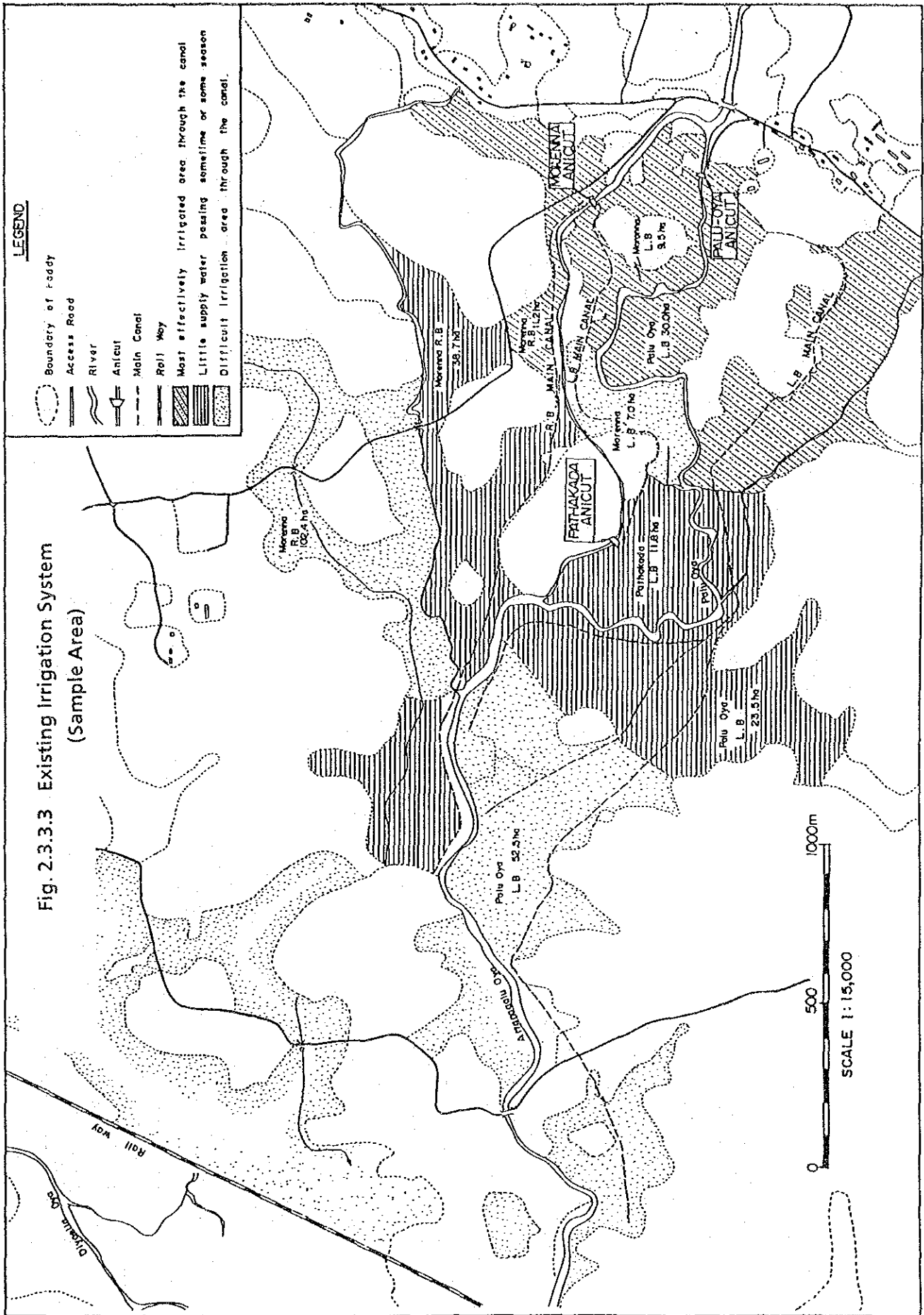


Table 2.3.3.6 IRRIGATION CANAL AND DESIGNED DUTY OF WATER UNDER THE ATTANAGALU OYA SCHEME

	Name of Anicut	Benefited Area (ha)	Length of Canal (km)			Designed Duty of Water (m <sup>3</sup> /s)	Unit Duty of Water (ℓ/s/ha)
			Main	Branch	Total		
DIYABELLA OYA	1. MURUTHAWELA MALLEHAWA GAL AMUNA PALLEWELA HAMBEY AMUNA	110 63 109 293 -	11.82 - - - -	0.77 - - 3.74 -	12.59 - - 3.74 -	1.62	2.82
	2. KUMBALLOLUWA UKULAWELA ALUGOLLAPITIYA MOLE AMUNA	140 97 41 41	5.55 - 1.86 0.36	1.43 0.11 - -	6.98 0.11 1.86 0.36	0.98	3.08
	3. PANUGALA MA-OVITA BBMULLA DORANAGODA	155 51 23 41	8.19 0.15 2.37 0.15	1.87 - - -	10.06 0.15 2.37 0.15	1.18	4.38
	4. IDELLAWALA	391	9.11	3.76	12.87	0.70	1.79
	(SUB-TOTAL)	(1,555)	(39.56)	(11.68)	(51.24)	(4.48)	Average 2.89
ATTANAGALU OYA	5. MORENNA PALU OYA PATHAKADA	254 124 75	5.49 3.24 0.64	3.05 1.00 1.60	8.54 4.24 2.24	0.53	1.17
	6. KETAWALA ALUTH ELA	506 117	5.87 -	5.58 -	11.45 -	0.11	1.77
	7. TAMMITA KAUDANGAHA BELUMAHARA GALWETIYA KOTUGODA	133 81 12 93	5.76 1.97 - 1.60	1.88 0.66 - 1.60	7.64 2.63 - 2.20	0.53	1.66
	8. OPATHA	81	2.61	-	2.61	0.31	3.83
	(SUB-TOTAL)	(1,476)	(27.18)	(14.37)	(41.55)	(1.48)	Average 1.00
URUWAL OYA	9. KINIGAMA GALWETIYA GALWALA AMUNA KEENAGALA PILLDEWA ORUTOTA GALWETIYA BOGAHAPITIYA	64 58 43 86 - 62	5.21 - 1.75 0.85 - 1.28	3.94 - 2.18 - - -	9.15 - 3.93 0.85 - 1.28	1.15	3.68
	10. WELIKADA MAGURUWALPITIYA PAULUSEYAGE PUNCHIMELIYA	468 37 3 18	5.90 - - 0.66	1.04 - - -	6.94 - - 0.66	1.26	2.40
	(SUB-TOTAL)	(839)	(15.65)	(7.16)	(12.81)	(2.41)	Average 2.88
TOTAL	3,870	8.39	33.21	115.60	8.37	2.17	

Table 2.3.3.7 LIST OF ANICUTS UNDER THE ATTANAGALU OYA SCHEME

Name of Anicut	Completed Year	No. of Bays	Lifting Style	DIMENSION OF GATE		Spill Way (Length)
				Size of Gate (width×height)	wooden or Steel	
1 MURUTHAWELA	1955	3	Screw type	2.13 × 1.98	wooden	(2) 4.57
a) Mallchawa	1972	3	- do -	1.83 × 1.83	- do -	-
b) Gal-Amuna	1969	3	- do -	(2) 1.98 × 1.67	- do -	-
c) Pallewela	1955	8	- do -	(1) 1.98 × 2.13 1.83 × 1.52	- do -	(3) 1.52 (2) 1.82
d) Ilambey Amuna	1970	3	- do -	1.67 × 1.98	- do -	-
2 KUMBALOLUWA	1950	3	- do -	2.13 × 1.67	- do -	(1) 6.09
a) Ukulawela	1973	3	- do -	1.07 × 1.67	- do -	-
b) Alugollapitiya	1972	4	- do -	2.13 × 1.83	- do -	-
c) Mole Amuna	1973	4	- do -	1.67 × 2.13	- do -	(2) 1.67
3 PANUGALA	1951	4	- do -	1.83 × 2.13	- do -	(1) 3.04
a) Ma-Ovita	1958	7	(5) Screw type (2) Planks	(5) 1.67 × 2.74 (2) " × "	- do -	-
b) Bemulla	1952	6	Screw type	2.13 × 1.83	- do -	-
c) Doranagoda	1973	4	- do -	1.98 × 2.13	- do -	-
4 IDELLAWALA	1947	5	- do -	1.98 × 2.28	- do -	-
5 MORENNA	1934	6	- do -	2.13 × 2.13	- do -	(1) 17.06
a) Palu Oya	1934	2	- do -	2.13 × 2.13	- do -	-
b) Pathakada	1922	4	- do -	1.67 × 2.13	- do -	-
6 KETAWALA	1943	A:4 B:3	- do -	1.83 × 2.28	- do -	(1) 55.47
a) Aluth Ela	1971	10	- do -	1.67 × 1.52	- do -	(1) 9.14
7 TAMMITA	1981	10	- do -	(8) 2.13 × 1.98 (2) 3.12 × 1.98	- do -	-
a) Kaudangaha	1981	3	Stop Planks	1.98 × 1.67	- do -	-
b) Belumbara Galwetiya	1950	4	Screw type	1.98 × 3.20	- do -	(1) 1.98 × 1.21
c) Kotugoda Bolanda	1890	3	Stop Planks	3.35 × 1.98	- do -	-
8 OPATHA	1970	1	Gear wheel system	6.10 × 3.05	Radial gate	(2) 7.62
9 KINIGAMA	1945	3	Screw type	1.83 × 1.07	wooden	(2) 1.82
a) Galwala Amuna	1960	4	Stop Planks	1.52 × 1.22	- do -	(1) 4.57
b) Galwitiya	1947	6	(1) Screw (2) Planks	1.52 × 1.67	- do -	(2) 1.82
c) Keenagala Pillidewa	1973	5	Screw type	1.52 × 1.98	- do -	-
d) Oruthota Galuwetiya	1965	-	-	-	-	-
e) Bogahapitiya	1968	6	Screw type	1.67 × 2.44	wooden	(5) 1.82
10 HELLIKADA	1948	5	- do -	2.13 × 2.13	- do -	(5) 3.04
a) Maguruwalpitiya	1972	2	- do -	1.67 × 2.44	- do -	-
b) Pauluseeyage	1969	3	Planks	1.67 × 1.37	- do -	-
c) Punchimeliya	1969	5	Planks	1.67 × 1.52	- do -	-

d) Irrigated Area and Catchment Area

The relationship between catchment area and irrigated area for the Attanagalu oya irrigated sector is shown in Table 2.3.3.8.

As can be seen from the table, there are instances where the ratio of individual catchment to irrigated area is less than 10. This does not suggest abundant water resources within the overall catchment.

TABLE 2.3.3.8 CATCHMENT AREA V.S. IRRIGATED AREA

Anicut	1. Catchment area (km <sup>2</sup> )	2. Irrigated area (km <sup>2</sup> )	1./2.
Muruthawela	28	5.75	4.9
Kunbaloluwa	36	3.18	11.3
Panugala	24	2.69	8.9
Idellawala	27	3.91	6.9
Sub-total	115	15.53	7.4
Morena	175	4.53	38.6
Ketawala	13	6.22	2.1
Tammita	17	3.20	5.3
Opatha	24	0.81	29.6
Sub-total	229	14.76	15.5
Kinigama	26	3.12	8.3
Welikada	70	5.25	13.3
Sub-total	96	8.37	11.5
Total	440	38.66	11.1

e) Problems in Present Water Balance

The Attanagalu Oya Irrigation Scheme area encompasses 3,870 ha. of paddy field situated along three rivers. In addition to rainfall, water sources are the discharges of the Uruwal, Attanagalu and Diyaella oyas.

Table 2.3.3.9 indicates the correspondence between field water requirement and effective rainfall. As can be seen from

the table, rainfall alone is insufficient to meet the field water requirement.

TABLE 2.3.3.9 FIELD WATER REQUIREMENT AND EFFECTIVE RAINFALL

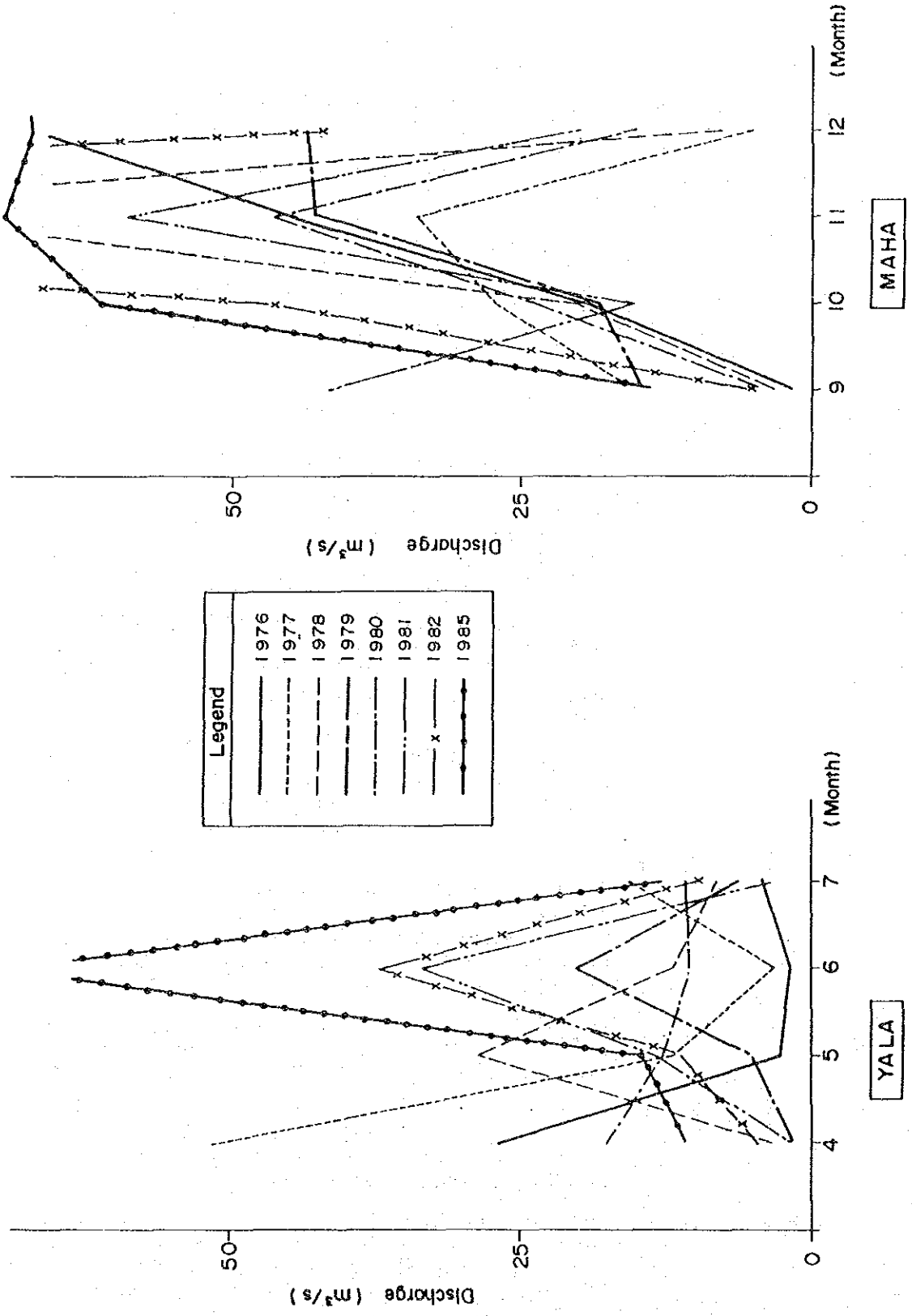
mm/Month

	J	F	M	A	M	J	J	S	D	O	N	F
F.W.R	59	102	167	307	313	281	156	147	292	344	426	149
E.R	23	51	95	189	193	171	88	82	178	214	229	83
Shortage	36	51	72	118	120	110	68	65	114	130	197	66

The following factors affect the water balance in the Attanagalu oya irrigation area:

- Anicut gates are either inoperable or do not function properly, and design irrigation requirement cannot be diverted.
- Due to improper gate function, puddling cannot be performed. As a result paddy cultivation relies on rainwater, and start of the cropping season accordingly fluctuates yearly depending on the timing of the monsoons.
- The overall catchment area consists of three smaller catchments, each of which has its own characteristics. Consequently, water insufficiencies must be considered on a per catchment basis.
- Although irrigation facilities are present, cultivation is at present dependent on rainfall. As a result, there exists a discrepancy between seeded area and harvested area, making evaluation of irrigation effectivity difficult.
- As supplemental water, the reuse of drainage from fields is possible. Consequently, water balance must be evaluated taking this potential into account.
- Irrigated area per anicut varies, and countermeasures for anicuts of excessively small benefit area must be considered.
- Discharge of the Attanagalu oya exhibits sharp fluctuation on both monthly and yearly basis, and consequently discharge is not stable during the irrigation period. In comparison to the Yala, water is relatively abundant during the Maha season.

Fig. 2.3.3.4 Monthly Discharge of Attanagalu Oya (1976 ~ 1985)



f) Calculation of Present Water Balance

Water balance calculations for principal anicuts are given in Table 2.3.3.10. These calculations are for a representative year selected from the 10 year period between 1976 and 1985. With the exception of periods of drought such as in 1976, a nearly 100% irrigation success rate can be expected in the Maha season. Due to insufficient discharge, unstable irrigation is anticipated for the Yala season.

However, it must be stressed that the said water balance calculation is made on the premise that irrigation facilities are in proper functioning order. At present, such facilities are in either damaged or inoperable condition.

Table 2.3.3.10 PERCENTAGE OF IRRIGABLE AREA

Yala Season																	
Repeated use: 30%																	
	Anicut	Area (ha)	1976					1979					1985				
			Apr	May	Jun	Jul	Min	Apr	May	Jun	Jul	Min	Apr	May	Jun	Jul	Min
DIYABELLA OYA	MURUTHAWELA	575	100	▲29	▲17	▲64	▲17	▲16	▲62	100	100	▲16	100	100	100	100	100
	KUMBALOLUKA	319	100	▲71	▲38	100	▲38	▲38	100	100	100	▲38	100	100	100	100	100
	PANUGARA	270	100	▲55	▲30	100	▲38	▲31	100	100	100	▲31	100	100	100	100	100
	IDELLAWALA	391	100	▲43	▲23	100	▲23	▲24	100	100	100	▲24	100	100	100	100	100
	Average	1,555	100	▲45	▲25	▲87	▲25	▲25	▲86	100	100	▲25	100	100	100	100	100
ATTANAGALU OYA	MORENNA	453	100	100	100	100	00	100	100	100	100	100	100	100	100	100	100
	KETAWALA	623	100	100	29	100	▲29	▲33	100	100	100	▲33	100	100	100	100	100
	TAMMATA	319	100	▲53	▲18	100	▲18	▲18	100	100	100	▲18	100	100	100	100	100
	OPATHA	81	100	100	100	100	00	100	100	100	100	100	100	100	100	100	100
	Average	1,476	100	▲90	▲52	100	▲52	▲54	100	100	100	▲54	100	100	100	100	100
URUHAL OYA	KINIGAMA	313	100	▲53	▲28	100	▲28	▲30	100	100	100	▲30	100	100	100	100	100
	WELIKADA	526	100	▲82	▲45	100	▲45	▲46	100	100	100	▲46	100	100	100	100	100
	Average	839	100	▲71	▲39	100	▲39	▲40	100	100	100	▲40	100	100	100	100	100
Average		3,870	100	▲68	▲38	▲95	▲38	▲39	▲94	100	100	▲39	100	100	100	100	100

▲ : shortage

Maha Season																	
Repeated use: 30%																	
	Anicut	Area (ha)	1976					1979					1985				
			Sep	Oct	Nov	Dec	Min	Sep	Oct	Nov	Dec	Min	Sep	Oct	Nov	Dec	Min
DIYABELLA OYA	MURUTHAWELA	575	▲22	100	100	100	▲22	100	100	100	▲57	▲57	100	100	100	100	100
	KUMBALOLUKA	319	▲52	100	100	100	▲52	100	100	100	100	100	100	100	100	100	100
	PANUGARA	270	▲39	100	100	100	▲39	100	100	100	100	100	100	100	100	100	100
	IDELLAWALA	391	▲29	100	100	100	▲29	100	100	100	100	100	100	100	100	100	100
	Average	1,555	▲33	100	100	100	▲33	100	100	100	▲84	▲84	100	100	100	100	100
ATTANAGALU OYA	MORENNA	453	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	KETAWALA	623	▲62	100	100	100	▲62	100	100	100	100	100	100	100	100	100	100
	TAMMATA	319	▲21	100	100	100	▲21	100	100	100	100	100	100	100	100	100	100
	OPATHA	81	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Average	1,476	▲69	100	100	100	▲69	100	100	100	100	100	100	100	100	100	100
URUHAL OYA	KINIGAMA	313	▲37	100	100	100	▲37	100	100	100	▲97	▲97	100	100	100	100	100
	WELIKADA	526	▲60	100	100	100	▲60	100	100	100	100	100	100	100	100	100	100
	Average	839	▲51	100	100	100	▲51	100	100	100	▲99	▲99	100	100	100	100	100
Average		3,870	▲50	100	100	100	▲50	100	100	100	▲93	▲93	100	100	100	100	100

▲ : shortage

Note: Percentage of irrigable area=(Available water/water requirement)×100(%)



3) Minor Irrigation Schemes

a) General

Minor irrigation schemes service benefit areas of less than 200ac. (80ha.) and fall under the jurisdiction of the Department of Agrarian Service. Total minor irrigation paddy area in Gampaha district is 5,900ha. Farm households benefiting from these schemes total 24,800. Average benefit area per household is 0.25ha. (see Table 2.3.3.11).

b) Facilities

Minor irrigation schemes in Gampaha number 750 and are scattered throughout the district. Water supply is by tank (63 schemes), anicut (612 schemes) and regulator (75 schemes). Water supply by anicut accounts for 82% of the schemes.

c) Current Status of Irrigation

Degree of superannuation of facilities is roughly the same as for major irrigation schemes. Data on design discharges, design drawings, facility scale, etc. are not available. Construction of anicuts falls within the jurisdiction of the Department of Irrigation, while responsibility for operation and maintenance after construction shifts to the Department of Agrarian Services. However, neither agency has on file basic data regarding irrigation schemes, and design discharges are not known.

At present, the Department of Agrarian Services is desirous of conducting either new construction or rehabilitation of minor irrigation facilities at 70 sites. These facilities are indicated on a catchment-wise basis in Table 2.3.3.12. Benefit areas of these facilities are small, at around 14~17ha. per anicut, and effectivity of these schemes is accordingly not high.

Table 2.3.3.11 Minor Irrigation Scheme in Gampaha

A. G. A. Division	Number of Facility			Benefited area	No of Cultivators
	Tank	Anicut	Regulators		
Divulapitiya (8)	6	54	48	920	2. 245
Attanagalla (6)	11	56	02	469	2. 484
Minuwangoda (11)	01	77	03	624	2. 862
Mirigame (7)	03	111	-	717	4. 599
Weke (4)	15	95	04	913	3. 847
Gampaha (6)	05	41	01	332	2. 128
Mahara (9)	14	42	11	470	1. 171
Kelaniya (2)	-	08	-	140	305
Katana (1)	02	60	02	395	1. 278
Watala (2)	-	01	-	10	41
Biyagama (10)	02	35	04	471	1. 510
Ja-Ela (4)	04	32	-	444	2. 393
<b>TOTAL</b>	<b>*(70)</b>	<b>63</b>	<b>612</b>	<b>5. 905</b>	<b>23. 863</b>

8%      82%      10%      (14. 592Acres)  
 \* Proposed for rehabilitation  
 750 : 100%      0. 25 hectare/cultivator  
 (0. 61 acres)

Table 2.3.3.12 Proposed Rehabilitation Work Under Minor Irrigation Scheme

Attanagalu oya				Maha oya				Kelani ganga			
Structure	Area	Nos	Farmer	Structure	Area	Nos	Farmer	Structure	Area	Nos	Farmer
A	452ha	28	1, 714	A	136ha	11	398	A	224	16	731
T	20	3	121	T	79	3	554	T	55	2	242
O	34	2	112	O	-	-	-	O	82	5	118
<b>Total</b>	<b>506ha</b>	<b>33</b>	<b>1. 947</b>	<b>Total</b>	<b>215</b>	<b>14</b>	<b>952</b>	<b>Total</b>	<b>361</b>	<b>23</b>	<b>1. 091</b>
15. 3ha/Scheme 0. 26ha/Farmer				15. 3ha/Scheme 0. 23ha/Farmer				15. 7ha/Scheme 0. 33ha/Farmer			

Note: A : Anicut    T : Tank    O : Others (Regulators and canals)

#### d) Tank Facilities

Tank facilities are utilized solely on minor irrigation schemes. At present, tanks are located at 63 sites, with total benefit area at 644ha. which represents 27% of the total for minor irrigation. Total farm households benefitted number 2,483, which is 10% of overall households affected by the schemes. Average benefit area per household is 0.27ha. However, data on tank capacities, type (fill type is prevalent), catchment areas, etc. are not available. This data must be obtained for subsequent irrigation planning.

A breakdown of current tank facilities is given in Table 2.3.3.13.

TABLE 2.3.3.13 MINOR IRRIGATION TANKS

A.G.A. Division	Number	Area (ha)	No. of Farmers	Average area (ha)
Divulapitiya	6	213	157	0.54
Attangalla	11	166	425	0.16
Minuwangoda	1	12	18	0.26
Mirigama	3	210	470	0.18
Weke	15	262	399	0.26
Gampaha	5	39	97	0.16
Mahara	14	280	338	0.33
Kalaniya	-	-	-	-
Katana	2	29	40	0.29
Wattala	-	-	-7	-
Biyagama	2	75	157	0.19
Ja-Ela	4	323	382	0.34
Total	63	1,609	2,483	0.27

#### (3) Rainfed Paddy Field

Rainfed paddy field area in Gampaha district totals 7,600ha., which is 44.5% of the total paddy field area. Rainfed paddy fields are essentially those for which irrigation supply is inadequate, and

consequently, it is difficult to draw a clear distinction between irrigated and rainfed paddy field in many cases. In addition to rainfall as a water source, rainfed paddy fields also utilize spring water which is available from surrounding coconut groves. Fields are not equipped with irrigation and drainage canals, and field surface elevation is irregular. As a consequence, puddling depth is uneven, and seeded area sparse. At times mid-season drainage overlaps with rainfall during the Maha and Yala seasons resulting in poor field drainage.

(4) Current Status of Drainage

1) Drainage Conditions

Paddy field areas in Gampaha district are almost totally without drainage canals. Even where such facilities are present, canal floor elevation is identical to that of paddy field elevation, and canals provide no drainage function in the case of rainfall. Since wet rice cultivation is pursued, emphasis is placed on drainage countermeasures during flooding in the Maha and Yala seasons as opposed to drainage at other times. Of the three major rivers in Gampaha district, areas of poor drainage exist along the Attanagalu oya and the Kelani ganga. As the river channel of the Maha oya is lower than surrounding farmland, drainage problems are relatively few. Areas of poor drainage exist along the Attanagalu oya and Kelani ganga for various reasons. These include i) narrow river channel, ii) insufficient embankment height, iii) superannuation of drainage facilities, iv) inadequate spillways adjacent to cultivated areas, v) tidal influences, etc. Ill-drained areas exist not only on the lower reaches of these rivers, but on the middle reaches as well.

2) Existing Drainage Facilities

Drainage modes include mechanical drainage (pumps), and natural drainage (gates and natural runoff). Pumps are of the diesel type. Gates are sluice type and radial type.

3) Drainage Projects (see Plan of Drainage, Fig. 2.3.3.5)

The Department of Irrigation has jurisdiction over drainage projects in Gampaha district. There are presently four such projects:

- a) Orutota~Yagoda drainage scheme (Attanagalu catchment)
- b) Kalu Ela ~ Dandugam oya drainage scheme (Attanagalu catchment)
- c) Kalu Ela ~ Nathawa Ela drainage scheme (Attanagalu catchment)
- d) Minor Flood Protection Scheme (Kelani catchment)

#### Orutota~Yagoda Scheme

The Orutota~Yagoda area is situated within the Attanagalu catchment on the middle reaches of the Uruwal oya. The Attanagalu oya itself lies to the north of the area. The area is roughly bisected by the Colombo ~ Kandy railroad running SW ~ NE. The area comprises a zone of flat paddy field. Two anicuts constructed in 1965 ~ 1968 are located within the area (Orutota Gal Wetiya and Bogahapitiya).

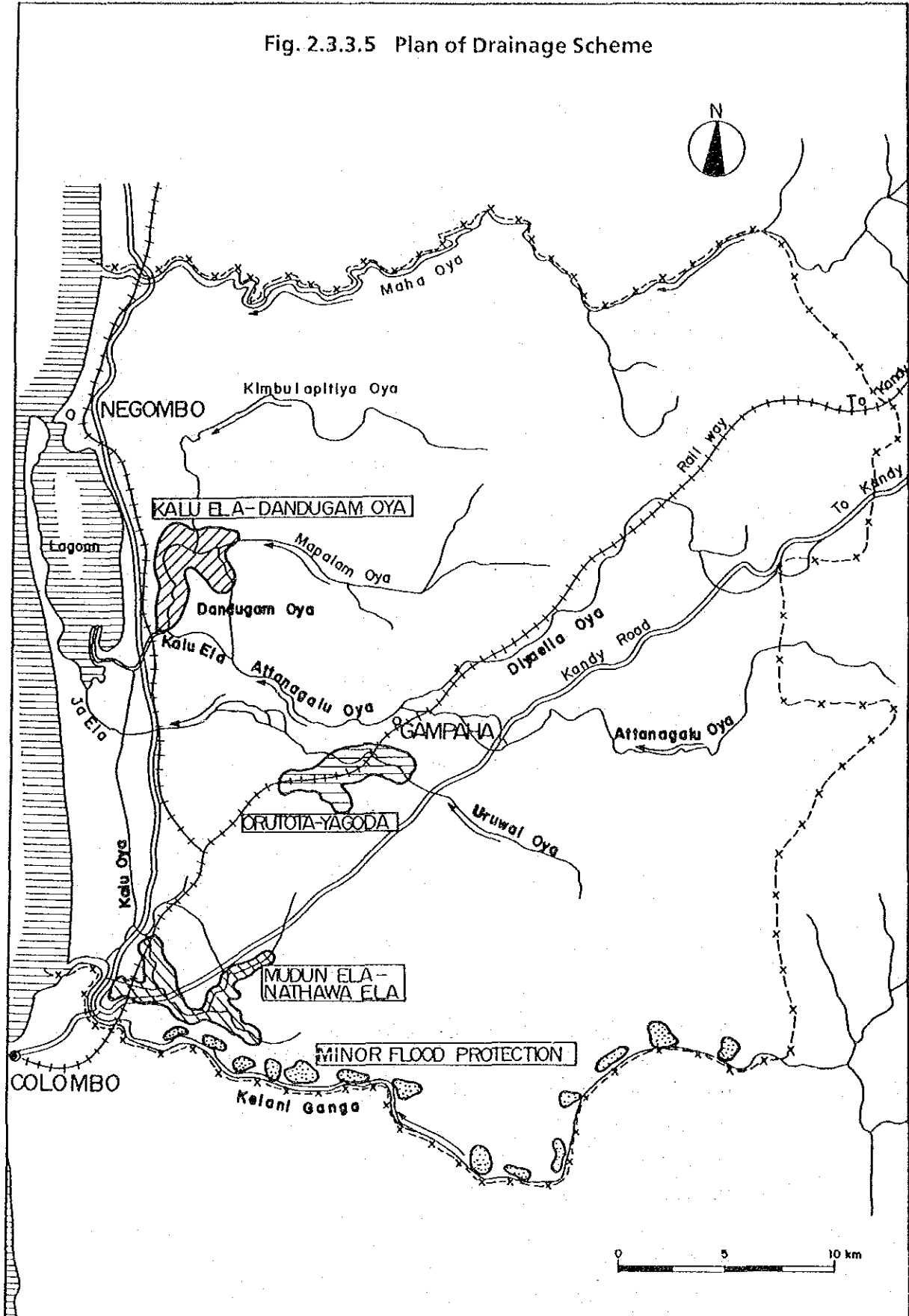
According to data on file with the Irrigation Department, flood damage afflicts 137ha. of the total 490ha. of farmland. Flood damage occurs due to the following:

- Floodwater of the Attanagalu oya enters the area from the north.
- The area is located in a lowlying, easily flooded portion of the catchment area.
- There are no drainage canals.
- As there is no head differential between the two anicuts in the area, gate malfunction during periods of flooding readily results in river overflow.

#### Kalu Ela ~ Dandugam Oya Scheme

The 15km of the lowermost reaches of the Attanagalu oya (total catchment area of 727km<sup>2</sup>) is referred to as the Dandugam oya. The Kalu Ela serves as a drainage channel for the Dandugam oya during flood stage, thereby reducing the discharge load on the main channel. The Dandugam oya is directly joined by both the Kimbulapitiya oya (catchment area 85km<sup>2</sup>) and the Mapalam oya (catchment area 89km<sup>2</sup>), as well as being fed with industrial drainage (secondary canal). Hence the Dandugam oya exhibits a complex river channel configuration as it meanders on its course to Negombo lagoon. Rock obstacles and bamboo jungle are pres-

Fig. 2.3.3.5 Plan of Drainage Scheme



ent which hamper the discharge carrying capacity of the river channel.

Farmland along the lowermost reaches of the river is influenced by tides from Negombo lagoon, further preventing adequate drainage. Although the Kalu Ela channel serves to somewhat reduce overflow of Dandugam oya, cross-section of the channel remains insufficient to have a major effect. Particularly during the Maha and Yala seasons, flood damage occurs to 650ha. of paddy field, with periods of inundation lasting up to one month. Urgent countermeasures are necessary.

#### Mudun Ela ~ Nathawa Ela Scheme

The Mudun Ela ~ Nathawa Ela area comprises a lowlying, flat paddy field zone near the mouth of the Kelani ganga (catchment area 2,278km<sup>2</sup>). The said area is bounded by the Kelani ganga and Kalu oya, and has a catchment area of 18km<sup>2</sup>. The area also constitutes an industrial zone adjacent to the capital of Colombo and as such is served by the Kandy and numerous other roads.

Three drainage channels (Mudun Ela, Nathawa Ela and Mahara Ela) flow through the area. Of these, the Mudun Ela conflues directly with the Kelani ganga near its mouth, while the other two channels join with the Kalu oya prior to debouching into the Kelani ganga, also near its mouth. Thus drainage in the area is influenced by the water level of the Kelani ganga. The principal drainage problem afflicting the area is the fact that a higher water level on the Kelani ganga than that within the area makes natural drainage impossible. As a result, 530ha of farmland suffers from bog-like conditions.

A backwater prevention sluice has been constructed at the lowermost reaches of the Kalu oya. Also, pump drainage is being carried out from the Mudun Ela into the Kelani ganga, although capacity is insufficient. Culverts and other crossing structures are located at 34 sites within the area. However, these facilities suffer from inadequate cross-section aggravated by sedimentation, further contributing to the poor drainage of the area.

#### Minor Flood Protection along the Kelani Ganga

The Kelani ganga (catchment area 2,278km<sup>2</sup>) is one of the largest in Sri Lanka and comprises the boundary between Gampaha and Colombo districts. The portion of the river which is contiguous to farmland in Gampaha district is 36km, or 27% of the river's total 130km length.

The high water level of the Kelani ganga is several meters above the crest elevation of embankment. To limit embankment damage spillways are located at various sites along the embankment to allow flood water to enter the depressed area. Backwater prevention sluices are situated at 15 locations on tributaries which conflux with the river. However, due to superannuation of facilities, flood backwater extends to farmland, with some 1,900ha. affected.

Under its Minor Flood Protection program, the Irrigation Department plans to rehabilitate backwater prevention sluices at 15 locations.

(5) Problems

1) Irrigation Problems

a) Lack of Modern Irrigation Technology

With the decline in performance of irrigation facilities, farmers have ceased to use them and have accordingly become unfamiliar with irrigation practices. Paddy cropping is now largely by the traditional, rainfed method limited by meteorological and other natural conditions. Although the Irrigation Department and the Department of Agrarian Services have plans to rehabilitate facilities and promote irrigated agriculture, said planning was drawn up 30~50 years ago and does not reflect modern development in cultivation and cropping pattern technology.

b) Irrigation Success Rate and Cropping Pattern during the Yala Season

Even with strengthening of agricultural production infrastructures (rehabilitation of facilities, etc.) as well as proper operation and maintenance of these facilities, an insufficiency in water balance is still calculated for the



Yala season. Adjustment of the paddy cropping season is accordingly necessary.

c) Anicut Structural Defects

On Sept. 11, just before the Phase I Field Study ended, the Opatha anicut at the extreme lower reaches of the Attanagalu oya was swept away and destroyed. On the basis of field survey, this is attributed to inadequate creep length. At other anicuts on the Attanagalu oya, water can be seen leaking at inner portions of piers. Weir main structures and gatestops are considered as constructed of unreinforced concrete. Although detailed data are not available, some anicut foundations appear to be soft rock (weathered rock). In terms of present life expectancy of these structures, the need for rehabilitation is considered urgent.

d) Command Area of Anicuts and Overall Rationalization of Schemes

The average command area for anicuts is 100ha. in the case of major irrigation and 14~17ha. in the case of minor irrigation. Command areas are particularly unbalanced in the Attanagalu oya area with single command ranging from 3ha.~500ha. Irrigation by anicuts must be rationalized from the standpoints of water balance, investment effectivity and operation and maintenance. Survey is considered necessary towards optimum distribution of facilities taking into account reducing the number of anicut sites by weeding out the schemes of poor efficiency.

e) Conformity of River Level and Diversion Water Level for Irrigation

Ideally, average river level is as much below embankment crest elevation as possible. In actuality, however, river level is unavoidably raised by anicuts to permit diversion for irrigation and ponding level subsequently approximates embankment crest elevation.

This phenomenon results from the fact that adequate head cannot be established between diversion water level and elevation of surrounding paddy field.

As a result, water pressure at the time of flooding acts against anicut gates and, aggravated by the superannuated state of these facilities, gates are subsequently rendered impossible to open. River water consequently overflows embankments, causing flood damage to farmland. Due to land acquisition and other structures, it would not be considered feasible to construct protective embankment or undertake river training works for the entire length of the river channel. However, survey of diversion water levels, topo-mapping, etc. should be undertaken towards formulation of measures to conform, to the degree possible, said diversion levels to the average river level.

f) Unavailability of Topo-mapping

The Survey Department publishes contoured topo-maps (S=1/63,360, contour interval of 100ft.); however, elevations of paddy field are not clear. This lack of adequate topo-maps is a large obstacle to irrigation development planning.

2) Drainage Problems

a) Attanagalu oya catchment

Three rivers compose the Attanagalu oya catchment. Anicuts are sited at 34 locations on these rivers. At present, the gates of these anicuts are damaged and inoperable at times of flooding. As a result, river overflow occurs at these points, inundating surrounding fields. Such inundation reduces flood discharge for the overall catchment, thereby softening the flood damage that occurs downstream. Consequently, if anicuts are rehabilitated and all gates subsequently opened during flooding, increased flood damage would occur at points in the vicinity