ENVIRONMENTAL PROFILE OF THE MONERAGALA DISTRICT

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C RAL ENVIRONMENTAL AUTHORITY
Y OF ENVIRONMENT & PARLIAMENTRY AFFAIRS

AN ENVIRONMENTAL PROFILE OF THE MONERAGALA DISTRICT

A Report prepared by Ms Agridev Consultants for a study sponsored by the Central Environmental Authority with NORAD collaboration

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FOREWORD

Sri Lanka's national energies and efforts during the last few decades have increasingly been towards the achievement of economic and social goals of development. However unplanned development , without due regard to the protection and management of the environment could lead to the reduction of the country ,s natural resource base and the degradation of the environment. The fruitful incorporation and integration of environmental considerations into the development strategies are fundamental to sustainable development. Unfortunately environmental concerns have not been incorporated into the planning process of some development projects and programmes. This has been mainly due to the lack of information on available human and natural resources , their utilization and development.

The Central Environmental Authority launched a programme to prepare District Environmental Profiles for each of the districts within the Island to identify and review the human and natural resources , their utilization , and significant environmental problems , associated with each district. I am grateful to the Norwegian Embassy for Development Co-operation (NORAD) for providing the necessary financial assistance to carry out this project.

The profiles have been prepared for the CEA by various competent and authoritative personnel and their ready cooperation in the successful completion of this exercise is duly acknowledged. The project has been managed by the Natural Resources Management Division of the CEA.

I trust this Environmental Profile would serve as a tool in the future development planning process for effective protection and management of the environment.

G K Amaratunga
CHAIRMAN
CENTRAL ENVIRONMENTAL AUTHORITY

August 1993

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AN ENVIRONMENTAL PROFILE
OF MONERAGALA DISTRICT

Contents — Pages

LIST OF FIGURES & MAPS

LIST OF TABLES

Basic Information Moneragala District

Land Area		5.587 sq.km.
Population		273,570 in 1981
Density of population		49 per sq.km.
Urban population		2.2% in Moneragala T.C. area
Ethnic Composition -	Sinhalese	92.7%
	Indian Tamils	3.2%
	Sri Lankan tamils	2.0%
	Moors	1.9%
	Malays	0.1%
	Burghers	-
	Other Christians	0.1%
Religious		
Composition -	Buddhists	92.7%
	Hindus	4.7%
	Muslims	2.0%
	Roman Catholics	0.4%
	Other Christians	0.1%
Literacy Rate		52.8% in 1971 Females 70.9% in 1981 Males 78.0%
Economically Active Population -	Male	67.4%
	Female	16.7%
	in Agricultural occupations	73.5%
Unemployment		9.2%
In the Urban Sector		12.6%
In the Rural Sector		9.2%
Facilities Electricity Available to		28.7% of the Housing units in the Urban Sector 1.8% in the Rural Sector 43,3% in the Estate Sector

ABBREVIATIONS

AGA	:	Assistant Government Agent
CEA	:	Central Environmental Authority
DEA	:	District Environmental Agency
DWC	:	Department of Wild Life Conservation
FFHC	:	National Freedom From Hunger Campaign Board
FRDP	:	Forest Resources Development Project
GA	:	Government Agent
GCEC	:	Greater Colombo Economic Commission
GOSL	:	Government of Sri Lanka
GS	:	Grama Sevaka (now called Grama Niladhari)
IRDP	:	Integrated Rural Development Project
MONDEP	:	Moneragala Integrated Rural Development Project
MODES	:	Moneragala District Environment Study
NARESA	:	National Research and Science Authority
NGO	:	Non Governmental Organizations
NORAD	:	Norwegian Development Cooperation
NP	:	National Park
WC	:	Wildlife Corridor

1. INTRODUCTION TO THE ENVIRONMENTAL PROFILE STUDY

1.1 Background

The CEA (CEA) in collaboration with NORAD has made arrangement to undertake detailed environmental studies with a view to develop district level environmental profiles and action plans. The overall goal of this endeavour is to obtain a sustainable development through a sound environmental management system.

The CEA has evolved a 'National Conservation Strategy' for the overall purpose of environmental management. It has, very correctly, identified that environmental planning should essentially have a regional focus and a spatial approach. The CEA has made the 'district' as the regional unit for the exercise of environmental management. Initially five districts have been selected for this purpose, and Moneragala district is one of them.

One of the hitherto identified five administrative districts, Moneragala is the only district which largely lied in the dry zone. The environmental problems would obviously vary from district to district or region to region. Although district level environmental problems are common there may be problems which would embrace a larger area, covering a geographical region.

In geographical size, Moneragala being the second largest district in the island, has particular significance for environmental management as it's natural resource base has yet to be fully and meaningfully exploited. Several development projects, are, however underway in the district aiming at accelerated development. Most of these projects are more concerned about 'development alone', and little attention is paid to sustainable development through sound environmental management. Therefore the present study is a timely one.

1.2 Conceptual framework and study objectives

Guided by the goal of sustainable development, the present study will be confined to the management of the environment rather than deal with the scientific and technological aspect. However, what ever scientific studies have been made in the past, will be referred to in order to focus their findings on the management dimension.

The futility of treating environment questions in isolation of the most pressing socio-economic problem of poverty in the district, as elsewhere, is kept uppermost in the study. This position was cogently highlighted in the "Public Investment 1985-1989" published by the Ministry of Finance wherein it is stated that, "For a developing country like Sri Lanka, complete eradication of poverty, malnutrition and unemployment are more important than pollution abatement, protection of natural resources or the conservation of the eco-system", Nevertheless, the search for a sustainable development is not jettisoned.

The study mandate is to produce a comprehensive assessment of the present state of environment of the Moneragala district, in the form of an environmental profile.

The objectives,

1) to identify and review the significant environmental problems and examine the existing machinery for their solutions
2) to study and promote participatory processes in managing the environment and suggest guidelines for the development of an action plan
3) to identify the natural resources of the Moneragala district with a view to understand its potential

resource has both natural and human

4) to identify the problems of resource utilization and development and the nature and level of resource utilization

5) to make recommendation for short term, medium and long term implementation strategies.

1.3 Methodology

The present study was carried out following the methods as described below.

(a) A study of the available literature to gather the basic information/data, from the district level statistics, situation reports, reports of special research studies. This included a study of the maps and airphotos as the base line for the detailed study. Topo sheets of 1:50,000 scale, District land use maps and airphotos were intensively used.

(b) A general 'environmental survey' was conducted. District and local level officials, village leaders and some selected farmer were interviewed using a general questionnaire. The district officials were called for a one day workshop, where the objectives of the study and survey were explained. The district heads of the Depts. of Agriculture, Forest, Irrigation, Agrarian Services, Land Commissioners and officials of the IRDP and other leading projects of the districts and AGAs were called for this meeting under the chairmanship for the Additional Govt. Agent. The local level people were interviewed through a few local investigators.

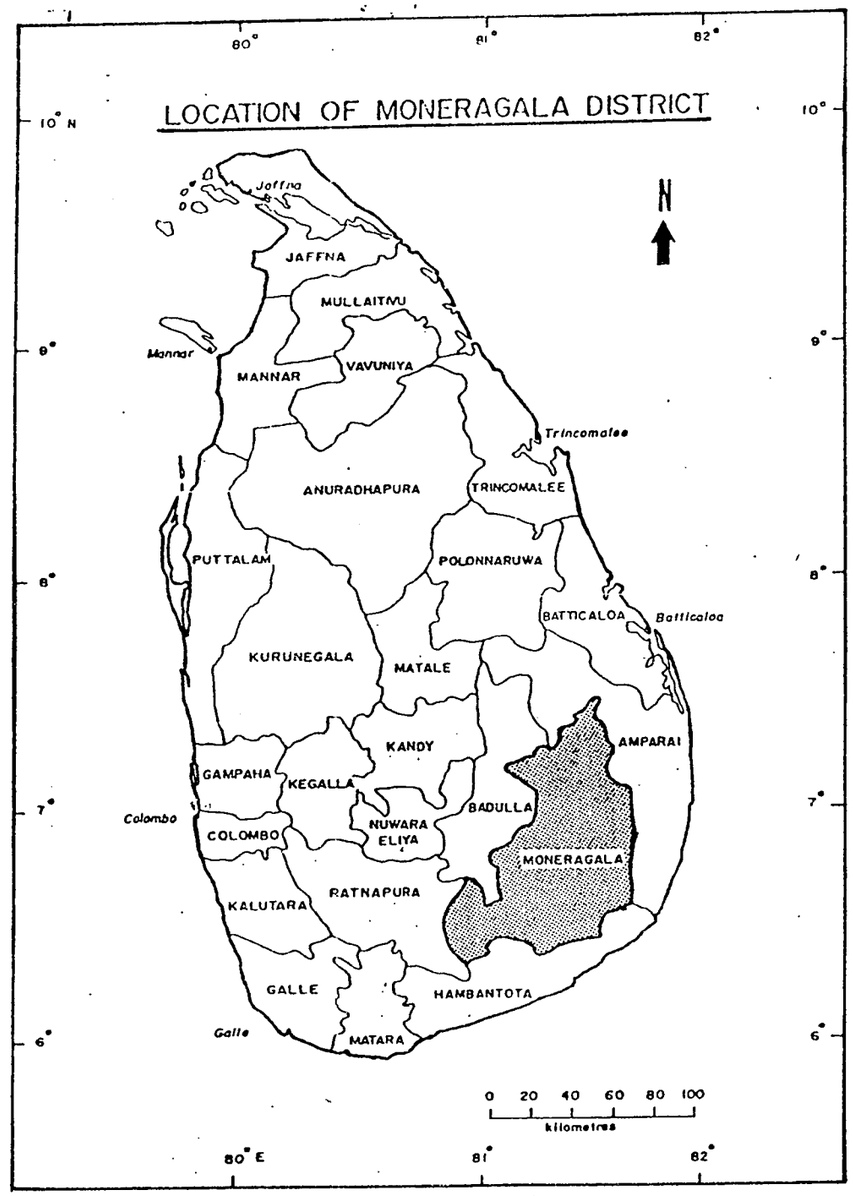
(c) a special Survey of critical issues and areas. The team visited areas and communities, where special environmental problems exist and where such problems may occur in the near future. The sites were selected based on the ground evidence detected, on the airphotos and lived-in experience and folk-wisdom of rural residents. These issues included for example, extensively eroded open land, degraded forest, chena or encroached land, overgrazed areas. Ecological concerns that engaged the attention of the study team were: change of insect dynamics, extinction and loss of medicinal plants, introduction of new plants and their effects, unplanned use of agro-chemicals, insect and animal vectors as disease carriers, minor tank sedimentation and ecological succession, micro-climate effects.

(d) A survey of the existing institutional arrangements for environmental management, and an assessment of their capacities and constraints, and an exploration of the nature and capacities of NGO and peoples organization for their involvement in environment planning, implementing and monitoring.

(e) A special transect survey was carried out in 10 representative locations, and was used as a Rapid Environment Assessment in order to establish certain base-line parameters on the current environment situation in the district.

1. 4 The NORAD Study, 1989

Whilst the study on an environment profile was proceeding, NORAD commissioned an Environment Study of Sri Lanka in May-June, 1989. In the national study, the two districts, viz., Moneragala and Hambantota, where NORAD is supporting two integrated Rural Development Projects, received special attention. Two separate Reports were prepared by teams of officials in the 2 districts. For the Monaragala Study Report (MODES), much of the data and information collected for the Environment Profile, were used therein. The Environment Profile Study consultants functioned as team members of the NORAD Environment Study of Monaragala District. Both Studies covered about the same grounds. However, more extensive field work required for the Environment Profile could not be carried out optimally in 1989 and early 1990 due to the disturbed political conditions and tight security situation in the district, which drastically inhibited field visits, village interviews and local meetings. Materials from MODES are incorporated in this Report.



2. PHYSICAL AND HUMAN SETTING AND RESOURCE BASE OF MONERAGALA DISTRICT

This chapter provides a detailed account of the district, based on available data and information generated by previous studies and on the knowledge gathered by field visits, and the author's working experience in the district.

2.1 Location

Moneragala district located in the middle of the southeast quadrant of Sri Lanka occupies a total land area of 5587 square kilometers (566,000ha) and is the second largest district of the island. The district is located between the northern latitudes 6.17" and 7.2.8" and between eastern longitudes 80.50" and 81.35". The southern part of the district is wider than the rest and district as a whole has an elongated shape (see map10.)

Located in the Uva province, Moneragala is bordered by four districts on each side, namely Ampara district on eastern and northern side. Badulla district on western and northern side, Hambantota district on southern side and Ratnapura District on the southwestern side. The district is accessible by two major trunk roads, one from Colombo via Ratnapura to Potuvil and the other from Colombo via Matara to Wellawaya. Unlike most of the other districts Moneragala is not accessible through railway and air transport. Moneragala district is divided into three electoral areas namely Moneragala, Bibile and Wellawaya and 9 Assistant Government Agent (AGA) divisions, namely Bibile, Medagama, Madulla, Badalkubura, Moneragala, Siyambalanduwa, Buttala, Tanamalwila and Wellawaya. (map 2).

2.2 Topography

Topographically Moneragala district is in a transitional zone from central highland to flat lowland. According to the landscape three terrain types could be identified.

a) Highly Mountainous terrain which covers the western boundary towards Badulla and Ratnapura districts; the elevation is between 550 to 1400 meters and the underlain parent rocks belong to highland series (Cooray 1967).

b) Hilly, steep and rolling terrain which is situated between the western boundary area [above (a)] and undulating and flat terrain [below (c)] within a elevation range of 160 to 550 meters.

c) Undulating and flat terrain, which covers the broad eastern and southern plain occupying about three fourths of the district. The elevation is below 160 meters and this terrain is underlain by Vijayan series according to the geological formation (Cooray 1967).

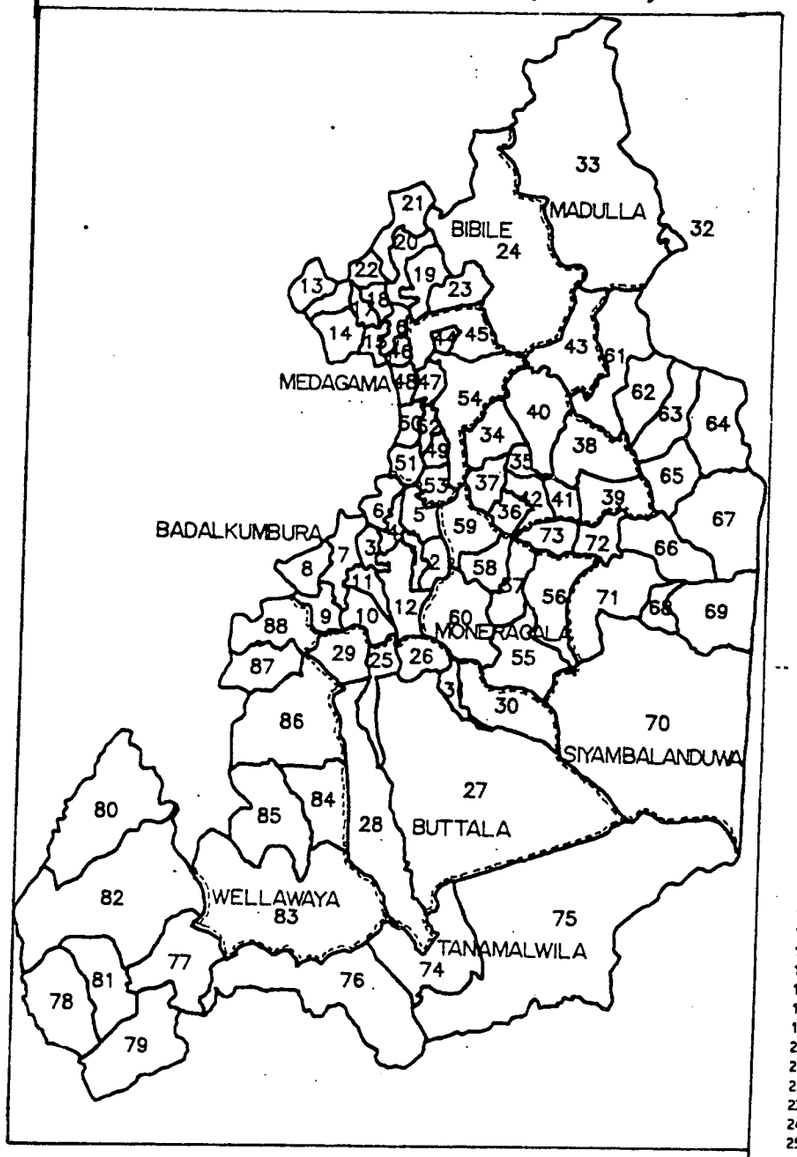
The general gradient of the district thus is from Northwest and West towards north, east, and south. Over 60 percent of the district is less than 30 meters. Slopes are gentle in the north, east and south increasing to the west with increasing elevation. There are isolated pockets of high slopes caused by steep sided mountains particularly in the central position of the western hill country. (See map 3)

2.3 Drainage

There are seven river basins which drain the Moneragala district^These rivers originate in the west central highlands and flow towards east, southeast and south. Most of these rivers originate outside the district boundary and strengthen the volume by several tributaries within the district and then flow outside the district^T to meet the Indian ocean. The several drainage basins are; (See map 4)

Heda oya - 59,050 hectares which represent 10.4% of the district^T's land area. This basin has excess water and good soil conditions for paddy cultivation, but has other conflicting land uses.

MONERAGALA DISTRICT
Administrative Boundaries of A.G.A. Divisions & G.S. Divisions (1989)



km
20

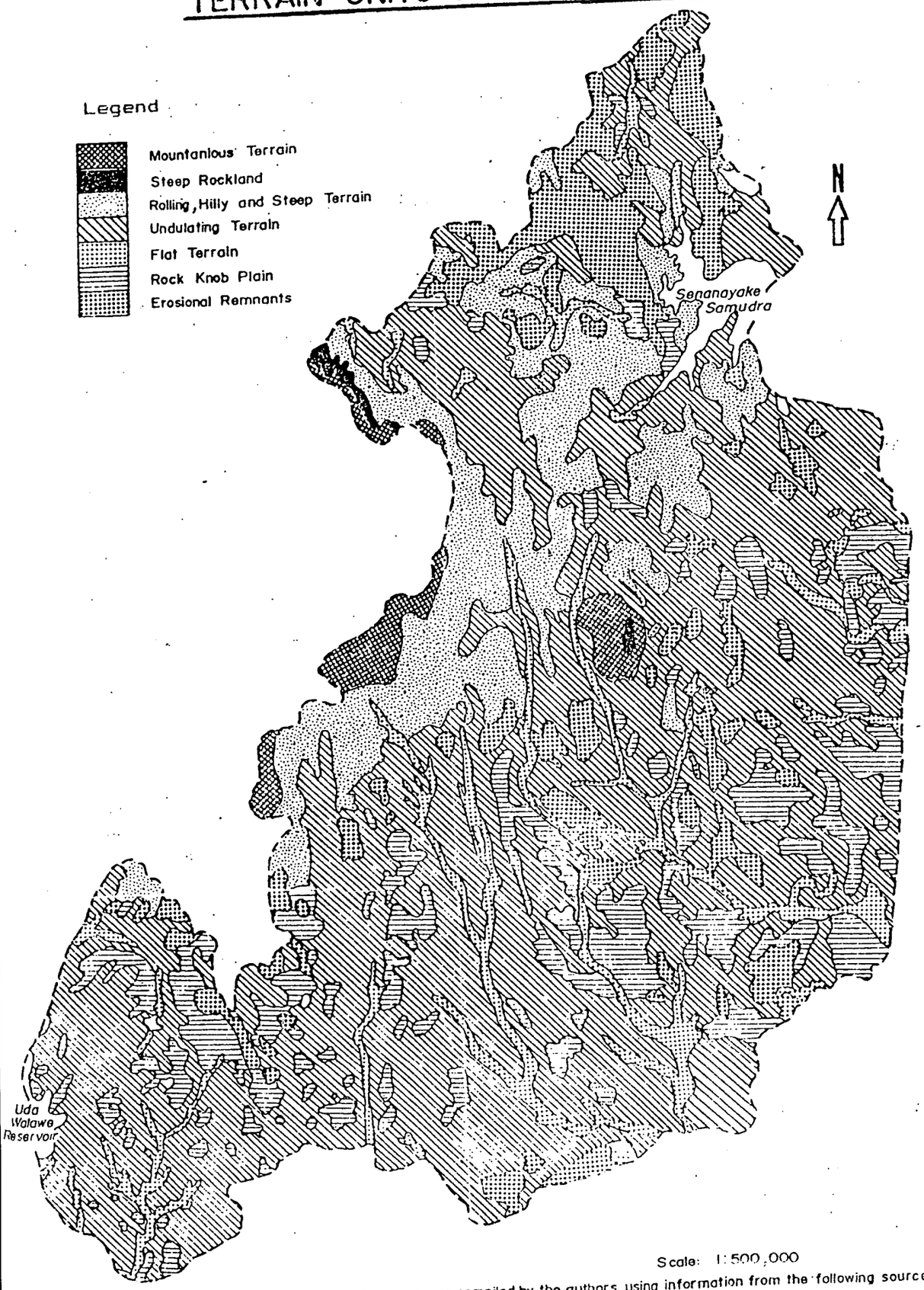
SEVA DIVISIONS

	NAME	NO.	NAME
2	Madukotanarawa	45	Nannapurawa
3	Yakurawa	46	Senapitaya
4	Alupotha	47	Kongolla
5	Wasipona	48	Kohukumbura
6	Karavile	49	Bakanigahawela
7	Wekumbura	50	Pitadeniya
8	Waradola	51	Kandavinna
9	Miyanakandura	52	Medagama
10	Hingurukaduwa	53	Rattanadeniya
11	Moratuwagama	54	Pubbara
12	Bogahapalessa	55	Kahambana
13	Atale	56	Kolonwinna
14	Kehelathawela	57	Kaudawa
15	Kotagama	58	Muppane
16	Yalkumbura	59	Batugammana
17	Dodamgolla	60	Kumbukkana
18	Kurawamba	61	Nape
19	Bibile	62	Waragama
20	Pitakumbura	63	Pallawela
21	Bokagona	64	Weragoda
22	Radaliyadda	65	Barawaya
23	Wegama	66	Kodayana
24	Hamapola	67	Siyambelanduwa
25	Nilgala	68	Etimale Colony
26	Udhaganawagama	69	Tisapura
27	Udagama	70	Wattegama
28	Medagama	71	Athimale
29	Kukurampola	72	Dombagahawela
30	Pelwatte	73	kimbulawela
31	Maligawila	74	Sellakataragama
32	Okkampitiya	75	Kataragama
33	Inginiyagala	76	Sittarama
34	Pothuliyadda	77	Sooriyaara
35	Thampalawela	78	Katupitagama
36	Makulla	79	Mahagama
37	Obbegoda	80	Kotavehramankada
38	Galbokka	81	Haberaluwewa
39	Ihawa	82	Hambegamuwa
40	Polgahagama	83	Balaharuwa
41	Deliwa	84	Handapanagala
42	Kottagalla	85	Tellula
43	Dambegalla	86	Wellawaya
44	Baduluwela	87	Kotikambokka
	Kotabowa	88	Kuragama

TERRAIN UNITS OF MONERAGALA DISTRICT

Legend

- Mountanious Terrain
- Steep Rockland
- Rolling, Hilly and Steep Terrain
- Undulating Terrain
- Flat Terrain
- Rock Knob Plain
- Erosional Remnants



Scale: 1:500,000

Note: This map was compiled by the authors using information from the following sources,
1. Soil map of Sri Lanka, printed by Survey Dept. Sri Lanka, Nov. 1977.
2. Reconnaissance field survey done by the authors.

Kubukkan oya - 112,930 hectares representing 20.4% of the district's land area. This is the second largest river basin in the district^T and also has excess water and good soils for paddy cultivation but conflicts in its southern reaches with the Yala National Park.

Wila oya - 24,860 hectares which represent 4.4% of the district's land area. This basin also has excess water and good soils for lowland cultivation.

Menik Ganga - Largest river basin in the district with 117,480 hectares representing 20.8% of the district's land area. This river basin has excess water and good soils for lowland cultivation but conflicts in its southern part with the western boundary of the Yala National Park.

Kirindi oya - 60,500 hectares representing 10.7% of the district's land area. On the southern boundary of the river Kirindi oya has subjected to a major diversion scheme with a large reservoir. However hydrological studies suggest possible water deficiency restricting the possibility of additional irrigation.

Malala oya - the smallest river basin in the district with only 11,400 hectares representing 2.0% of the districts land area and this has a little excess water for moderate lowland cultivation.

Walawe - 64,500 hectares representing 11.4% of the district land area. This is the third largest basin in the district. A major reservoir is located in the western boundary of the district. There is a water deficiency in : hence additional irrigation projects are not feasible.

All of these river basins have annual flows with fluctuation levels and volumes depending on the seasonal rains and dry spells.

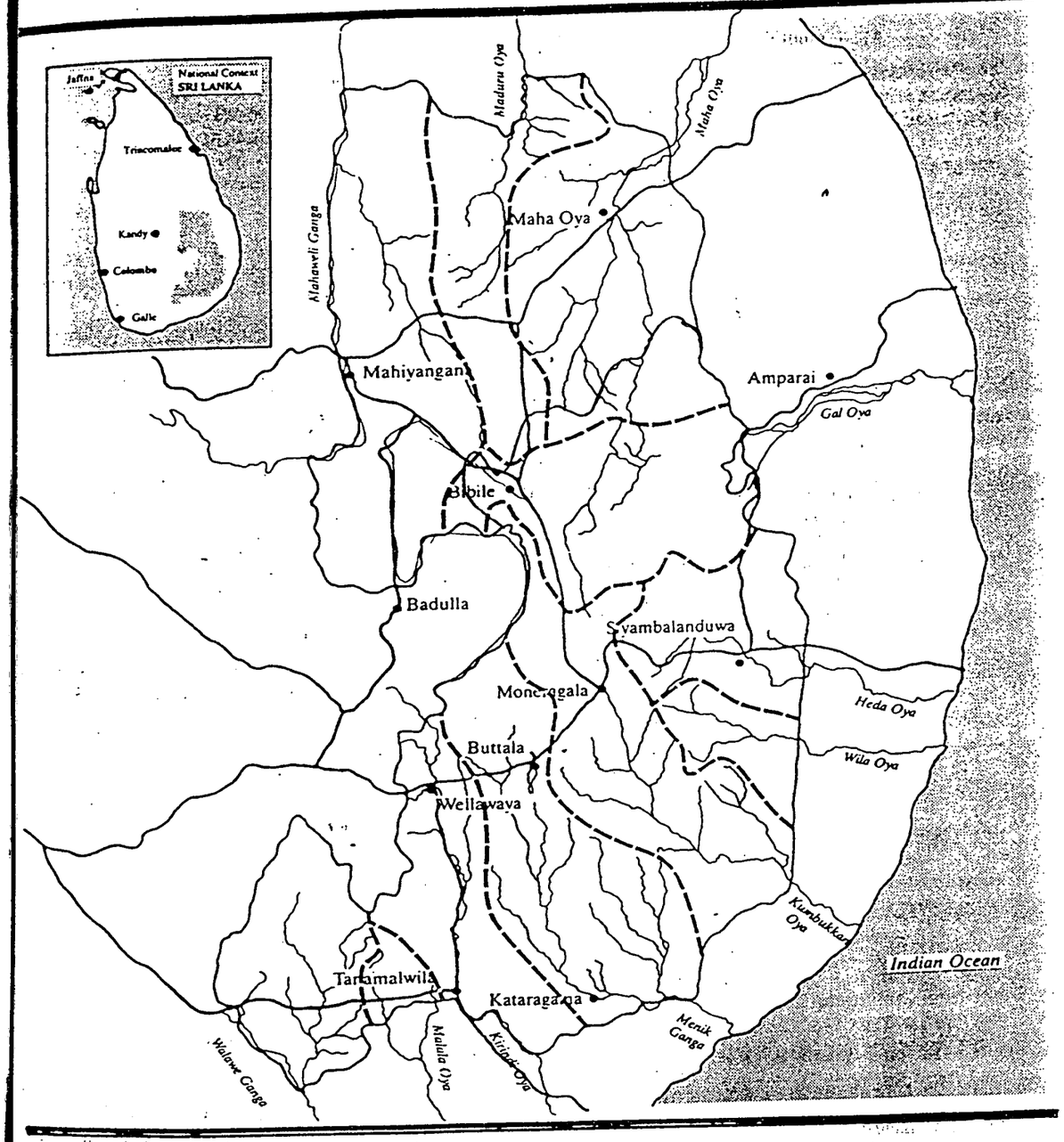
2.4 Climate

The dry zone environment of Moneragala is basically determined by the seasonal spell of rains, resulting in two rainy seasons namely Maha (main) rain season and Yala (minor) rain season. The Physical and human environment of entire dry zone is virtually based on this seasonality of rains. The two rainy seasons extend from early October to late January and from late March to late May respectively, and corresponding to these long and short rainy seasons there is also a long and short dry seasons (June - September and February - March). Map 5 show the agro-ecological zones of the district.

Total rainfall in the district ranges 1328 - 1821 mm (50-72 in) a year. Over 84 percent of rain is received during the seven rainy months of October to January and March to May inclusive. There are also minor but significant regional differences in the amount and distribution of annual rainfall within the Dry Zone and there is thus a regional specification of plant growth. As a common factor in the Dry Zone the district is characterized not only by an uneven average spread of rain over the year but also by very high variability in each months rainfall from year to year. The table 2.1 shows the mean monthly rainfall of nine stations in or near the district with coefficient of variation. The coefficient of variation is normally considered the best measure of rainfall variability.

Table 2.1 shows that as mean monthly rainfall drops it's reliability also drops. For any given year the rainfall pattern is erratic and hard to forecast. The areas of high rainfall (i.e. western water part) enjoy best of both northeast and south West monsoonal rains. Maha season corresponds to northeast monsoon period while Yala falls within southwest monsoon period. According to the readings of ten meteorological stations (including Maha Illuppallama) the mean number of Maha and Yala seasons are 92 and 50 days respectively. The mean start and end of the rainy seasons at these ten stations are given in table 2.2

4: River Basins and Drainage of Moneragala District



Lower Uva Regional Development Plan
Prepared for:
Sri Lanka Ministry of Lands and Land Development and Canadian International Development Agency
Prepared by:
DPA Consulting Ltd., Canada

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Table 2.1 : Mean monthly rainfall of nine stations in the district.

Month	Mean rainfall	Coefficient of variation (percent)
January	125	86
February	93	91
March	130	91
April	210	68
May	104	87
June	25	135
July	36	141
August	34	135
September	58	104
October	208	52
November	309	39
December	190	66
total	1522(60 in.)	22

Source: hunting Techinical SErvices Ltd - (1980) Moneragala land use study - for Ministry of Agriculture Development and Research.

Table 2.2: Mean start and end of the rainy seasons.

Station	Start	Maha End	Days	Start	Yala End	Days
Hambegamuwa	Oct 03	Jan 10	95	Mar 14	May 13	57
Okkampitiya	Sep 23	Jan 13	103	Mar 19	May 12	51
Ugalakaltota	Oct 03	Jan 05	90	Mar 04	May 14	67
Kataragama	Oct 04	Jan 10	93	Mar 22	May 11	47
Meegahajandura	Oct 03	Sep 28	82	Mar 24	May 14	48
Ethiliwewa	Oct 10	Dec 25	72	Mar 08	May 01	51
Tenamalwila	Oct 12	Dec 30	75	Mar 18	May 06	46
Embilipitiya	Oct 02	Jan 03	90	Mar 18	May 14	54
Lahugala	Sep 23	Jan 15	110	Mar 21	Apr 30	37
Maha Illupalama	Sep 27	Jan 10	102	Mar 22	May 06	42
Means	Oct 02	Jan 02	92	Mar 17	May 09	50
Coefficient of variation (%)	2	2	14	8	4	17

Source : Hunting Technical Services Ltd (1980) - Moneragala Land Use Study

The probability of effective rainfall during each season is as important to plant growth as the start and end of season because it supports to the growth cycle of plants specially in the case of available crops.

Mean daily temperatures of the district vary little over the year as the altitude within the vast low country of the district does not exceed 91 m (300 ft). The temperature varies only from 26 c (79 F) in January to 29 c (84 F) in June. However there is a high average annual diurnal temperature range of 8.9 C (16 F).

The mean annual relative humidity in the district varies from 75 (day) to 86 (night) percent. [According to the closest readings of the Hambantota station, 1990].

The limited open pan evaporation records at five dry zone stations reveal that there is little significant difference between monthly means for each stations although this may not be true in any one year. The monthly mean evaporation ranges from 113 mm in December to 193 mm in August, while the annual mean is 1859 mm.

2.5 Soils

Based on topographical and climatic variation, a variety of soil types are identified in the district. According to the great soil groups of Sri Lanka there are two soil groups in the district, namely Reddish Brown Earth (BE) and Red Yellow Padzolic (YP) soils. The RBEs are present in Dry and semi-dry Intermediate areas while RYP soils are found in wet and semi-wet intermediate areas. Within these two soil groups eight solid units are identified (DPA - CIDA study on lower Uwa Regional Development Plan 1982). The characteristics of these soil units are briefly described in the table 2.3 Map 6 shows these soil groups including the miscellaneous land units according to the solid map of Sri Lanka.

Table 2.3 : Major characteristics of different soil units

Soil unit	Distribution/occurence	Drainage class	PH range	Depth	Texture	Liaiat ions
Reddish Brosn	Dry zone crest upper and aid slopes of undulating to hilly areas	Well to imperfectly	Slightly acid to neutral	1-1.5a	Moderately fine	Erodability low moisture ranges and availability
Low Humin Credy	Abandoned tank areas, lower slopes & valley bottoms	Poorly	Slightly acid to Alkaline	Deep	Moderately fine	Poor drainage low permeability & readiness to flooding.
Solodized solonetz	Low lying areas	Poorly	Slightly acidic	1-1.5 a	Moderately coarse	Poor drainage salinity & Alkalinity
Non calcic Brown	Crests & slopes of undulating terraria in large extent	Well to imperfectly	Lightly to medium acit	>1 a	Medium	Low moisture holding capacity erodability & low fertility
Lemature Brown Loams	Steep, eroded slopes in intermediate zone	well	neutral to slight acid	< 1 as	Moderately fine	Higher erodability
Alluvial Soils	Adjacent to river streams & flood plains	Well to imperfectly	Acid to Alkaline	1 a	Heavy	Flooding hazard
Red Yellow Podzolic	Intermediate zone	well	Acidic	Shallow	Moderately fine	Slipping sliding & erosion hazard
Mountain Regozols	Intermediate zone	Well	Acidic	Shallow	Medium	Slipping sliding & erosion hazard

2.6 Vegetation

A considerable extent of land in the district is under natural reserves and forest (see map 4.). Approximately a third of total land area in the district is covered by natural forests under natural parks and/or sanctuaries which are not available for human use and another 25 per cent of land is under different types of grassland. The total natural forest area in 1982, was reported to be 160,000 hectares which is about 28 per cent of the land area. Over a third of the land area in the district is under natural forests and protected reserves which are shown in Table 2.4.
The total extent of land under protection in the district exceeds 158,070 ha with proposed areas covering an additional 11,900.ha. (Table 2.4). The actual extent under archeological reserve has not been determined for this study.

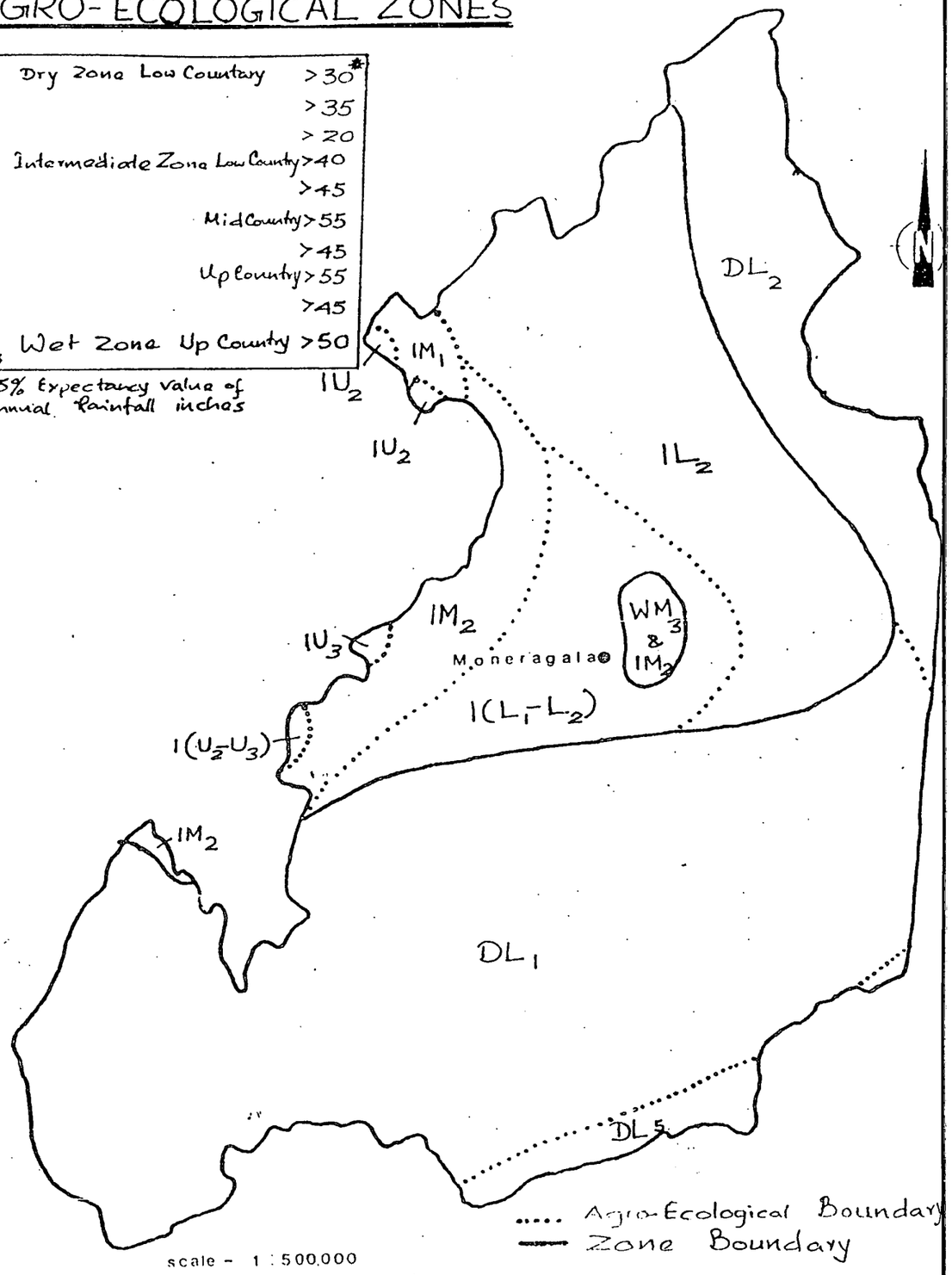
Owing to the rapid influx of population into the district, the natural forest cover has been drastically diminished by 70 per cent during the period from 1956 to date. This is comparable with the diminution of the forest on the whole island from 44 per cent coverage in 1956 to 23 per cent in 1980. During the last 30 year period thus forest land has been cleared at an alarming rate (16,000 ha. per year), for chena, logging and development activities.

MONERAGALA DISTRICT

AGRO-ECOLOGICAL ZONES

DL_1	Dry Zone Low Country	>30*
DL_2		>35
DL_5		>20
IL_1	Intermediate Zone Low Country	>40
IL_2		>45
IM_1	Mid Country	>55
IM_2		>45
IU_2	Up Country	>55
IU_3		>45
WM_3	Wet Zone Up Country	>50

* 75% Expectancy value of Annual Rainfall inches



MONERAGALA DISTRICT

SOIL GROUPS

LEGEND

SOILS OF THE DRY ZONE, & SEMI-DRY INTERMEDIATE ZONE

1. Reddish Brown Earths & Low Humic Gley Soils
2. Reddish Brown Earths & Solodized Solonetz
3. Reddish Brown Earths, Noncalcic Brown Soils & Low Humic Gley Soils
4. Reddish Brown Earths & Immature Brown Loams
5. Solodized Solonetz & Solonchaks
6. Alluvial Soils of variable drainage & texture

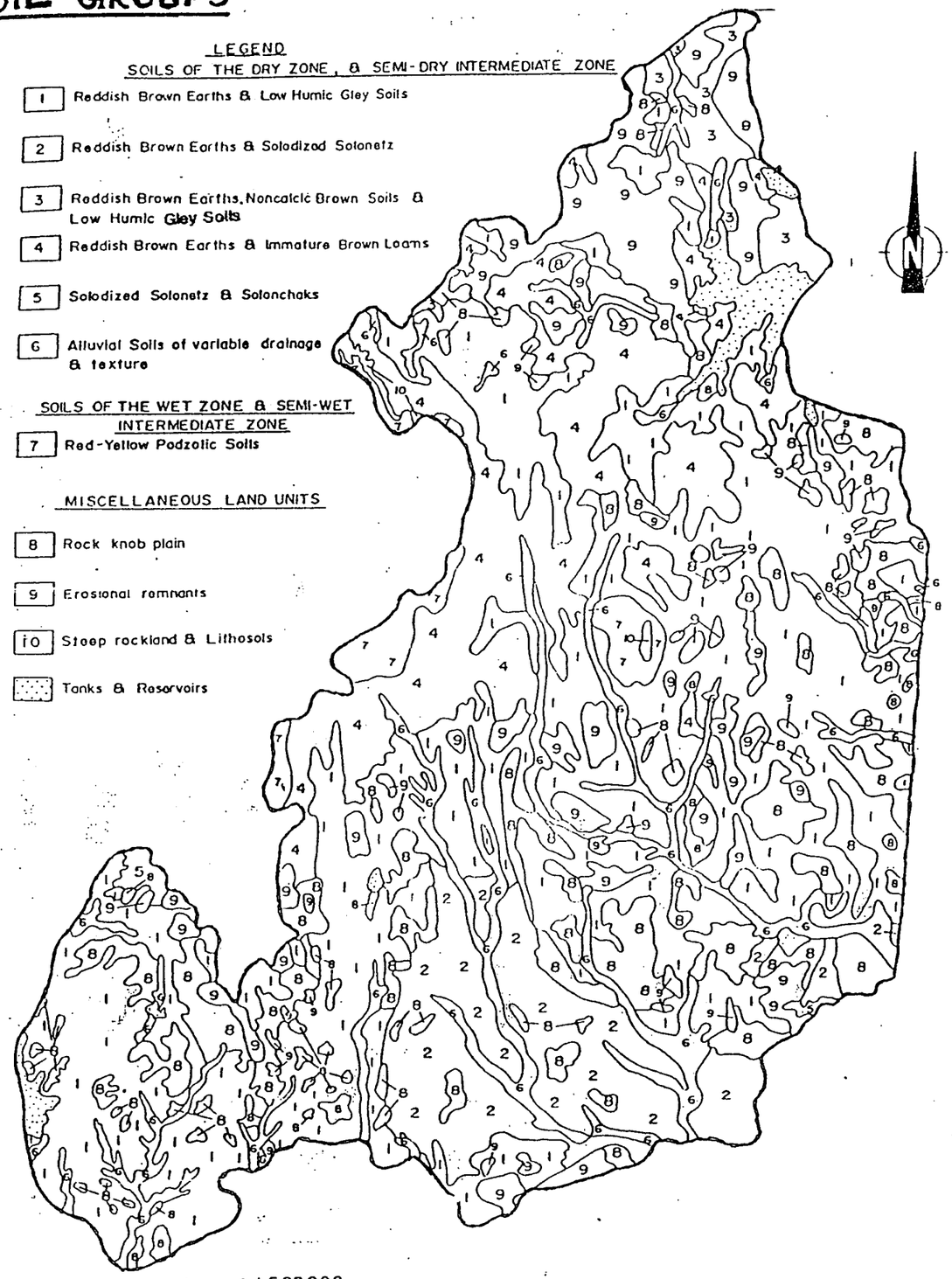
SOILS OF THE WET ZONE & SEMI-WET INTERMEDIATE ZONE

7. Red-Yellow Podzolic Soils

MISCELLANEOUS LAND UNITS

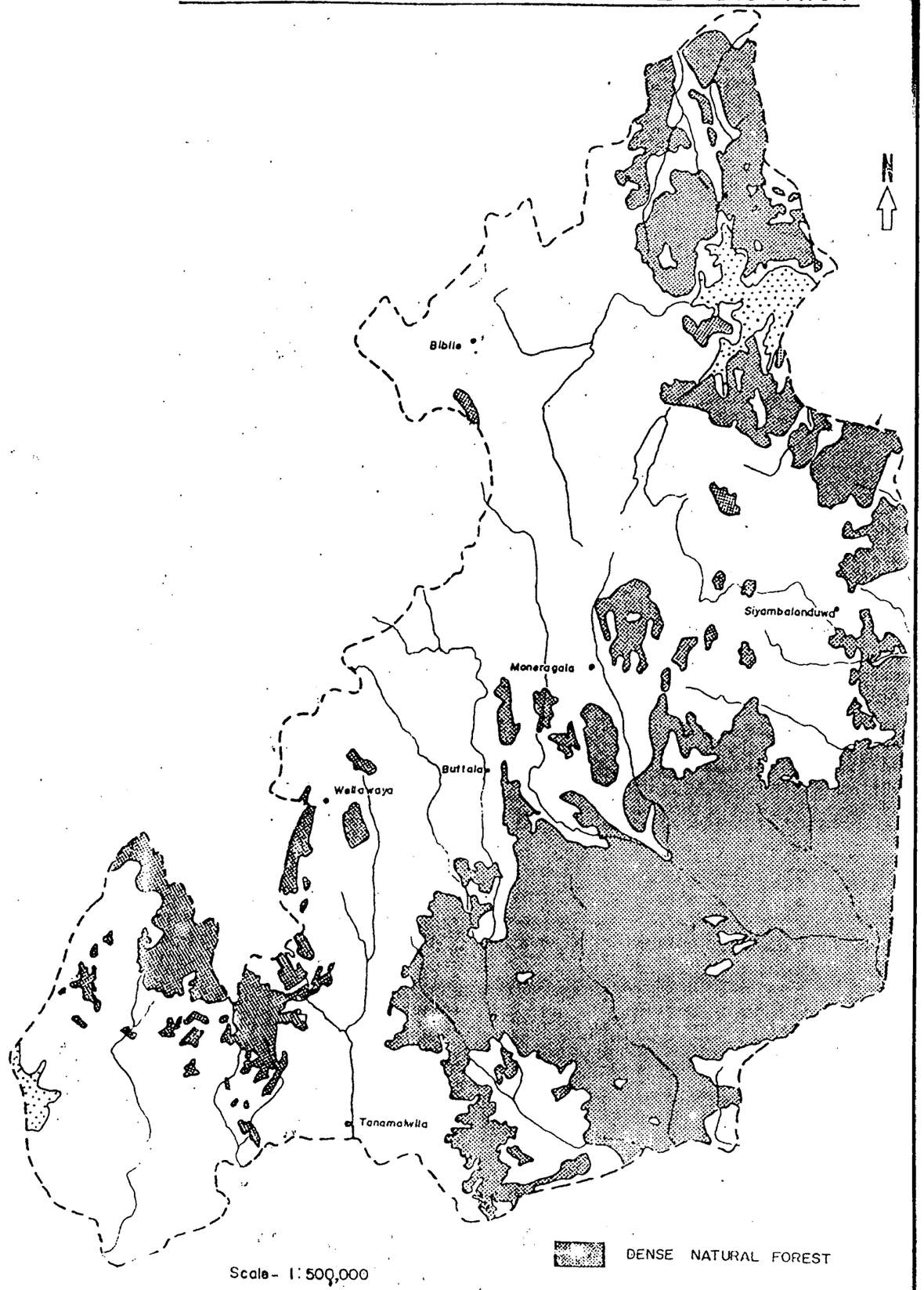
8. Rock knob plain
9. Erosional remnants
10. Steep rockland & Lithosols

Tanks & Reservoirs



Source; Survey Dept, 1977

FOREST COVER OF MONERAGALA DISTRICT



The forest cover is mainly concentrated, which is described as tropical, Dry, Evergreen, Mixed Forest and is mainly a secondary climax developed after a long period of earlier civilization based on irrigated agriculture. Since then the forest area has been disturbed by chena agriculture and in more recent times by large scale illicit felling. The natural forest is divided into three vegetation classes: high forest, riverine or gallery forest and dry scrub.

The high forest class presents a distinct stratification by a total of 56 different species (Hunting 1982), most of which are relatively unproductive. Of the identified species 10 species form 78 percent of the stands. In order of occurrence these species are Weera (Drypetes Sepiaria-23%), Kanumella Diospyros ovalifolia), Wetland (pterospermum cenescens), Palu (Manilkara hexandra) Halmilla (Berrya Cordifolia, Kuma (Gleniea Umjuga), Burutha (Chloroxylon swietenia), Kaya (Memecylon spp), Renai (Alseodaphne semecarpiyfolia), Panakka (Plenrostylia opposita) and Kaluwara (Dispyrous ebenum - only 2%).

A considerable extent of vegetation cover in the district is found in the forms of Savanna (damana) and grass land (patana) both of which are ecologically categorized as "fire climax" or "Anthropo-climax" as human activities are causes for their existence. The savanna in west and northwestern area of the district (Bibile, Medagama and Madulla AGA divisions) is well known for their medicinal threes in the upper strata. The common species found are Aralu (Terminalia belerica) Bulu (Terminalia Chebula), Nelli (Embilica Officinalis), Kahata (Careya arborea), and Gammalu (Pteracarpus marsupium). The ground (lower) strata of savanna is dominated by grass varieties like Mana (Cymbopogon confertiflorus).

The grassland are found in southern dry areas (Buttala and Thanamalwila AGA divisions), bordering forest areas, and they are locally known as "Dry Patanas". They are dominated by guinea grass (Panicum maximum), illukl (imperata Cylindrica) and Mana. Illuk is wide spread in flat and undulating dry areas, where extensive chena has been practiced, and chena farmers believe that Illuk is an indicator of poor soils and claim that they are very difficult to eradicate. Mana on the other hand are believed to be an indicator of good soils. The young sprouts of these varieties (specially guinea grass) are eaten by cattle, but they become rough when mature, and thus farmers usually set fire to these grasses with the objective of feeding cattle with young sprouts after fire. These grass varieties have fire resistant rhizomes with dense root network which penetrates into the fertile soils.

Table 2.4 : Protected Reserves , Moneragala District

National Parks & Reserves	Size within the District (ha)	Status
Yala National Park	69,420	existing
Galoya National Park	30,210	existing
Sellaka Oya Sanctuary	12,630	existing
Ampara Sanctuary	4,000	existing
Uda Walawe National Park	18,800	existing
Lunugamvehera National Park	20,500	existing
Wild Life Corridors		
Lunugamvehera - Udawalawe corr	4,650	existing
Sellaka Oya corr	5,000	existing
Yala - Lahugala corr	2,250	existing
Bakinigahawela Forest Reserve	220	existing
Daragoda Forest Reserve	470	existing
Namakandiya Forest Reserve	430	existing
Wedihitikanda Forest Reserve	760	existing
Bibilehela Forest Reserve	690	existing
Archeological Reserves		
Buduruwagala , Wellawaya	na	existing
Habassa	na	existing
Maligawila , Okkampitiya	na	existing
Dambegoda , Okkampitiya	na	existing
Galebadde	na	existing
Pasohimaramaya , Hambegamuwa	na	existing
Budugalage	na	existing

2.7 Wildlife:

The forested area (natural reserves and parks) of the district is inhabited by a diverse fauna which includes six endangered and two threatened animal species. The endangered species are the elephant, leopard, Red face Malkoha, Esturine Crocodile, Bengal Monitor and Python. The threatened list includes Purple faced languor and the Togue Macaque (International Union for the Conservation of Nature and National reserves and the US Fish and wildlife Service). These species are all found in other parts of Sri lanka and except for the Toque Macaque, Purple-faced Languor and the Red-faced Malkoha are also distributed in other parts of the tropical world. According to local sources, Malkoha is also found as an endemic specie in Sri Lanka. The Bengal Monitor and Leopard have the widest distribution, and the afore - mentioned exceptional three species are most commonly observed in riverine forests.

Special mention must be made of the following fauna (as note by Dr S.W. Kotagama in a personnel communication);

1) Cabrita leschenaultith lankae - "skink", found in the Savanna grasslands of the district. An extremely rare, subspecies endemic to Sri lanka. The subspecies is believed to have adjusted its life in response to the fire of the Savanna grasslands.

2) Calodactylus illingworthi - a geko, which has so far ben recovered from Nuwragala at Maha Oya. Though Maha Oya is outside the Monaragala District, conditions similar to Nuwragala prevail among many of the inselbergs and rock outcrops within Moneragala. As such it is likely that this species may be found in Moneragala.

3) Francolinus pictus watsoni - Painted Partridge. This bird is strongly restricted to the Savanna grasslands for the Uva Province of which mostly lie in the Moneragala district. This range distribution has not been adequately explained, but the survival of the species in Sri Lanka depend very much on the protection of the grassland.

4) Alcedo meninting phillipsi - Blue-eared Kingfisher. The Nilgala area and the food hills of the western district boundary is the area from which this species has been reported. Outside this area it has been reported. Outside this area it has not been positively recorded.

5) Terno Phoenicoptera phillisi - Southern Yellow-Legged Green Pigeon. This peigon is found in the forested areas of Nilgala, Senanayake Sanctuary. Once again, though no explanation is possible its stronghold is this area, in Monaragala.

Thus Monaragala holds some unique fauna that can only survive if the Natural Habitats are protected. The detail fauna of the area is not know and as more studies are needed.

Related to their feeding patterns and water requirements elephants are observed to have seasonal movements. During the dry period elephants and other animals tend to congregate closer to perennial streams and tanks and riverine forests, and in the wet season they disperse and enter highland areas for feeding. The latest estimate of the number of elephants in Sri Lanka is 2000, of which about 400 to 600 are in Yala and adjacent forest areas.

There is also a number of endemic animals which include species of fish, amphibians, reptiles and mammals. Other relatively large mammals found in the area are wild boar, sloth bear, deer and sambur. A majority of the 251 resident bird species found in Sri lanka are also found in the area and during the winter months, at least 75 other bird species are migrants from Europe and other northern countries.

Out of the wildlife habitats most important area is the Yala park and the extensions of forest to the north inside the district boundary plus the adjacent Kumbukkan and Panama forest reserves and the Lahugala sanctuary to the east of the boundary. The other park habitats like Uda Walawe are mainly covered in chena and scrub jungle and less important compared to Yala which provides high forest, grassland and perennial streams to be a good

habitat.

2.8 Natural Ecosystems

Some of the interesting natural habitats in the district are:

1) Savanna Grasslands - Both upland and lowland. Their locations are know, but detail mapping is needed, in terms of the different types. These grasslands are found in the North- Western part of the district.

2) Intermediate Forests - Few patches probably still exist along the western sector of the district. These areas need to be identified on ground.

3) Isolated Highlands - There exist within the districts many locations of high elevation arising from flat terrain. These areas need to be considered as separate 'habitats'. Nothing is known of these in specific detail.

4) Rock outcrops - large number of rock outcrops, or rock highlands are found in the district. These are found to harbour flora and fauna unique to this system. These habitats have not been studies at all.

5) Natural Streams and Waterholes - Apart from the large streams to the major river systems, there exist a large number of small streams and isolated waterholes. These small areas have not been studied at all. Being isolated, probably seasonal waterholes and streams would be a very interesting biological system for study and research.

6) National Parks and Sanctuaries - The Gal Oya National park, part of the Uda Walawe National park and part of the Ruhunu National Park are in the Monaragala District. These parks harbour a large number of dry zone fauna. Even though the species list is not properly compiled, it could be said that these areas will probably be the last bastions of this fauna if prevailing forest destruction continues.

7) Aquatic System - There exist a large number of tanks, Wewas and rivers in the district. Their flora and fauna is generally known but its potential and productivity apart from fisheries is not adequately known. In this respect importance as food sources - example: Nelumbium tumbers, for religious needs - flowers etc, need to be studies carefully.

2.9 Land use:

Present land use in the district is a combination of traditional irrigated and rainfed agriculture plus the plantation crops introduced by colonial rule and more recently by government of Sri lanka. The traditional three phase land use pattern, namely, tank (wewa), homestead (Gangoda) and rainfed Highland (Chena) changed in to a commercial agriculture, towards the wet zone of the district after introducing tea, rubber, coconut and minor export crops like coffee and cocoa. and within the intermediate and dry zone plantation of sugar cane was introduced by the government in recent years, which transformed most of the traditional chena areas and scrub jungles into sugar cane estates and out-growers plots.

Because of the constant change n land use which has taken place during recent years the data on land use appears to be not very reliable in most cases. However a summary of broad land uses are given in table 2.4, based on available sources (Ministry of Plan Implementation (1982) & DPA (1982)).

Paddy is the single most important crop in the district which contribute to 10260 hectares of which over 71 percent is cultivated during maha season in a normal year while only 20 percent is cultivated during yala.

Total extent under permanent crops is 25,910, which includes Tea (800 ha), Rubber (2190 ha), Coconut (4170 ha) and minor export crops of coffee (215 ha), Cocoa (681 has and Cashew (847) ha. Of the above plantation crops Coconut, Coffee and Cashew are grown in small holdings.

Table 2.5 Summary of land uses, Moneragala District

Land use	Area in hectares	Percent
National Parks	145,000	25.6
Grassland & Savanna	141,500	25.0
Forest Reserves	46,100	8.1
Non agricultural uses (Roads & Buildings etc)	3,240	0.6
Permanent Crops	25,910	4.6
Paddy	10,260	1.8
Other Food Crops (Mainly chena)	12,955	2.3
Cultivable but not cultivated	5,668	1.0
Other users (including wasteland abandoned chena & recent sugar cane	167,465	29.6
Inland water bodies	7,902	1.4
Total	566,000	100.0

The subsidiary food crops extent which varies year by year and season by season contribute to about 13,000 hectares and together with home gardens and permanent highland cultivation, the total extent of subsidiary food crops would probably range from 16000 to 28000 hectares.

Livestock Farming is relatively a significant economic activity in the district although it has not been very well developed when its vast potential is considered. The district's livestock is dominated by cattle and buffaloes. There is a limited number of pigs and goats and a considerable population of poultry. The table 2.5 shows the number of different livestock by AGA divisions in the district. Of the 46063 holdings in the district, some 18900 holdings practice at least one type of livestock rearing and this corresponds to 18641 hectares. Of the total cattle and buffalo population (52795 cattle and 11270 buffaloes only a small percentage, (3 and 5 percent respectively) is of improved quality namely ghi-bred and cross-bred. There is a relatively high proportion of males in the cattle population, that is mainly used for draught power. A little less than half the mature females are milked. Cattle are usually kept in small herds of less than ten heads and on farms of small acreage. The livestock in general is underdeveloped because, (i) the majority of cattle are of indigenous low productive stocks, (ii) improved pastures are not available and cattle are mostly fed by free grazing, and (iii) livestock is not properly integrated with arable cultivation for mutual benefits and has developed into conflicting land uses instead. Prospects for improved livestock farming is promising as a large extent of natural grassland in the district (about 25% of the total land) could be transformed into productive pastures, and this has to be coupled with upgrading of quality of cattle and buffalo stocks. the potential for improving other livestock like poultry and goats also high in the district as the present production levels are not up to the standard owing to poor services available.

Table 2.6: Distribution and number of livestock

AGA Division	Cattle	Buffaloes	LIvestock/ land ratio	Goats	Pigs	Poultry
Badalkubura	335	600	7.0	223	8	8361
Bibile	6931	864	6.2	167	-	5424
Buttala & Wellawaya Madulla	11308	3265	5.6	208	-	22401
Medagama	5520	487	5.7	67	-	9760
Moneragala	5919	595	5.6	321	-	11439
Siyabalanduwa	3371	382	7.3	578	8	5349
Thanmalwila	8348	356	5.6	41	8	12170
	7943	4721	5.4	84	60	9201
District	52795	11270		1689	84	84105

2.10 Land Tenure

Over 40 per cent (44682 ha) of the cultivable land (110,600 ha) in the district is owned by individual operators. 65 per cent of farmers who own land, cultivate less than 2 hectares while only 8.2 per cent of farmer owning land, cultivate 4 - 20 hectares of land. Of all the operators 15 percent are reported to be landless farmers, who either practice shifting cultivation (chena) or work as agricultural laborers. Table 2.7 shows the number of operators and area cultivated by such operators by different uses. Major export crops are estates owned and privately owned while majority of the recently developed sugar cane plantations are owned by public and private companies.

Table 2.7 Ownership of Land holdings

Ownership category	No of operators	%	Area (ha)	%
Owning home gardens only	19133	41.4	13955	31.2
Owning home gardens & other land	17802	38.6	28357	63.5
Owning other land only	2281	4.9	2370	5.3
Landless	6958	15.1		
Total	46174	100	44682	100

Source: Sri Lanka Census of Agriculture - 1982

Spear headed by the Presidential Land Task Force, 16,687 ha of state lands were alienated by 31 Aug 1991. About 70% of this extent were previously by encroached lands, which were regularized under the programme. A good majority of these lands are under small-holder sugar cultivation. In the Table 2.7, these now owners of state lands are not included.

2.11 Human Resources

Although it is the second largest district of the island, the human population is quite low, contributing only 1.88 percent of the island's total. This is an indication of relatively under-populated district on one hand, and there is ample land for human use on the other. When the land actually available for human use is considered, this impression would change as over a third of the total land area is covered by sanctuaries and forest reserves etc.

The enumerated population at the census of 1981 was 273570 and there has been a rapid increase during last 20-30 year period. The estimated population for year 1990 is 390,000 as a result of relatively higher growth rate of the district. The growth rate has been 4.7 percent per annum during the period 1963-71 and 4.0 percent per annum during the period 1971-81. The estimated growth rate used by Department of Census and Statistics for the period 1981-91 is 3.7 percent per annum.

As one may quite correctly assume a very high percentage of population in Moneragla lives in rural areas. In 1981 rural population was 94.8 percent and 2.2 percent came under urban sector while the balance 3 percent accounted for estate population. The population growth varies considerably by both AGA and Gra Sevaka division-wise, within the district. The highest growth rates are found in southern AGA divisions which are known as areas with "unutilized land" such as Thanamalwila (highest rate of 9.1 per cent) and old Buttala (Now sub-divided to Buttala and Wellawaya) AGA division (5.8 percent). The population growth is relatively low in permanently cultivated areas with higher population densities like Bibile and Medagama GA divisions The lowest growth rate of 1.7 percent is reported in Siyambalanduwa AGA division, even though it has much land available for cultivation. This contrast between Southern AGA divisions and Northeastern AGA Division, is obviously caused by the fact that in-migration is high in southern divisions which are located in close proximity to densely populated districts of Southern and Sabaragamuwa provinces, while the in-migration is much lower in other divisions which are bordered by under populated Ampara district. The population size and growth by the AGA divisions are given in table 2.8.

As already hinted the governing factor causing a high population growth in Moneragala district is the very high in-migration to district from densely populated districts in the south and west of Moneragala, which are located

mostly in the wet zone and intermediate zone. A large number of people has migrated to Moneragala from matara, Ratnapura, Hambantota and Badulla districts in search of land for both cultivation and settlement purposes. The pull factors in the district are land availability for extensive upland cultivation, a series of recently completed and on-going development programs which has created employment and settlement opportunities and rather weak government control over encroachment of crown land and illicit gemming.

Highest population growth is reported in eight Grama Sevaka divisions owing to numerous migrator y reasons such as importance as a service center (Bibile), presence of migratory fisherman (Inginiyala), high opportunity for gem mining activities (Okkampitiy and Maligawila), and availability of large tracts of vacant crown land for chena cultivation (Katupilagama, Balaharuwa, Sittarama and Kataragama).

Apart from Moneragala town which is also a high scored area, other attracted area for in-migration are townships of Badalkubura, Wellawaya, Tanamalwila and Kataragama. The affect of both old and new settlement schemes is notable in some areas, where a disproportionate number of male immigrants have been attracted. Examples ar Atale and Mortuwagama in lower Badalkubura, Etimole colony including its spill over area Tissapura, and Muthikandiya scheme in central Siyambaladuwa AGA divisions.

There are 7 Grama Seva Divisions with very low scores for migration caused by very poor accessibility, remoteness and cultural integration (Kotabowa, Nilgala, Pothuliyadda, Baduluwela, Thampalawela, Polgahagama and Wattegama).

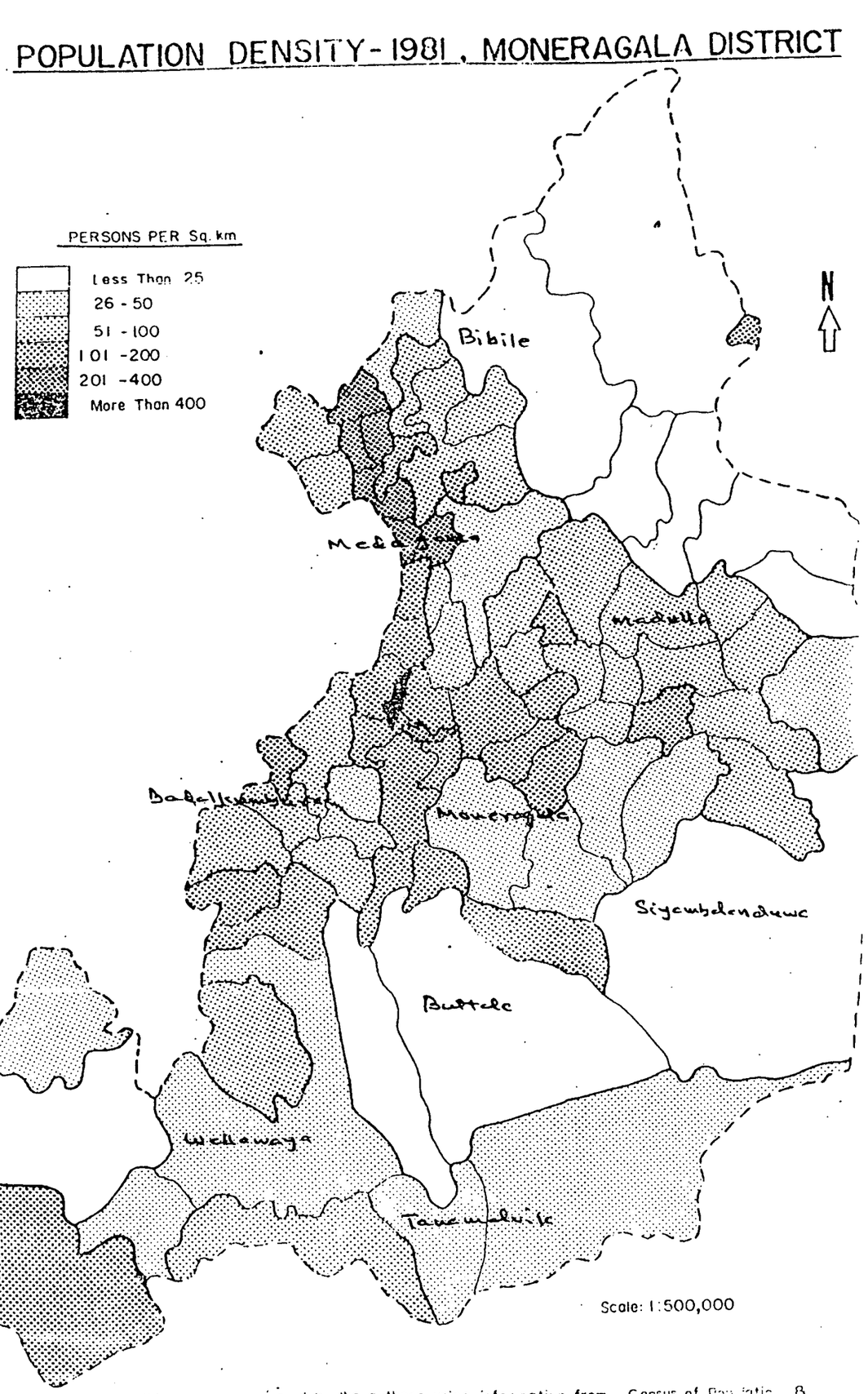
The natural population growth is also relatively high in the district, which is caused by following factors; (1) the fertility rate is high compared to the national mean (crude birth rate is 39.4 in the district while national figure is 28.7), (ii) The mortality rate is lower than the national figure (3.8 per 1000 against 6.1 per 1000) owing to out-migration of the elderly people and (iii) the infant mortality rate is lower than national average (22 against 37 per 1000 live births).

According to the ethnic composition of the population, 92.7 percent is Sinhalese, 3.2 Indian Tamils, 2.0 Sri Lankan Tamils, 1.9 Moors, and 0.1 other. Religious composition almost corresponds to this, showing the values 92.7 per cent Buddhist, 4.7 Hindus, 2.0 Muslims, 0.4 Catholics and 0.1 Christians. The literacy rate was 72 percent for females. The economically active population in the district is rather high; it is 73.5 percent in the agricultural section; overall district figure for males is 67.4 percent, and for female 16.7 percent which is relatively low. The unemployment rate is 9.2 percent; it is 12.6 percent in the urban sector and 9.2% in the rural sector.

Table 2.8 Population size and growth by AGA divisions

AGA division	1971	1981	1990	Growth Rate 71-81	Growth Rate 81-90
Badalkubura	20109	31887	33799	4.7	3.9
Bibile	20692	26505	31872	2.5	2.1
Buttala	35664	28739	43675	5.8*	4.8
Madulla	15289	21424	27469	3.4	2.8
Medagama	18288	23366	27469	2.5	2.1
Moneragala	20219	30766	41931	4.3	3.5
Siyabalanduwa	26127	30835	34821	1.7	1.4
Tanamalwila	19200	45843	87305	9.1	7.4
Wellawaya*		34205	51982	5.8*	4.8
District	175582	273570	391803	4.5	3.7

* Rates for old Buttala AGA divison was used for both of these divisions.
Source: Department of Census & Statistics - 1985



Note: This map was prepared by the authors using information from Census of Population & Housing, Sri Lanka, 1981 Dept. of Census and Statistics

3. ENVIRONMENTAL PROBLEMS AND ISSUES

3.1 Identification Methodology;

The environmental problems of Moneragala district were identified by three distinctive methods. They are:

i Analysis of the available literature which included, previous studies, official documents, transactions of the government bodies dealing with aspects of the environment.

ii Interviews with district officials and knowledgeable people.

iii Analysis of the findings of a special "Transect Survey" carried out in the district.

The first method was used to assemble the data and information which are available in the district as a result of studies concerning environmental aspects. These studies include, reports of surveys by Department of Census and Statistics, Department of Land Commissioners`, Land use studies situation reports studies on lower Uva region and other studies done by Ministry of Plan Implementation and for monitoring purposes of District Integrated Rural Development Program of Moneragala (MONDEP). One particularly rich source of information were the minutes of the District Coordinating Committee and the District Environment Agency of Moneragala district. From these it was possible to identify a number of environmental concerns which drew the attention of the officials.

One important source of socio-economic data and information on resources in the district is the Family Profile Survey, which was in fact a census of all families in the district conducted in 1989 - 90. The survey was carried out by the newly appointed Grama Niladharis. The census results are aggregated and incorporated in Resource Profile for each Division. The Resource Profiles contain information on natural and human resources and demographic, employment, infrastructure, institutional data. When the present study was proceeding, the Resource Profile were being got ready, and hence are not utilized for our purposes.

The second method was interviewing officials and people in the district and was carried out as an informal method of obtaining updated information on different environmental components (Viz. Vegetation, soils, water and wildlife)from the personnel who are directly or indirectly involved in "development" of different aspects of these components. These officials included heads of government department, authorities and other independent agencies, working at regional, district and local levels.

NORAD sponsored Environment Study provided a good opportunity in May-June 1989, for the authors of this report to discuss and analyses the data and information gathered by them within other members of the study team. Of much value was the insight thrown into the linkages between the environmental concerns and the poverty question in Monaragala district. Fig 1 presents in diagrammatic form the linkages referred to.

3.1.1 Transect Surveys

A special "Transect Survey" was carried out at 10 selected locations to ascertaining the type, degree and variations of the environmental problems as a more practical method in addition to the other two methods. The locations for transect were selected to represent all agro-ecological zones, AGA divisions and different terrain and land use types. The 10 locations selected for "transect" are listed below.

1. Muthukandiya in Siyambalanduwa AGA division to represent cleared forest, chena stabilization and new settlement areas in the dry zone.
2. Kaluobbe - Etimole, in Siyabalanduwa AGA division to represent catchment and command area of a rehabilitated tank.
3. Kudaoya-kirindi Oya in Thanamalwila AGA division representing chena, encroachment and mixed highland.
4. Udawalawe in Thanamalwila AGA division to represent shrub jungle, chena and small holder sugar cane.
5. Hulandewa in Moneragala AGA division representing urban and highland settlement.

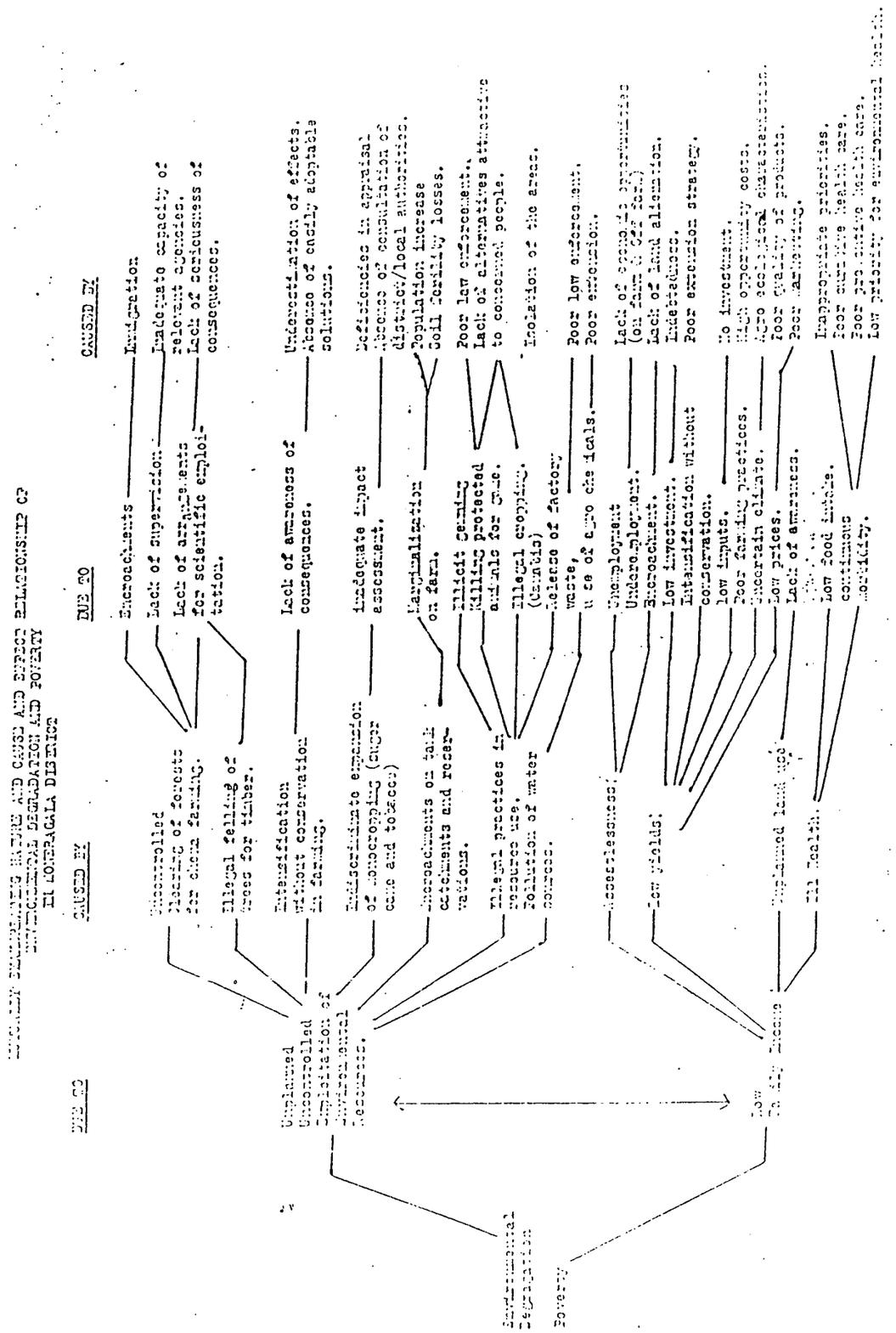


FIGURE 1 – ENVIRONMENT DEGRADATION/POVERTY

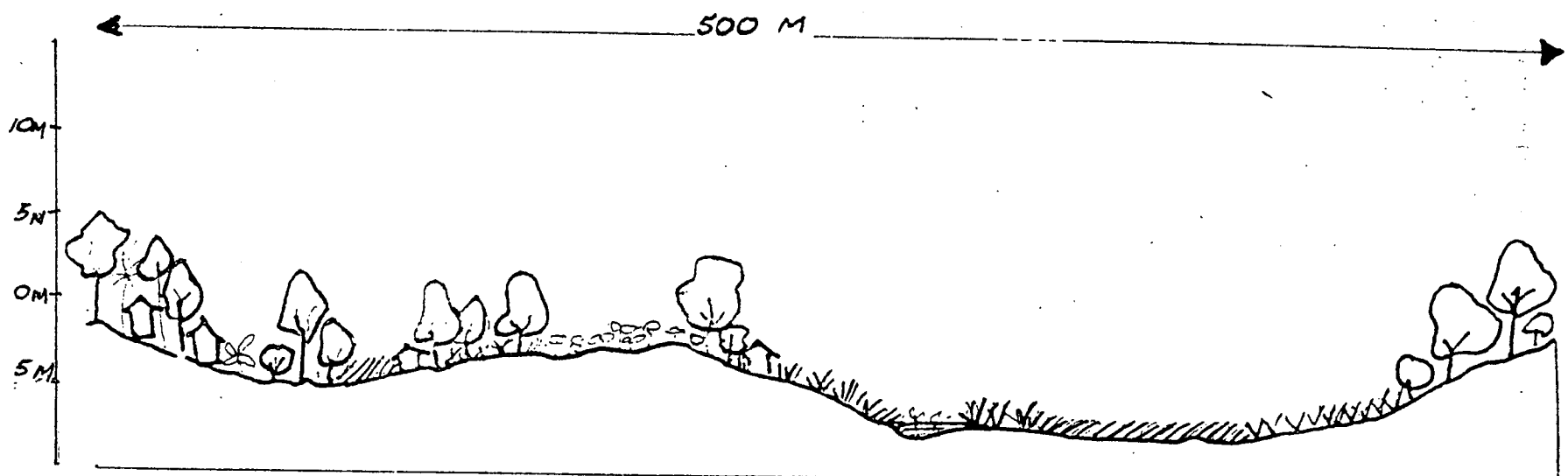
6. Badalkumbura in Badalkumbura AGA division to represent minor export crops and mixed garden plantation areas.
7. Nakkala in Moneragala AGA division representing dry savanna, mixed gardening and lowland paddy.
8. Okkampitiya in Buttala AGA division to represent natural vegetation, gemming and home gardening.
9. Galbokka in Madulla AGA division to represent savanna forest and chenaed area.
10. Thampalawila in Madulla AGA division, representing purana village with traditional agriculture and encroachment.

The transect survey was used as a "Rapid environmental Assessment (REA) too in order to establish base line environment aspects include, natural vegetation, soils, and water. The repetition of this survey along the same transect after a given time interval (Say 4-5 years) would be an "Environmental Monitoring Tool (EMT) to enumerate the environmental changes, and thus to take measures against environmental degradation.

For the present study, 500, meter long transect were established, and environmental aspects were recorded in 5 — separate schedules, each covering 100 meters long stretch of the transect. The enumeration of natural vegetation, aliens, soil depth and type of degradation, water courses and ground water, was carried out and one transect would take one day for recording.

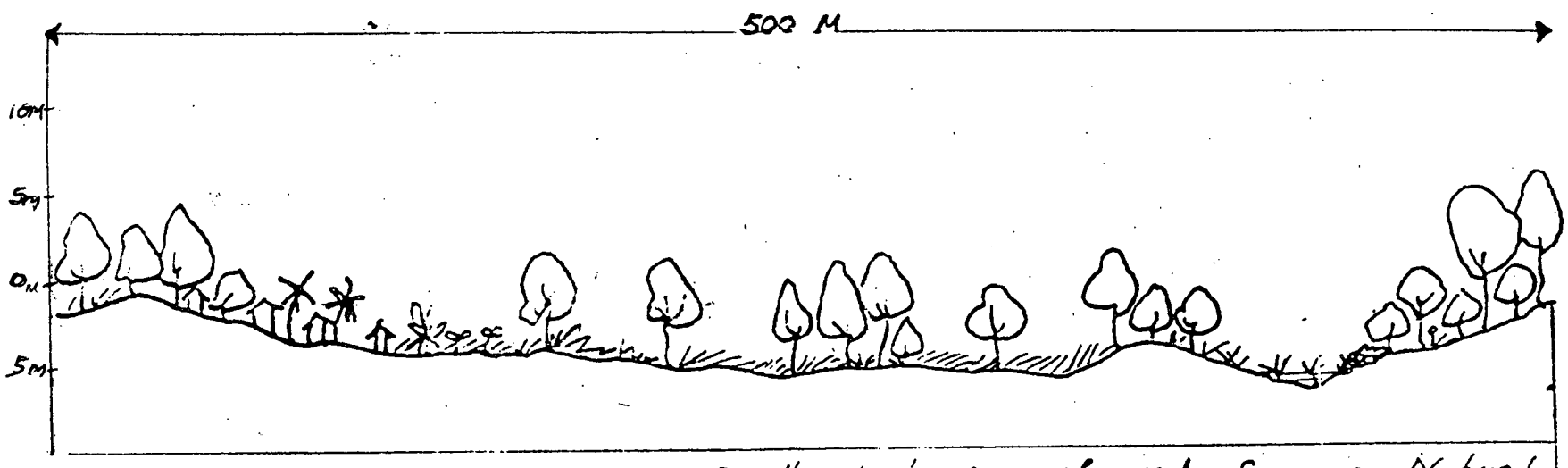
The figures 1A-10 illustrate the transects together with the summary of certain measurements of the different environmental components and nature of environmental problems.

In the second section of each transect, households around the transect were interviewed to further ascertain, the problems and to test the environmental knowledge of the average villager. This socio-environmental survey helped to trace the history of environmental problems, evolution of present land use, and villagers' attitudes to environmental problems.



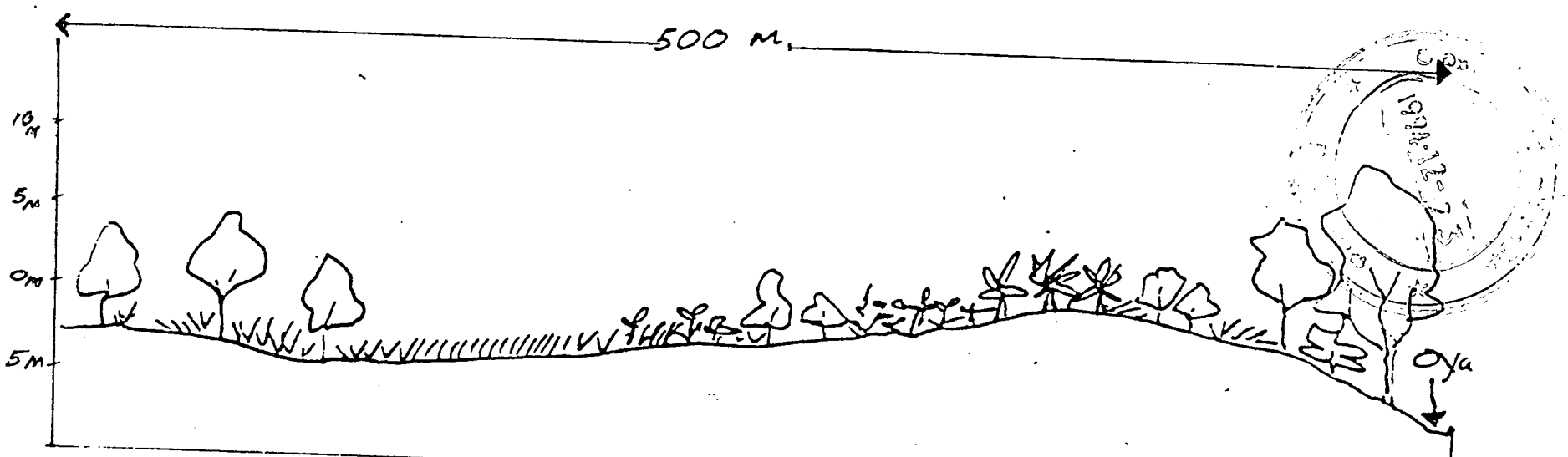
Vegetation	Mixed Garden	Scattered trees with aliens	Highland Crops	Swamp	Lowland Paddy	Natural Vegetation
Soil Depth	Moderate to shallow	Deep to Moderate	Deep	Deep	Deep	Deep
Ground Water	1–5 m	< 2 M	< 1 M	Surface	< 1 M	1–5 M
Problems	Soil erosion	Clearing for mono cropping	Soil erosion	Water stagnation	—	—

Figure 1A Transect of Muthukandiya Settlement Scheme.



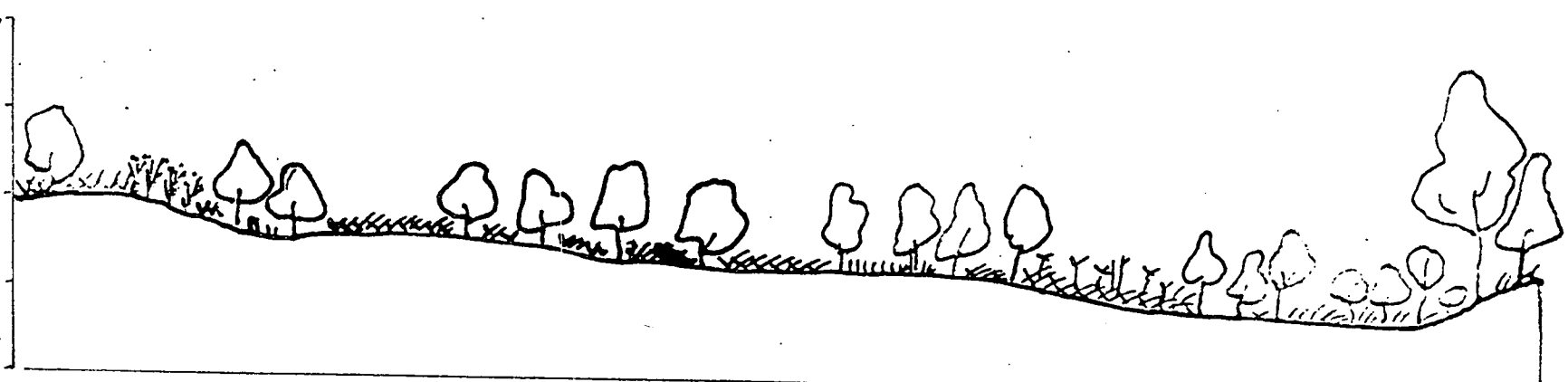
Vegetation	Mixed Garden	Aliens	Scattered trees with aliens	cleared forest	Swamp	Natural Vegetation
Soil Depth	Moderate	Moderate to Shallow	Deep to Moderate	Deep		Deep
Ground Water	1–5 M	< 1M	1–5 M	< 1 M	Surface	>5M
Problems	Soil erosion	clearing / burning for chena	Soil erosion	deforestation		—

Figure - 2. Transect of Kahobbe Village



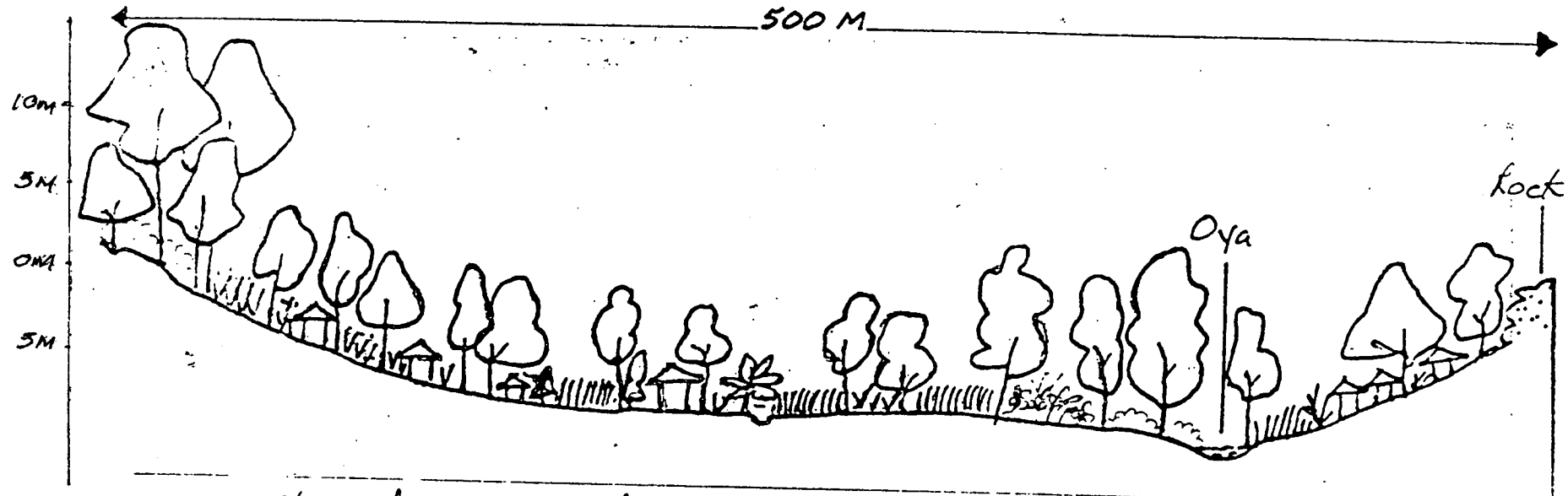
Vegetation	aliens with scattered Trees	Irrigated Paddy	Highland crops		Natural Vegetation
Soil Depth	Moderate to Shallow	Deep to Moderate	Moderate	Deep to Moderate	Deep
Ground Water	< 1 M	< 1 M	1–5 M	1–5 M	< 1 M
Problems	Deforestation	—	Soil erosion	encroached chenaing on reserves	—

Figure 3– Transect of Thanamalwila-Kirindioya.



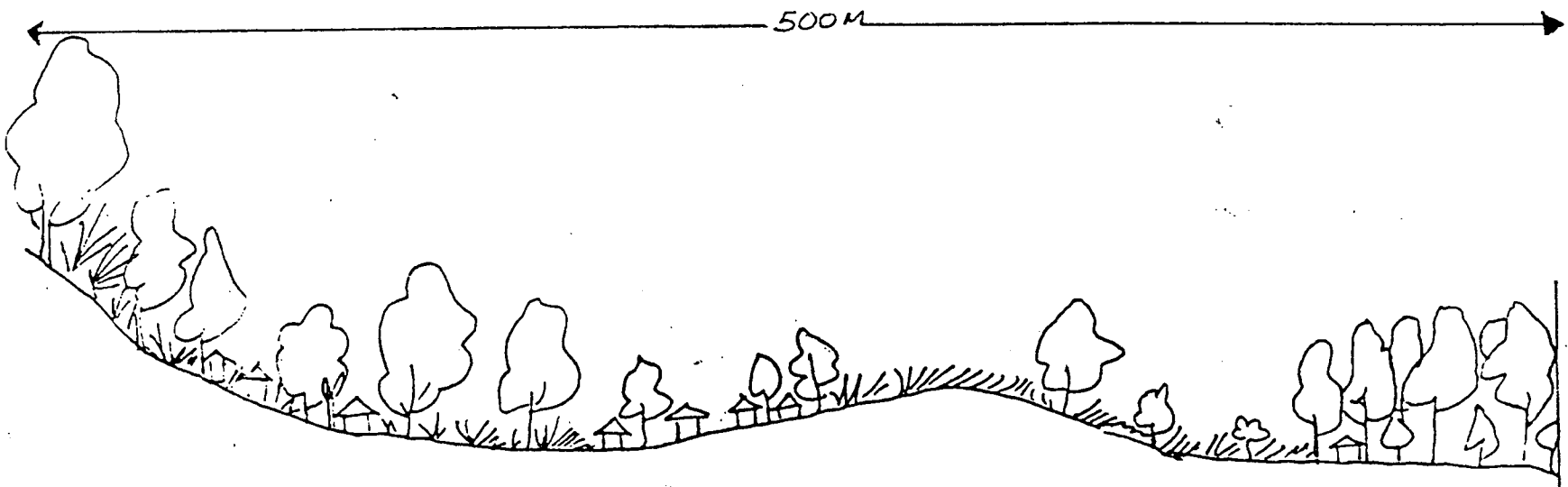
Vegetation	Highland crops	Scattered trees with aliens	aliens	chena-fallow area	
Soil Depth	Deep	Deep to Moderate	Deep to Moderate	Moderate	Deep
Ground Water	> 5 M	1–5 M	1–5 M	< 1 M	1–5 M
Problems	Encroached chenaing	Deforestation	Deforestation	soil erosion	

Figure-4. Transect of Kiri-ibbanara



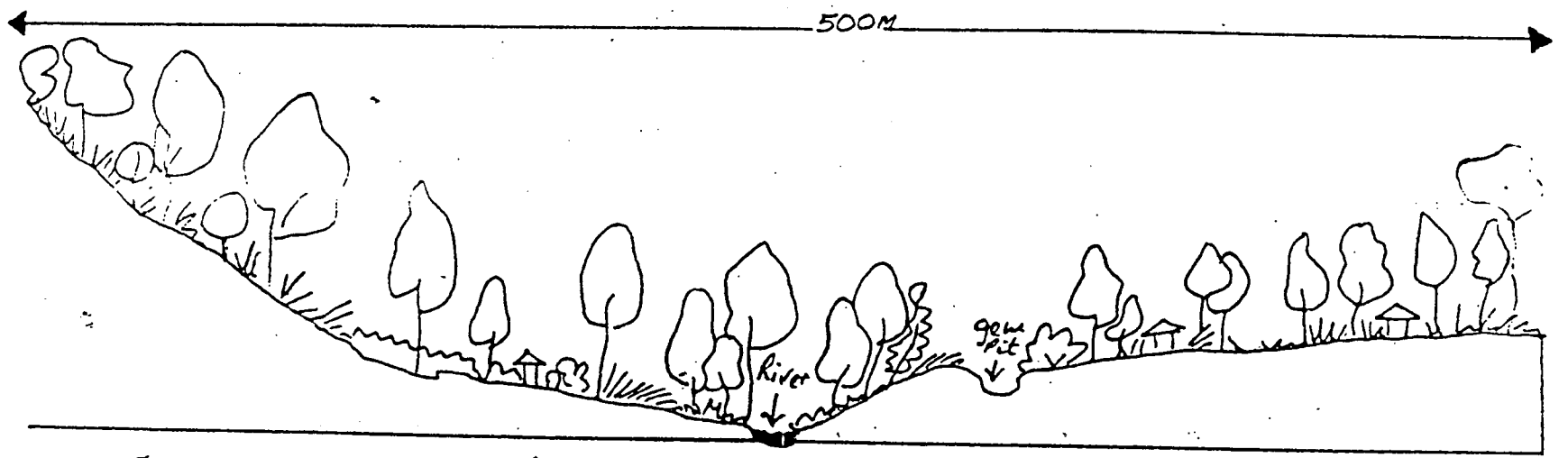
Vegetation	cleared Natural vegetation	Mixed garden	Irrigated Paddy	Highland cultivation	Paddy & Homestead
Soil Depth	Deep to Moderate	Shallow	Moderate	Moderate to Deep	Deep to Moderate
Ground Water	> 5 M	1–5 M	< 1 M	< 1 M	1–5 m
Problems	Deforestation	Soil erosion	–	Encroachment of water reserves (ravines)	soil erosion

Figure-5. Transect of Hulandewa colony



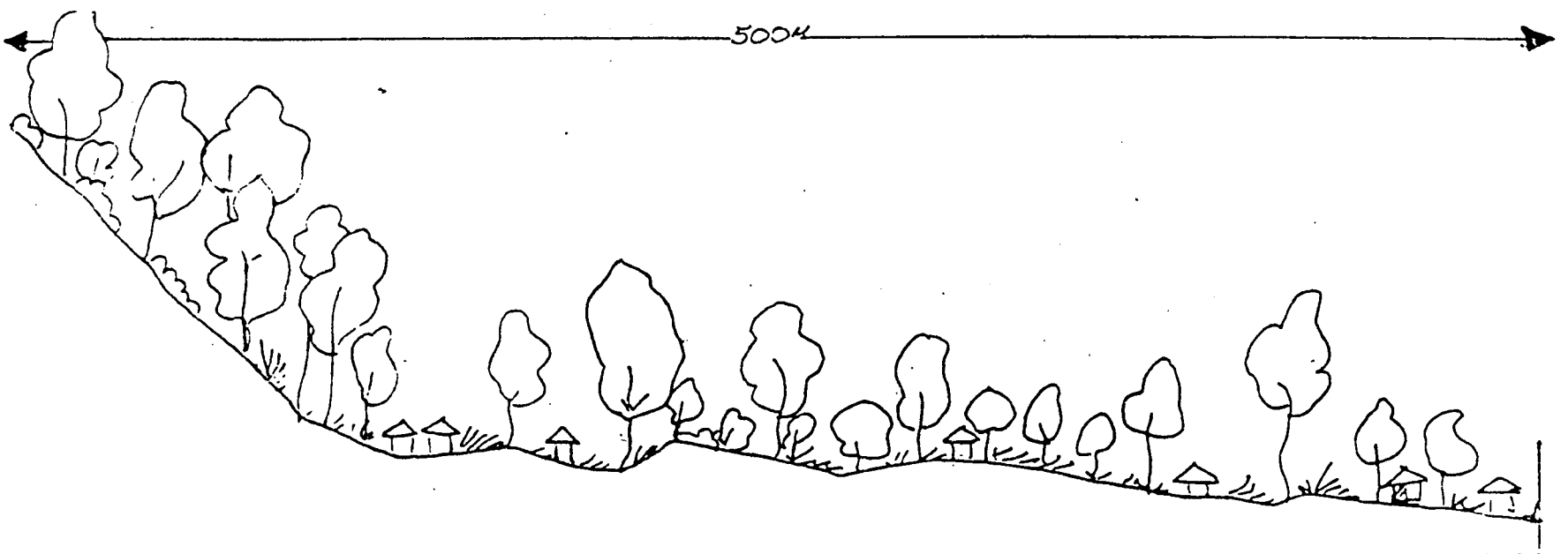
Vegetation	cleared Natural vegetation	Mixed garden	Weeds	Mixed garden	Plantation crops
Soil depth	Deep to Moderate	Shallow	Moderate	Moderate	Deep
Ground Water	> 5	1–5 M	1–5 M	1–5	1–5 M
Problems	Deforestation	Soil erosion	Weed invation	clearing for mono-cropping	–

Figure 6. Transect of Badalkumbura Mixed-garden area



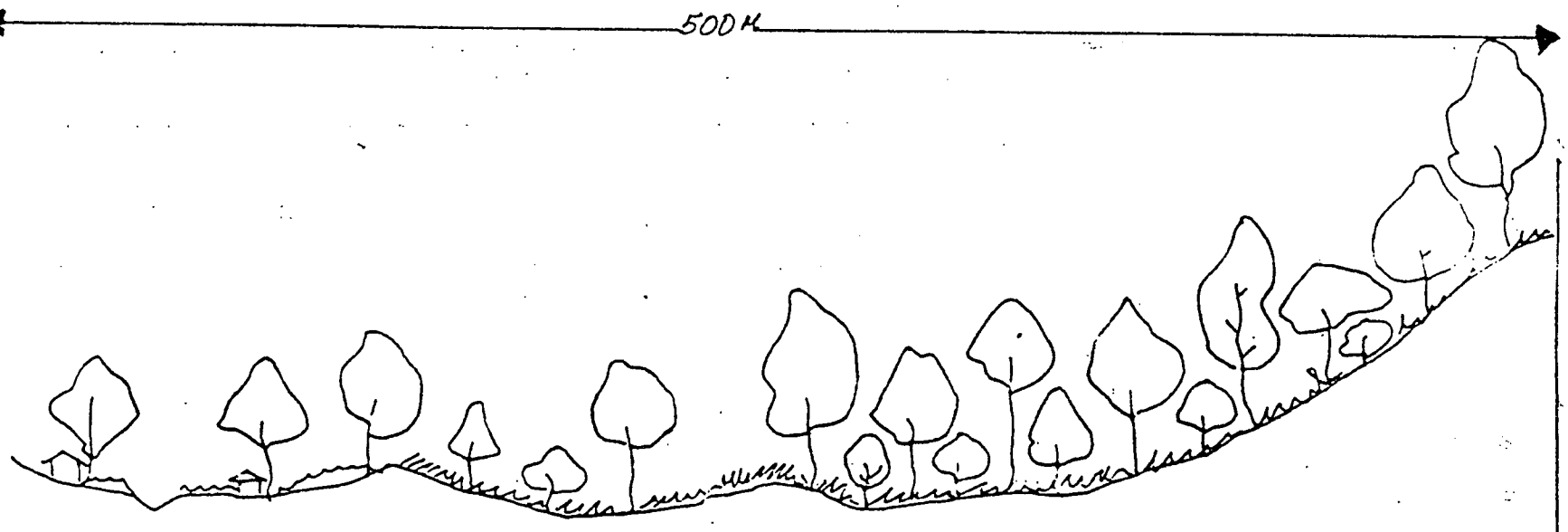
Vegetation	Savanna	Mixed garden	Reverine Vegetation	Mixed garden	cleared forest
Soil Depth	deep	Moderate	Moderate	Shallow to Moderate	Moderate
Ground water	>5	1-5	1-5	1-5	>5
Problems	Soil erosion	encroachment	Soil erosion	Gemming	weed invation

Figure - 7 Transect of Nakkala Savanna & Mixed-garden



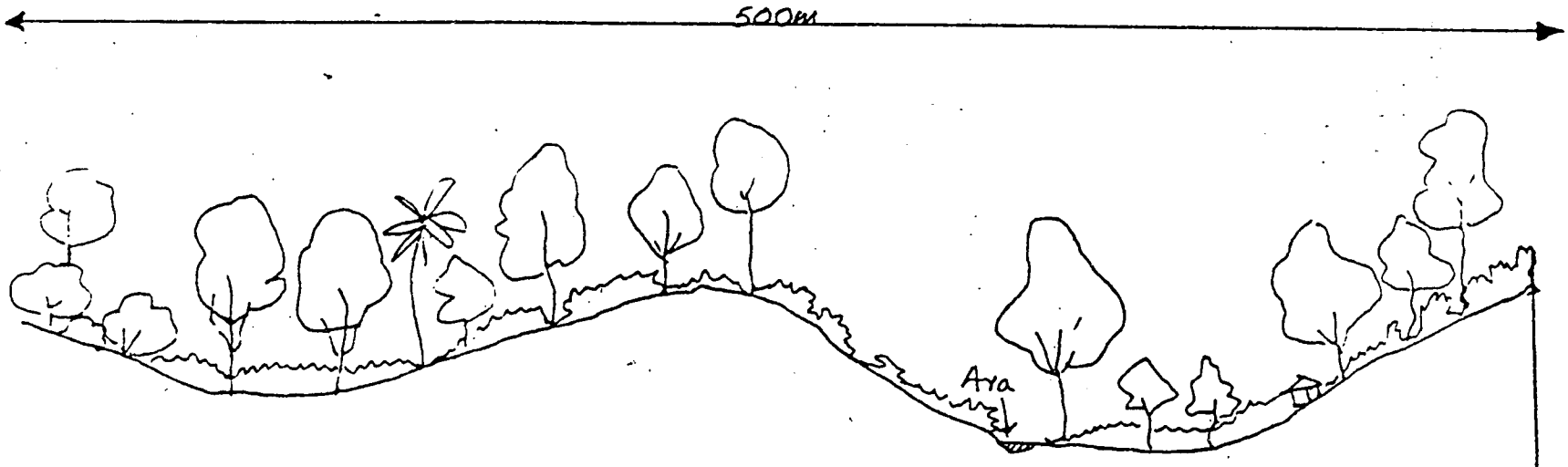
Vegetation	Natural Vegetation	Mixed garden	Mixed garden	chena	chena
Soil depth	Deep	Moderate	Moderate	Moderate	Shallow to Moderate
Ground Water	>10 M	>5 M	1-5 M	1-5 M	1-5
Problems	deforestation	encroachment	soil erosion	weed invasion	encroachment/ gemming

Figure-8 Transect of Okkampitiya encroached-gem area



Vegetation	mixed garden	Savanna	Savanna	cleared forest	Reserved forest
Soil depth	Shallow to Moderate	Moderate	Moderate	Moderate to deep	deep
ground water	> 5 M	> 5 M	> 5 M	5-10 M	> 10 M
Problems	soil erosion	forest clearing by fire	forest clearing	soil erosion	—

Figure - 9 Transect of Galbokka mixed-garden area



Vegetation	cleared Forest	Mixed garden	scrub jungle	Mixed garden	scrub jungle
Soil Depth	Deep to Moderate	Moderate	Moderate to Shallow	Moderate	Moderate to deep
Ground Water	> 5 M	> 5 M	1-5 M	1-5 M	> 5 M
Problems	Deforestation	Soil erosion	Weed invasion	encroachment	Deforestation

Figure - 10. Transect of Thampalawela encroached area

3.2 Environmental Problems

It was evident from both previous studies and the special transect surveys that Moneragala district is endangered by environmental problems stemming from its very nature being predominantly rural and agricultural. It is no surprise that urban environmental problems are negligible in the district, owing to the fact that of the total population in the district only 2.2 percent are urban. Moneragala is one of the few districts in the island with a very high rural population (94.8%) and together with the estate population (3%) almost all of the environmental problems are caused by economic activities in the rural-agricultural sector. Map 9 summarizes, major environmental problems that are found in all AGA divisions. Some problems are more acute and more localized in some divisions than in other. The major environmental problems in order of occurrence and magnitude are (i) solid erosion, (ii) chena cultivation, (iii) encroachment of forest and water resources, (iv) deforestation, (v) mono-cropping of sugar cane and tobacco, (vi) environmental sanitation and (vii) gem-mining. Most of these problems are interlinked or inter-related.
As shown in the map, environmental problems are most acute in four AGA divisions of the districts, namely, Moneragala, Siyambalanduwa, Buttala and Tanamalwila, which suffer from five environmental problems. The most common problem in the district is soil erosion and next three common problems found across the district are chena cultivation, encroachment of reserves and deforestation. Mono-cropping of sugar cane and tobacco is another problems which has occurred during past two decades and seem to become aggravated in a few divisions from very recent years. Gemming is localized in the southern and central part of the district and occasional landslides are found only in Badalkumbura AGA division

3.2.1 Soil Erosion:

In all transects surveyed soil erosion was identified as a very widespread and acute problem in the district. It is a combined effect of the other environment problems of chena cultivation, encroachment of reserves, deforestation, and mono-cropping which are caused by human activities. In the mountainous region of the north western part of the district, mass movement, gully, and rill erosion have occurred but most widespread type of soil erosion caused by clearing of land and burning the vegetation before the onset of the monsoonal rains annually. Clearing the land within a short period of time and burning the slashed jungle destroys the soil structure and makes it very susceptible to movement of the topsoil as thin sheet with run-off water. This is quite evident when one travels along newly cleared areas just after the monsoonal rains and all the water courses get reddish brown in colour as they carry a very high volume of soil particles in suspense. Although it has not been calculated for dry zone Sri lanka separately, it could be estimated that between 5-20 tones per hectare are washed away from these flat and undulating landscapes annually.
The very nature of chena cultivation does not encourage any soil conservation practices owing mainly to; (i) chena farmers not possessing title to land and (ii) lack of extension facilities to educate farmers in conservation practices. Encroachments of water reserves too contribute very highly to soil erosion. The aggravated effect of soil erosion is sedimentation of water bodies like, tanks, rivers, canal and other streams, which will lead in the long run to flooding in the low-lying area, and slowing down of investments on desilting of irrigation schemes will results in more and more land going out of cultivation.

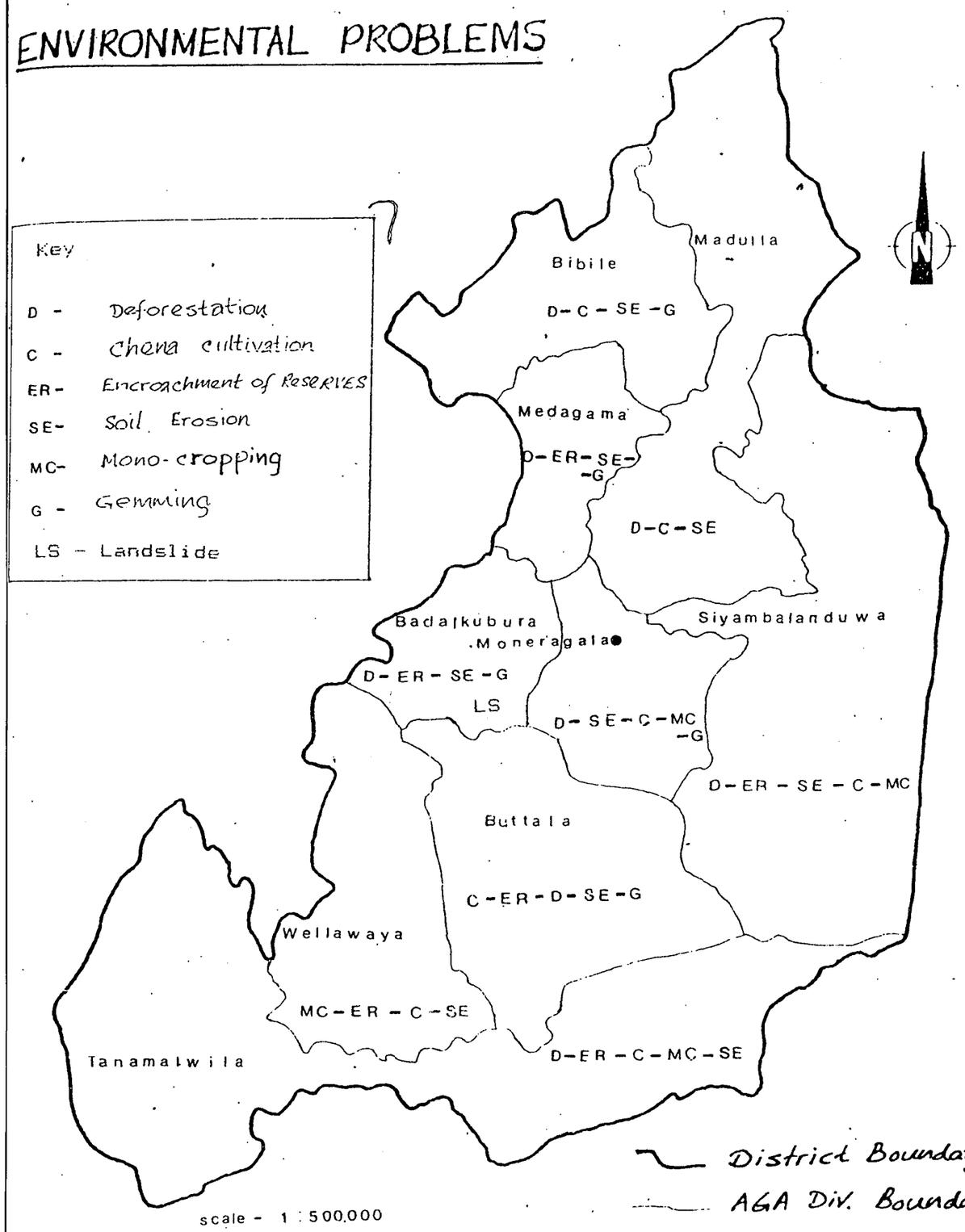
The neglect of repairs to the damage caused by soil erosion will result in much land going out of cultivation and/or any productive vegetation. The existence of a vast number of aliens (weeds) along all the transect surveyed, clearly showed the rapid colonization by uninvited aliens, which are either fire-climax or anthropo-climax and are not easy to eradicate in an attempt to re-condition the soils.

3.2.2 Chena cultivation:

Although the recorded extent of chena in the district is around 13,000 hectares, this figure should be even higher presently, owing to the high rate of migration into the district. Chena cultivation is the major factor in soil erosion and deforestation. The transect survey revealed that chena cultivation is quite widespread and more harmful to environment, especially because at present the traditional nature of chena has disappeared. With the increased pressure on land the long fallow has become impossible and shortened from 15 years to 2-5 years. This has made chena cultivation no longer a sound system and in turn it has become a negative factor in the environmental concerns, contributing to few other problems like deforestation and soil-degradation.

MONERAGALA DISTRICT

ENVIRONMENTAL PROBLEMS



Small-holders dominate the sphere of agricultural resource use in the District. The average size of a family holding is approximately 1.2 ha, of which over 1 ha is under rainfed farming or highland crops. However many households farm a chena plot in addition, which extents are obviously not reported to the authorities, since there is a ban on chena cultivation. Those who cultivate only chenas are about the poorest section of the community. The factors that compel the chena farmers to defy the authorities have been noted as "... typically those of population pressure constraining a viable from of chena cultivation, increasing costs of inputs and constraining market conditions for their output (poor terms of trade), weak supportive services, poor quality of inputs, indebtedness, few employment opportunities and poor social services. Al of these factors increase economic and financial burdens on the poor household, inducing them to encroach on marginal lands and catchment areas, exploit timber and other resources for added income, intensify cultivation without conservation and adequate nutrient replacement, and engaged in other potentially environmental hazardous practices. However, it must be stressed that the poor by their actions in this regard are not in themselves to be blamed, for they are the victims of the scramble to get cheap and exploitable public resources by richer commercial/public interests. Without ownership to land and other assets, or the ability to get access to more equitable terms of trade for their labour or products, environmental security and sustainable development." (MODES, pp. 28-29)

3.2.3 Encroachment Reserves

With increased pressure on cultivable land caused by, natural increase and in-migration of population, both forest and water reserves which account for a third of the total land area of the district have been threatened by chena cultivators. Although exact figures are not available it is evident from the transect survey, most of the river and canal reserves and some of the forest reserves (including savanna) have been encroached and cultivated either by chena crops or cash crops like sugar cane and tobacco. In the western and central hilly areas, even high slopes and hill-tops are encroached. No action whatsoever has been taken to rectify this environmentally harmful practice.

The encroachments on the catchment areas have been noted as one with far-reaching consequences. "Moneragala District comprises large extents of lands which are deemed catchment areas for reservoirs and basins feeding agricultural lands. Many of these feeder lands are located in adjacent districts under different authorities. Up to the present, there have not been any studies undertaken of the environmental effects of the encroachments in catchment areas in the Moneragala Districts. This means that planners and other officials who work in Moneragala do not have any benchmark data on the effects of changes in land use in these areas. However, the visible changes in water levels in tanks, as well as increased river flows to near flood levels during the rainy seasons, are cited as local evidence for these practices. Some of these areas include (a) lower reaches of the kirindi Oya; (b) Handapanagala Tank; (c) mid and lower reaches of the kumbukkan Oya; and (d) Muthukandiya Tank." (MODES, p.29)

3.2.4 Deforestation

The next most widespread environmental problem in the district is deforestation and it is directly inter-related into the other problems. In fact deforestation is an effect of extensive chena cultivation, and encroachment of forest and water reserves and in turn it causes the accelerated erosion of most valuable topsoil of the district. The continuous occurrence of soil erosion too, causes, in the long-run, further reduction of natural vegetation as denuded earth surface cannot give rise to a regeneration of original forest cover resulting invasion by aliens (weeds) or open soil. Deforestation would also cause earthslips, drying of springs, wells and water courses and silting of tanks, rives and tributaries as the chain effect of deforestation-soil 0rosion-sedimentation etc. The other adverse effects are reduction in soil-moisture and ground water conditions which will in the long-run result in negative alteration of micro-climatic conditions.

The development programs implemented during the past two decades which included large scale settlement cum irrigation projects, Divisional Development Councils' (DDC) projects in 19970's, District integrated Rural Development Program, and establishment of sugar companies, contribute to a considerable extent to remove the forest cover of the district rapidly. It is estimated that since 1956 the natural forest in entire Lower Uva region has been shrinking at an average of 16,000 hectares per year due to chena, logging, and development projects. Majority of this amount (round 10,000 ha. per year) is supposed to be applicable to Moneragala

district. The natural vegetation is now restricted to Yala and other forest reserves. Even in these areas the flora and fauna are endangered.

3.2.5. Mono-cropping

Causing a chain of environmental problems, the most recent practice introduced to the district is mono-cropping which is dominated by sugar cane and tobacco. The recently established three major sugar companies directly manage around 11,800 ha. of sugar cane and it is estimated that another 5000 ha. are cultivated by private outgrowers. The total area involved, thus, seems to be quite high and affects existing and abandoned chena and savanna forest areas which has made the chena cycle impossible and natural vegetation shrunk.

Environmental Impact Assessment (EIA) was not conducted prior to these massive mono cultivations showing the low priority in environmental consideration. Consequently, certain operations that have been taken by these companies have had adverse effects in the region; one serious impact has been the forceful exclusion of the local wildlife from the cleared areas which had ben the habitat of to wildlife (particularly elephants). This in turn has had an impact on surrounding settlements as wildlife has to cross the human habitats. The authorities are now finding solutions to these problems which is rather delayed consideration! Another environmental effect has ben the mismanagement of effluent from the plants which is allowed to escape into the river system.

Tobacco cultivation is the other commercial crop backed by Ceylon Tobacco Company which has serious impact not only on natural vegetation but also on cultivated area. As these cultivations involve a 'cultivation package' some farmer shave abandoned the traditional food crops and have turned to tobacco, converting some of the cultivable area plus hill slopes and hill tops which are not suitable for such crops, without adopting adequate solid conservation measures, resulting in serious soil erosion and sedimentation of water courses.

Mono-cropping is widespread in the AGA divisions of Thanamalwila, Wellawaya, Buttala, Moneragala and Siyambalanduwa. This large -scalae land use system has created the path to further deforestation, soil erosion, and displacement of wildlife. If one makes an estimate on the environmental degradation caused by mono-cropping, figures would be alarmingly high.

3.2.6 Gem-mining

The problem of gem-mining is prevalent in the AGA divisions of Buttala, Moneragala, Badalkumbura, Medagama, and Bibile. It is mostly practiced in the upper reaches of the river basins of Kubukkan-oya and Menik-ganga by both licensed and unlicensed operators. Gemming has become a major private investment activity, with investors and traders coming largely from outside the district. Only a fraction of the wealth generated by gemming remains within the district. the number of unlicensed gem-miners is very high in the district resulting in serious environmental problems. Even tough the removal of forest and use of explosives are prohibited and dug-up gem-pits are required to be filled up for environmental considerations, in practice, forest destruction and stagnation of water in unclosed pits have been quite evident in these gem-mining areas. The unclosed pits have provided breading habitats for the mosquitoes of malarial and other types. The illicit gem-mining has, thus caused severe damages to environment, namely, deforestation (Okkampitiya & Bibile), earthslipes (Badalkubura), damages to river basins and reservations (Buttala & Okkampitiya), and damages to paddy fields (Medagama & Bibile).
Gemmers have damaged river and canal banks in some locations causing siltation flow to rise and adversely affecting agricultural activities downstream. The most affected area is in Okkampitiya, where more than 25,000 persons are reported to be engaged in gemming operations on agricultural lands near to flowing water courses. Therefore gem-mining has not only caused short-term environmental sanitation problems and disarray in agricultural activities but also long-term solid and forest degradation.

3.2.7 Environmental Sanitation

Although environmental sanitation is now depicted in the Map 9 it is a common environmental problem in the district. Monergala is well below the national average in terms of a number of health indicators. Many of the most serious health problems in the district, particularly bowel diseases are related to the lack of safe drinking water and sanitation facilities. Previous studies show that nearly two-thirds of the population have no hygienic facilities for the disposal of human waste and only 11 percent have drinking water source that could be considered safe. Table 3.1 shows the toilet facilities in the district.

Table 3.1 - Type of Toilet by Sector

type	Urban percent	Rural percent
Flush toilet	0.7	10.0
Water seal	0.8	11.0
Pits	30.0	34.0
No facilities	64.4	42.4

The serious problem of total absence of latrines leads to open air defecation which is a common practice in rural areas linking into another chain of environmental problems. the fact that only 11 percent of the population have access to safe drinking water, further aggravates the problem of environmental sanitation. The main sources of the drinking water are tanks, rivers, and other open water bodies which are susceptible to contamination by human and animal waste that carry polluting sources like bacteria and viruses; and as the combined effect of both poor latrines facilities and unsafe water consumption,a series of water-borne diseases are widespread in the district.

3.2.8 Some Illustrative Cases

In the following pages are given certain cases illustrating selected environmental concerns in the Monaragala district, and what action is proposed or pursued. These cases are reproduced from (A) the Monaragala Environment Study and (B) Yala Park Project Proposal. The Yala proposal illustrates the need to take cognizance of certain environmental projects crossing district and even provincial boundaries for their proper planning and meaningful implementation. Also for (C) Yala Block 4 Environment Project, a brief description.

A1 Dealing with Encroachments in the Moneragala District

(1) Geelong Mountain: Aliyawatte

One case example of encroachment and response can be cited for the activities which occur very close to Moneragala town, on the abandoned rubber plantation of Aliyawatte and its upper reaches on the Geelong mountain. This area has been designated by the District Forest Officer (BFO) as a "Protected Area" for reforestation, but lack of enforcement or any efforts towards reforestation has not abated the chena practices on the slopes of the mountain by encroaches. [This practice was witnessed by the DES team the evening of the 26th of May, when a large section of the upper reaches of the mountain was set on fire in preparation of chena cultivation.] The Land Reform Commission has not permitted any lease of this land for any cultivation for fear of environmental effects. In any cultivation for fear of environmental effects. In fact a prior lease given to the former estate workers at Aliyawatte for two-acre plots following the abandonment of the estate was cancelled following a large fire on the upper reaches which caused considerable damage.

The case of Aliyawatte highlights a dilemma common in many impoverished regions in the district where certain groups of people do not have access to adequate lands of their own, do not have adequate employment prospects, and are financially unable to undertake any other form of productive enterprise which could yield a sustainable income. At Aliyawatte estate there are 8 settlements with around 350 residents, and nearby there is a village with around 200 residents. These settlements are isolated from Moneragala town despite being in fairly close proximity, for lack of good roads. The people here are also very poor given that they do not have sufficient employment or lands to cultivate. Many of the estate residents take outside employment, in the sugar cane fields for land owners, or as casual labourers elsewhere, but the amount of income obtained is very low. the villagers have access to some land of their own on the lower reaches of the mountain, but these lands are not large in extent. Furthermore, poor access to the market does not allow for easy transport of inputs or output. Chena is the easy way out since it involves few capita or labour inputs. And because there are few viable alternatives to this form of land use, especially among the abandoned estate residents, chena will continue. As a need for land intensifies, the extent of lands taken under chena will also like increase and the period of fallow will lessen. The end results of this practice is quick erosion of the lands and poor conservation in water catchment areas. The chena cultivators have been informed of their prominently harmful effects, but their

poverty situation does not permit much scope for any other forms of productive activity.

Under the MONDEP Estate Workers Development Project 2, assistance to the residents of Aliyawatte has been granted. This is primarily welfare oriented assistance but some efforts has been made in the planning of the project to secure lands for the residents. This has not been possible due to the protection of the lands by the LRC. The only viable alternative, both in productive and environmental terms, so far suggested has been the replanting of rubber by the state or a company with investment interests. This would provide employment in the future and secure al the fertility of the land. This is currently under negotiations with the Upali Group of Companies, which has applied for the lease for the lands from the LRC.

There are other similar cases of catchment lands being encroached by chena cultivators in Monergala district without remedial or well-planned action which would offer viable alternatives to the poor farmer of the region. Protection, encroachment and alternative livelihood need to go hand in hand for workable solutions to take place. In analysis of this sort, it is important to also investigate the particular socio-economic circumstances of the encroaches to determine what alternative solutions might be acceptable.

(2) Balaharuwa Catchment Forestry Project

One attempted such a solution has been made under an area development project initiated by MONDEP in the GS Division of Balaharuwa. Here, in catchment area of Balaharuwa tank, and afforestation project was introduced at the instigation by the local people of the area through the Balaharuwa Tank Society to protect the tank. A community forestry project was started to produce a number of different conservation species, such as margosa (Asadirachcha Indica, kolong (Adina Cordifolia), teak (Tectonia Grandis) and the woodapple (Feronia Minonia), but which also had used value for the local residents.

As attempted in the Balaharuwa programme for afforestation in the catchment areas, a general environment of species composition can be relevant. It was identified in the project that natural re-growth and succession in the catchment area was a solution to the tank problem, but this king of management might fail as encroaches will continue to cultivate. The other strategy, and the one which was adopted, was to plant a variety of indigenous species in compositions relatively similar to the ones which have formed in the natural forests. Thus the local genetic stock would be conserved.

(3) World Bank Afforestation Project

Another attempt at conservation, but on a much larger scale, has been the 'Forest Resources Development Project (FRDP)' funded by the World Bank. This project, started in 1984, plans to reforest an area covering 2835 ha. consisting largely of abandoned chena lands. This area has been deemed a protected zone, with the result that some families living in the region have had to be resettled elsewhere. Up to the present, 1,340 ha. of land have been replanted with several indigenous and other tropical species of plants. They include the following species; eucalyptus tereticornis, eucalyptus camaldulensis, Tectona grandis, Azadirecta ridica, and Albizia adorattissma. The species are not mixed.

The purpose of the project is to establish forests which can meet timber and fuel wood demands in the future. It was thus supposed that the villagers nearby could utilize the wood resources. However, some conflicts have ensued which has unfortunately delimited the project in its objectives. One conflicting problem is that half of the afforestation area has been suggested to become a part of a wildlife corridor between the Uda Walawe NP and the proposed Lunugamwehera national parks. This implies that much forest in the area will be protected against utilization. Fire has also been a problem as continuous burning in the surrounding areas have not been held in checked by the Forestry department and has spread into the plantation area. Replanting now has to be undertaken in some of the already planted areas. Finally, much of the area is covered with mana, guinea grass, and illuk. Control of the weeds has been difficult, forcing the FRDP into using heavy machinery for land preparation and to control the grass problem.

The FRDP has been one type of measure to protect the environment and catchment areas in that large forest area has been demarcated against encroachment. However, this has not entirely stopped the problem because of the inability of the Forest Department to enforce against all encroachment. This points to a need for a more direct attack on the poverty encouraging farmers to encroach, by providing other support services and community forestry, in combination with large afforestation measures.

A2 Wildlife and Protected Areas

The issue of encroachment and conflicts over and use also relates to the larger issue of national protection for wildlife and forest areas. This invariably is of major concern in Moneragala district since approximately 30%

of the total land area (126,000 ha.) falls under this classification.

(1) **Protected Areas and Sites**

The establishment of the protected areas have had a considerable impact on the land use potentials in certain area sin the district. They represent important resources for the nation and also for local people; however, up to now the local population (i.e. the vast number of poor rural residents) has only benefited to a minor extent from the establishment of such protected areas and land use conflicts are still a major problem.

The primary purpose of protecting nature in reserves is to sustain the original ecosystem with regard to both natural vegetation (tree and ground cover consisting of indigenous species) and the wildlife species and their natural habitats. Furthermore, the conservation of threatened animals, plants or ecological systems are in themselves criteria for selecting sites for protection. Concerning archaeological sites, the purpose of protection is to preserve the cultural inheritance.

The establishment of the national parks and sanctuaries in the catchment areas of Gal Oya and Uda Walawe, and the proposal to establish a national park in the Lunugamwehera catchment area, have been selected with human interests in mind. These areas will primarily serve as watershed management areas for protection against siltation of reservoirs. Thus the establishment of these national parks also serve as part of the irrigation management.

The management of the protected areas and sites vary with respect to the governmental agencies involved, legal land use, and public relations against illegal activities. The Department of Wildlife (DW) has a strict policy not to allow any settlements and agricultural practices within the national parks. Furthermore, it is a specific policy of the GOSL that no reserves be tampered with before the DW has been consulted. The Wildlife sanctuaries, on there other hand, may include some settlements and agricultural land. However, felling, clearing and construction of roads or buildings is prohibited in the state land sanctuaries.

Future expansion of existing protected areas and other changes to boundary lines may either resolve or lead to conflicts. Several changes currently being proposed are:

(1) The norther part of Gal Oya NP south of Mulegama can be reduced. This area is of special interest for agricultural activities and community development. It has also been suggested that further reduction can take place if the DW is the given more land outside the western boundaries of the park. However, the DW is not very interested to release this area for other purposes.

(2) Extension of the western part of Gal Oya NP east of Baduluwela has been suggested. This area has at an earlier stage been presented as possible land for a wildlife corridor (Nilgala). The exact location has not yet been formalised.

Several new areas are also proposed to be included in the system of protected areas (Fernando, 1988). These include: Luhugamwehera NP; Yala NP - Lahugala Wildlife Corridor (WC); Sellaka Oya Sanctuary - Luhugala WC; Nilgala WC between the Gal Oya and Maduru Oya NPs; and, Uda Walawe NP - Luhugamwehera Np and WC.

The Luhugamwehera Np will be the first to be established, probably in late 1989 or early 1990. The area is today inhabited by about 100 families and about 5000 cattle. The Forest Department also has 200 acres of forest plantation, consisting mainly of teak. Small tanks exist within the area. As the boundaries become fairly established the people will have to be resettled elsewhere. This has already raised some concern about adequate compensation and viable alternatives for the residents.

The first WC to be established will be the one connecting Luhugamwehera and Uda Walawe Nps. the boundaries have to be surveyed again since the WC should not cover established settlements in Balahuruwa and Kuda Oya areas.

The Nilgala WC was demarcated in 1985. It seems as if the corridor will not be established as originally marked due to development efforts already undertaken in the area. Detailed plans about the establishment of the other WC will probably be presented in the coming years.

(2) **Buffer Zones**

At present people are permitted to settle on the boundaries of reserves. This utilization pattern leads to problems, such as poaching, logging and chena cultivation within the reserves. In order to avoid land use conflicts, the DW has the legal right to establish a 1.6 km (1 mile) buffer zone surrounding reserves. The width of the zone is probably insufficient to prevent these activities, but they will help to constrain illegal land use.

DW officials argue that buffer zones of about 5 km width could stop most of the illegal activities, but there is yet political or public consensus to establish this legally. Work has been delayed in this respect because not all of the government authorities want to implement the strategy, claiming that such zones are not necessary where there are sanctuaries surrounding the national parks serving this function.

As it presently stands, the strategy has raised some conflicts over the best form of land use, with rural peoples interests in mind. Since the buffer zones would be located outside the protected areas, and yet have similar regulations as the protected areas, agricultural activities would be prohibited. This is not acceptable to the surrounding communities which view this land as valuable resource for exploitation.

(3) **Elephant Conservation**

The conservation of the elephant has been a primary aim of the establishment of protected areas in the district. However, a major problem is that the national parks are not as attractive habitats as the agricultural land, bringing into focus a conflict between man and animals over land use. Elephants cause particular problems in sugar cane areas situated near to the national parks, especially Sevengala and Pelwatte. Strategies for coping with these problems have been implemented with varying degrees of success. These include; (a) tank construction; (b) electric fences; (c) watch teams; (d) shooting; and (e) pasture establishment.

Tank construction:

In order to improve Yala NP as an elephant habitat, the DW has constructed 3 small tanks. More are being planned for restoration. At present, natural water resources are lacking, and the animals have limited access to water sources outside the reserve. The Pelwatta Sugar Company Ltd., has also funded restoration since they have several problems with elephants damaging sugar cane. The establishment of tanks will probably make it possible to lead elephants from Pelwatte back to settle in Block 3 and in so doing reduce migration.

Electric fences:

Electrical fences have been widely used to keep the elephants out of sugar cane areas with good success until recent civil disturbances resulted int he fences being destroyed. The DW has also suggested electrical fences to be erected at Sevenagala. The measure seems to be a good long term strategy.

Watchers:

Due to the problems of elephant migration into the sugar cane areas, the DW has placed watchers in the area to physically chase them away from and back to the parks. This strategy has arisen in response to the destruction of the fences.

Shooting:

The extreme example of elephant control is shooting. This is legal in so far as the elephants intrude upon private property and cause damage. However, there is also considerable poaching under the guise of elephants intruding. This is a more severe problem and one which the DW has difficulty in trying to control.

Pastures:

The establishment of water tanks within the national parks is not considered sufficient to keep elephant herds within park boundaries. Therefore, the DW is proposing other habitat changes, such as the creation of pasture lands, which will supplement existing habitat and thus improve the land capacity for elephants within the protected areas.

(4) **Illegal Use of Protected Areas**

Poaching inside the national parks is a major problem. According to officials, the only solution tot his problem is increased patrolling, but the DW lack the resource to provide sufficient protection, resources are lacking. The most urgent antipoaching equipment needed include camping equipment, binoculars, radio connection equipment and vehicles/motorcycles. Other facilities which could lead to a better management include the construction of staff houses, power generation at Park Headquarters in Yala, and domestic water supply at different places within the park. The DW has had discussions with NORAD about project cooperation.

Other legal land use activities inside the protected areas include logging, fuel wood collection, chena cultivation, gemming and the collection of food and medicinal plants. In the national parks these activities are not allowed. The DW faces serious problems with respect to illegal activities in both the Yala and Gal Oya NP's.

The Management of the sanctuaries is even more problematic as exploitative agricultural activities are permitted. Although three felling and the construction of roads and buildings are not allowed, there is a problem as to where to draw the line on what is an illegal activity and what is not since human settlement is permitted.

The measures taken by the NPs to controls currently in operation have very limited coverage. The areas they command are inadequately mapped and the shifting patterns of land use by surrounding communities are not closely monitored. The lack of protection in these areas pose a serious hazard for the conservation and environmental management of human use of valuable resources.

A3 **Changes in Land Use: The Case of Sugar**

Land use conflicts and changes in and use patterns have been most visibly demonstrated in Moneragala district with respect to the advent of large sugar cane companies and the vast expansion of monocropping systems. Sugar cane cultivation presently covers about 4.5% of the land area in the district. But the intensity of the operations and the rapidity of its introduction has brought about considerable changes, both positive and negative. The introduction of sugar industry also poses some environmental concerns, largely because of its scale of operation and multiple impacts in the region.

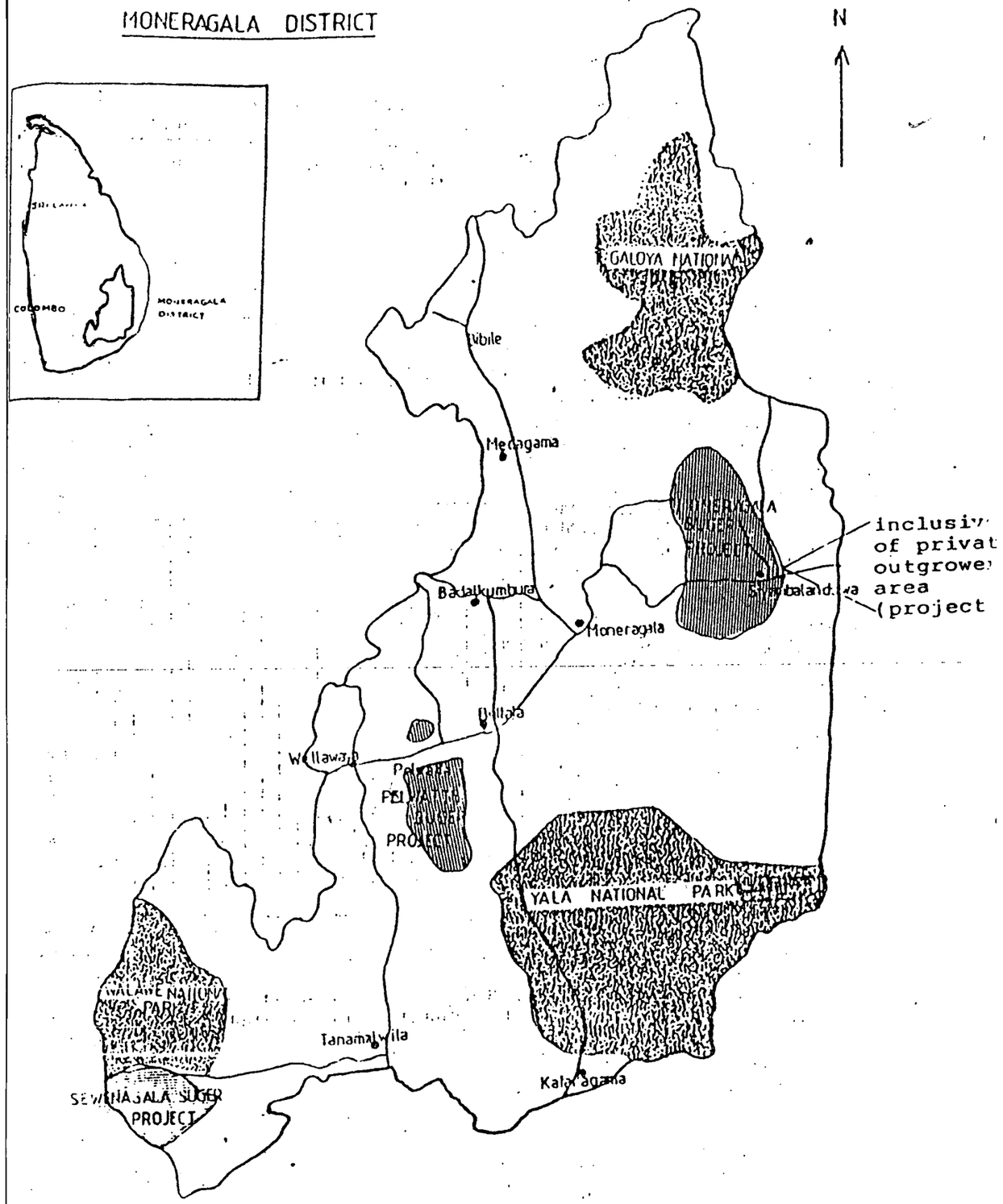
Three companies presently have land holdings in the Moneragala district; Pelwatta Sugar Company (PSC), Moneragala Sugar Company (MSC), and Sevenagala Sugar Company (SSC). MSC is currently not operational, due to political unrest. SSC is government-owned and operated. Pelwatta has both private and public investment holdings, though its operation is wholly private. This section looks only at Pelwatta, the largest of the three companies.

The expansion of sugar cane cultivation for the home market is an agricultural development initiative of the GOSL in order to reduce import dependence. This initiative started in 1950s with Kantale project, followed by the project at Hingurana. More recently the GOSL began producing sugar in Moneragala and Sevenagala, though this venture has been highly capital intensive at a cost of Rs.1000 million. Unable to finance more ventures of this scale in the district, the GOSL sought private investment to participate in the development of the industry with the expressed objective to serve the local market. Two international organizations entered into agreement with the GOSL setting up two companies, PSC, corporately managed by Booker Agriculture International (BAI) and MSC, managed by Mehta International. in total, the Sevenagala, Pelwatta, and moneragala companies directly control close to 9,500 ha. of sugar cane cultivation. This does not include thee large amount of land which is presently under cane held by private out growers. It is roughly estimated that this may total another 16,000 ha. (Dept. o Minor Export Crops, 1989).

At present, the government imports over 80% of the sugar needs of the country, but the GOSL is targeting to reduce this dependence to 50% by 1995 with the full operation of these five factories. That percentage,a t the moment, is the limit which government has set.

PSC was established at the end of 1981 in agreement with the GOSL as a commercial sugar cane producer and processing enterprise to provide for the domestic market. PSC is a public company with foreign equity participation. The largest share of ownership is vested in the GOSL (64%). The total project cost before loan repayments is estimated at Rs.2,677 million.

BAI was appointed as corporate managers with the task of both raising the finance for the project as well as developing and managing overall project operations. The includes managing a sister organisation, Pelwatta Settler Organisation Ltd.(PSO), which deals directly with the production process of the settlement farmers and registered outgrowers. Settler farmers supply approximately 35% of the cane. With the balance coming from the nucleus estate and local outgrowers. April 1989 data for cane - land inventory is given below.



MAP No.10 National Parks and Sugar Plantations

Table 3.2 : Cane-Land Inventory-

Source	In cane	Fallow	Total
Estate Nucleus	2,399	621	3,020
Settler	2,085	693	2,778
Registered Outgrowers	2,367	?	2,367
TOTAL	6,851	1,851	8,165

The total extent of cane produced for PSC in Moneragala is not precisely known because of the large number of unregistered private outgrowers who sell cane independently. However, PCS estimates this to be around another 1,100 ha. Cane is harvested annually. It will be replanted with every fifth season, after a plant crop and three ratoon crops have been harvested.

Cane is cultivated directly by the company within the nucleus estate through wage labour. Cane produced within the settlement areas is done on contractual arrangement between he settlers, who rent the land from the Sri lanka Sugar Corporation representing the GOSL, and the PSO. The land is prepared by the company and inputs (seed cane, fertilizer and herbicides), extension services and transport are amenities. Cane is purchased from the farmer at Rs.600 per metric ton. The average yield in 1988-89 in the settle areas was 76 Tc/Ha. Each settler cultivated 1.75 ha. under cane, with an additional .25 ha. for home garden cultivation. Registered outgrowers are eligible for loans, inputs and transport subsidies ranging from Rs100 - 165 per ton depending on the distance to the factory.

Approximately 100 kilometers of roads have been constructed by the PSC in the nucleus and settler ares, with a further 125 km of grass terrace drains providing in-field access. The plant consists of the factory, support structure, feeder reservoir tanks, evaporation tanks and personnel operations structures.

B. The Yala Park Project Proposal

(Submitted to McArthur Foundation, USA by Institute of Development Anthropology Inc. 1988)

The project description that follows is for llustrative purposes. It does not relate to the entire park area but rather to the western and north western portions which are most seriously affected by population encroachment and which include the most frequently visited section of the park (this is Ruhumna's Block 1 to which tourist travel is currently restricted). Although field surveys and discussions were carried out in Sri Lanka during August 1988, they were exploratory and represent no commitment to proceed on either the part of government or Sri Lanka or the Institute for Development Anthropology.

Although poverty is causing serious encroachment by low income people, approximately 10% of Sri Lanka's territory has been gazetted as national parks, strict nature reserves and sanctuaries. Of these the Yala complex in the southeastern portion of the country is the largest (560 sq. miles), most popular among visitors, and the most important in terms of wildlife. Kumana in Yala East, for example, is world famous for its waterfowl, while Block 1 in Yala West (Ruhuna) contains a relatively stable population of 20 leopards and 20 sloth bears in an area of about 54 square miles. Wild elephants vary in number from 200 to about 50 depending on the season, while the park complex also includes and mouse deer.

The most serious internal threat to Yala integrity according to park officials is too many "wild" buffloas. Though no censuses have been carried out, their number is estimated at about 5000, with the total buffalo population periodically increased by five large hers of domestic buffalo which are seasonally driven in to the park along with domestic cattle. Though no studies of buffalo impacts have been carried out the Department of Wildlife having no funds for such research, the park officials believe that they are having very determental effect on both range lands and water holes. according to their observation, perennial grasses are gradually being replaced by non palatable weeds while buffalo wallowing is adversely affecting water holes.

In addition to using it as a grazing ground for domestic buffalo and cattle. External threats to the park include poachong by local villagers, gemming, and increasingly, the implementation of Sri Lanka's second largest land settlement project. Though pached meat is available for sale in neighbouring towns, at the moment park personnel do not consider poaching a major threat. The same applies to pit excavation for gem stones in the sanctuary area. By far the largest threat, which can be expected to also increase both poaching and gemming, is the Kirindi Oya Project for which asian Development Bank is the major donor. Phase 1 of the kirini Oya Project, involving the settlement of 4,200 families in 18 hamlets, two villages and one town, has already been implemented. Though it has increased the density of people within ten kilometers of the western park boundary, it has not caused the settlement of the buffer zone between the western park boundary and Kirinda-Yadakandiya-Tissamaharama road. Currently this is relatively lightly settled although some 8090 villagers from Yodakandia and Tissamaharama have cleared rainfed fields and built houses in this marginal area during the past 10 years, with a number of farmers cultivating fields immediately adjacent to the Park boundary.

Kirindi Oya's Phase 2 will radically change this situation. Involving another 4500 households to be settled in 17 new hamlets and two villages, during this phase the left bank main canal will be extended into the buffer zone, placing land under irrigation for hundreds of settler households in the immediate vicinity of the park. Phase 2 will also cut off access of 100 or more elephants to the park, restricting them to a small pocket unable to meet their needs, hence practically forcing them to raid Kirindi Oya paddy fields unless they can be relocated to the Yala complex and the carrying capacity of that complex for elephant can be increased. Inspite of such expected impacts, no mention of the Park is included in the 1987 Asian Development Bank Appraisal nor is the Park included in the ADB maps.

Such was the situation that IDA found during its August, 1988 reconnaissance. Currently no agencies have the funds or the outreach to handle the issue involved. Though difficult, they are resolvable. An example relates to the buffalo problem. What is needed first are surveys as to the actual impact of buffalos on rangelands and waterholes, surveys which would produce figures on the extent to which the buffalo population should be initially reduced, and on an annual offtake thereafter. IDA would facilitate such surveys by identifying, preferably in Sri Lanka, the necessary scientific experties and then financing thee necessary surveys. Buffalo capture methods would also need assessment since past experience with noosing, us of tranquilizer darts, and the drives into stockades needs updating and adaptation to current conditions (stockades, for example, have been used for elephant but not, apparently, for buffalos).

Park officials believe that initially at least a thousand buffaloas should be captures, with several hundred to be captured on an annual basis thereafter. Disposal of these animals can be done in such a fashion that links the rural poor, rural development and conservation. Though some buffalo were captured on several occasions in the 1970s, those efforts faltered for two major reasons. On the first occasion the buffalos were trucked to a distant location (Kegalle). Not only did the local people not obtain them, but some died in transit hence antagonizing Buddhist priests and public opinion. though the next capture disposed of the surplus animals locally through an auction, again local farmers were not the main beneficiaries while public opinion was gain aroused when a number of animals were sold to butchers. The logical solution for the 1980s is to sell the surplus animals to local farmers for preparation of paddy fields and for dairy operations (it takes only about a week to "domesticate" feral buffalos).

While two wheel tractors are slowly replacing buffalos, hence reducing demand, buffalo dairying is on the increase. During Phase two of the kirindi Oya Project, for example, there is the intention to acquire 100 dairy buffalos per year. These could come from the Park. While pricing would have to equal capture and "domestication" costs, initial estimates indicate that local farmers would be able to acquire park buffalos at below market prices.

Buffalo sale should be restricted to villagers and Kirindi Oya settlers living adjacent to the Park so that they would se Yala as a "reservoir" of economically priced buffalos for their use. Other ways in which economic benefits from the park might favour the rural poor in the vicinity is through revenue sharing

whereby a portion of park proceeds are used to meet such immediate village needs as improved supply of potable water (through low-cost concrete ring wells, for example) and more accessible medical facilities. Park revenues, however, are insufficient to meet the needs of both the Wildlife Department and the surrounding population as they relate to park appreciation.The same goes for the funding requested by IDA from the McArthur Foundation. The solution is a stand alone project that links natural resource management to rural development for the surrounding population and which would be funded by an environmentally concerned donor.

McArthur funding would be used by IDA to develop such a project up the feasibility level, at which time it could be appraised and hopefully funded by a multilateral development bank (such as the ADB) or other donor. In the Yala case, key IDA personnel would be Kapita P>Vimaladharma and Thayer Scudder who have already worked together as a team since 1979 in evaluating the settlement component of Sri Lanka's largest development project -- The Accelerated Mahaweli Project. The project co-ordinator would liaise with such ministries as State (which includes tourism and wildlife) and Lands and Land Development (which is responsible for the Kirindi Oya Project); with the Assistant Government Agents responsible for administrating areas surrounding the park; with the National Research and Science Authority and the Central Environmental Authority of Sri Lanka; with the university system and such national research institutions as the Institute of Fundamental Studies; with rural development oriented NGOs and the small number of recently established environmentally oriented NGOs whose activities to date have been mainly concerned with reforestation; with the Buddhist hierarchy at Kataragama and other sacred sites near thee Yala complex; and with such local organizations as welfare and temple societies and water user and other producer association.
The Project Co-ordintor will obtain project approval from thee government of Sri Lanka, and second, to obtain the cooperation and the interest of the various organizations previously mentioned and to work with Scudder in recruiting and supervising the necessary research personnel, in designing the Yala Project for donor funding, and in devising and appropriate trianing and educational programme for collaborating officials and the public. How to ensure local participation will require special attention since currently the surrounding villagers do not see the park as providing benefits to them as opposed to tourists and the government.

In addition to Kirindi Oya settlers, the local population is associated with four population centres. These are Kirinda, Yodakandiya, Tissamaharama and Katargama. Kirinda is primarily a marine fishing village, whereas Yoda and Tissa are farming communities immediately below large ancient irrigation tanks which will be incorporated with the Kirini Oya Project. Kataragama is one of the Sri Lanka's holiest sites, with ancient temples along the Menik Ganga (which flows south to the Indian Ocean through Yala National park) sacred to Buddhists, hindus and Muslims alike. Recently the Government's Town and Country Department has designed and implemented a plan integrating new town of Kataragama with the neighbouring religious complex, and currently the same department is working on a similar, though much less ambitious, plan for Tissa. The integration of ancient religious complexes with commercial centres sets a precedent which could be expanded to include such natural resources as Yala National park and the upper catchments of the kirindi Oya and Menik Ganga, and such large government projects as the Kirindi Oya Settlement Scheme.
Perhaps the most difficult component of IDA's Yala proposal will be to integrate the residents of these four areas, and of the Kirindi Oya Settlement Scheme, into a natura resource management plan. Funded through the IDA proposal, social surveys will be necessary to elicit information not just on attitudes toward the Park, but on the kind of benefits which will generate a willingness to protect the Park form both local poachers and gemmers and From outsiders. Appropriate institutions to represent local interests as they relate to management issues must also be identified and assisted, and educational programmes for adults and children alike must be designed and institutionalized.

(written by Prof. Thayer Scudder, Institute of Development Anthropology, Inc.)

C. Yala Block 4 Environment Project

In August 1991, largely resulting from the recommendations of NORAD Environment Study of 1989, NORAD funding of Rs.12 million was made available for the Yala Block 4 Environment Project. Phase

I of the project, which is currently underway includes;
a)habitat enrichment by planting elephant fodder such as grass and wood-apple trees.
b)Renovating 6 abandoned tanks as a source of drinking water for the animals;
c)constructing 120 kms of jeepable roads, providing access to the park area.
d)Driving the elephants which roam the adjacent villages, into the park area.
e)a sub-office of the Wildlife Conservation Department for Yala Block 4 area.
f)enhancing the capacity of the WLCD by providing a tractor and double cb for transport of staff and materials.

In the later phases of the NORAD Environment Project, support for (a) community participation and (b) institution-strengthening of the DEA, are envisaged.

3.3 Environmental Issues

Four sets of issues emerge from the geographical features of the district, from institutional changes in regional administration,form macro policies regarding resource mobilization and from socio-economic conditions of the people in the Moneragla District.

3.3.1 The geographical setting

The fact that the location of natural resource, vegetation, fauna, and population flows occur irrespective of and even in disregard of specific political and administrative boundaries, is a fact that must be reckoned with. Whilst the sources of some rivers are either located or traverse the monaragala district, whilst the river utilization remains within the purview of another administrative district, is an example. The environmental concern of the upstream district is quite obviously different from that of the downstream district. Population flows between neighboring districts have at times been exacerbated by certain political events whilst the same events have also halted such flows.

How does one deal with such cross-boundary issues/ is an important concern in environmental planning and implementation.

3.3.2 Regional and local perspectives

The fact that enlarged regional entities in the form of Provincial Councils have recently been established, with powers and responsibilities for environmental management too, needs to be reckoned with.
Since powers in regard to general administration and coordination and over the control and regulation of the exploitation of natural resources are being further decentralized to Divisional Secretariats, the question of integrating divisional level activities into the district and the provincial levels, will loom large in the immediate future. Mechanisms that are evolved to the immediate future. Mechanisms that are evolved to harmonize conflicting interests of local political leaders, community members and planners and administrators will determine the fate to the environment and sustainable development.

3.3.3 Macro Policies:

Certain macro policies which haver critical environment concerns, are often not integrated within themselves nor with the environmental aspect. Two examples may be cited:

a) Irrigation development, resettlement, and agricultural development are three sectors which have strong environmental consideration. If one takes an area such as Siyambalanduwa AGA division, one cannot escape the observation that certain projects which al claim to deal with the environmental problem of chena cultivation, either directly or indirectly, are likely to meet with only partial success. The Mutukandiya Dry Farming project has no irrigation component, but farmers demand food security and subsistence paddy; Australian Community Aid Abroad project concentrates on irrigation rehabilitation, but lacks a chena stabilization element the FFHC's irrigation renovation-cum-reinfed project is weak in settlement planning; the intrusion of sugar plantations into the hitherto peasant sphere of chena cultivation, is currently facing political protest and social tensions. The overall effects of such disparate projects in the same Siyambalanduwa division, is something worth examining in the environmental context of chena cultivation and deforestation.

b) Another sphere in which policy goals of different sectors and interest groups are at conflict is in relation to wildlife conservation and settlement expansion. The usual policy stance is that the two objectives are discongruent, one gaining at the expense of the other. However, an alternative, and unorthodox view might be that settlers be taken into confidence, given an economic status in the protection of wildlife natural vegetation, where men and beast and trees are not seen as rivals but as mutually benefitting entities.

3.3.4 Environment Conservation and Poverty Alleviation

Aggravating poverty conditions would further accelerate environment degradation. No doubt most development and welfare programmes are directed to the amelioration of the conditions of the poor and the disadvantaged groups, and meeting the basic needs of the people such as food, employment, housing, health etc. However, there is an urgent need to integrate the various development programmes so that the socio-economic imperatives can be harmonized with environmental conservation and sustainable development.

4. EXISTING ARRANGEMENTS FOR ENVIRONMENT PROTECTION AND MANAGEMENT

4.1 The Legislation

The problem in Sri Lanka is not so much the lack of laws relating to environment protection and conservation, but the absence of their enforcement. As against the very limited objectives of resource and environment protection which matter in the past, the present day demands on the existing laws have been quite heavy and their inadequacies and weaknesses became exposed. This situation led to the promulgation of additional and modern environmental laws in the 1980s, the centre piece of which is the National Environmental Act of 1980. A list of the key legislation relating to natural resources and environment conservation and development is given below. No less than 75 statutes are reported to be available to deal with environmental subjects. (Wijayadasa and Ailapperuma 1986).

The chief features of these laws are.

a) fragmented and evolutionary nature. In the part laws were enacted to deal with specific problems, eg. wild life, forests, rivers, land, as they emerged from time to time. There was thus no comprehensive law that dealt with multiple and related components of the environment.

b) new laws generated new institutions, at the time they were promulgated such as Forest Department, Wildlife Department, Lands Department and the responsibility for environmental aspects was thus distributed over many departments and institutions. Often some parts of one law was in conflict with another law, thus weakening their enforcement and resulting in procastrination between competing departments.

c) staff, equipment and resources made available to the institutions entrusted with the administration and enforcement of these laws, did not match the enormity nor the urgency of the problem which meanwhile kept on increasing in scale and intensity.

4.1.1 Key Environment-Related Laws

Land/Water

1) Land Development Ordinance No.19 of 1935 (last amended in 1983) - systematic development and alienation of state land. (Land Commissioner's Department and Provincial Councils)

2) Crown Lands ordinance No.8 of 1947 (and later amendments)
   - hgt for roads, streams etc. (Land Commissioner's Department/Provincial Councils)

3) Crown Lands (Encroachments) Ordinance No.12 of 1840 later amendments)
   - prevention of squatting on state lands (Land Commissioner's Department/Provincial Councils)

4) Agrarian Services Act No. 58 of 1978.
   - raise productivity of agricultural lands by enforcing good management standards, tenurial security, and providing institutional arrangements. (Commissioner of Agrarian Services & Provincial Councils).

5) Mahaweli Authority of Sri Lanka Act No. of 1980 (MASL)
   - irrigation-agriculture-settlements; hydropower, forest and wildlife reserves

6) Irrigation Ordinance of 1900 (amended in 1968)
   - construction and management of reservoirs, canals; drainage schemes. (Irrigation Department)

Natural Resources

National Aquatic Resources Development Act No. 54 of 1981. (NARA)
National Resources, Energy and Science Authority Act No. 78 of 1981 (NARESA)
Fisheries Ordiance of 1940; (Fisheries Dept.)

Geological Survey
- investigations into mineral resources. (Geological Survey Department)

National Heritage Wilderness Act of 1987.
- preservation of rare eco-systems (Forest Department/Wildlife Conservation Department)

Fauna and Flora Protection Ordinance NO.2 of 1937 (and later amendments)
- controlling gaming; establishing wildlife sanctuaries. (Department of Wildlife Conservation)

Forest Ordinance (cap.311) of 1907 (amended in 1966, 1979, 1982)
- protecting forests; reforestation; forest reserves. (Conservation of Forests) Water Resources Board Act No. 29 of 1964.
- advisory; studies (Water Resources Boar) Mines Minerals Law NO. 4 of 1973.

Industries
Factories Ordinance No.45 of 1942 (amended form time to time)
- safety, health & welfare of workers (Labour Department)

Greater Colombo Economic Commission Act of 1978 (GCEC)
- establishing expert industries and control of effluents National Buildings Research Organization, Ministry of Local Government.
- monitoring industrial pollution and waster disposal Ceylon Institute for Scientific and Industrial Research.
- research into technology and industrial pollution

Sri Lanka Land Reclamation and Development Co-operation Act No. 15 of 1968 (amended in 1976, 1982).
- reclaim marshy lands for industries, commerce & housing.

Tourist Development Act No. 14 of 1968.

Coordination/Control

National Environment Act No. 47 of 1980 (amended in 1988) (CEA)
- coordinating advisory; regulating pollution; enforcing Environmental Impact Assessment.

Town Country Planning Ordinance of 1946 Urban Development Authority Law No. 41 of 1978 (amended in 1979,1980,1982)

Prevention

Food Act No.26 of 1980 (Health Department)
- food contamination

Control for Pesticides Act no. 33 of 1980 (Agriculture Department)
- Use and sale of pesticides

Plant Protection Ordiance of 1924 (Dept. of Agric.)

4.2 The National Institutions

The various institutions charged with the responsibility of administering the environment-related laws, were set up as independent institutions with little coordination of policy, planning or implementation of their work programme. 70 institutions dealing with environment have been reported (NORAD, 1989). What is given below, therefore is a very brief statement of the institutional framework for environmental action, and their status as at present.

The Sri Lanka Constitution of 1978 in article 27 914) states that, "The state shall protect, preserve and improve the environment for the benefit of the community", and further in article 28F stresses that, "The exercise and enjoyment of rights and freedom is inseparable from the performance of duties and obligations and accordingly it is the duty of every person in Sri Lanka to protect and conserve its riches".

The Central Environmental Authority is the focal institution, and has been placed from 1990 under the project Ministry for Environment, within the Cabinet Ministry for Parliamentary Affairs and Environment. CEA consists of 3 members including the chairman, appointed by the President of Sri Lanka.

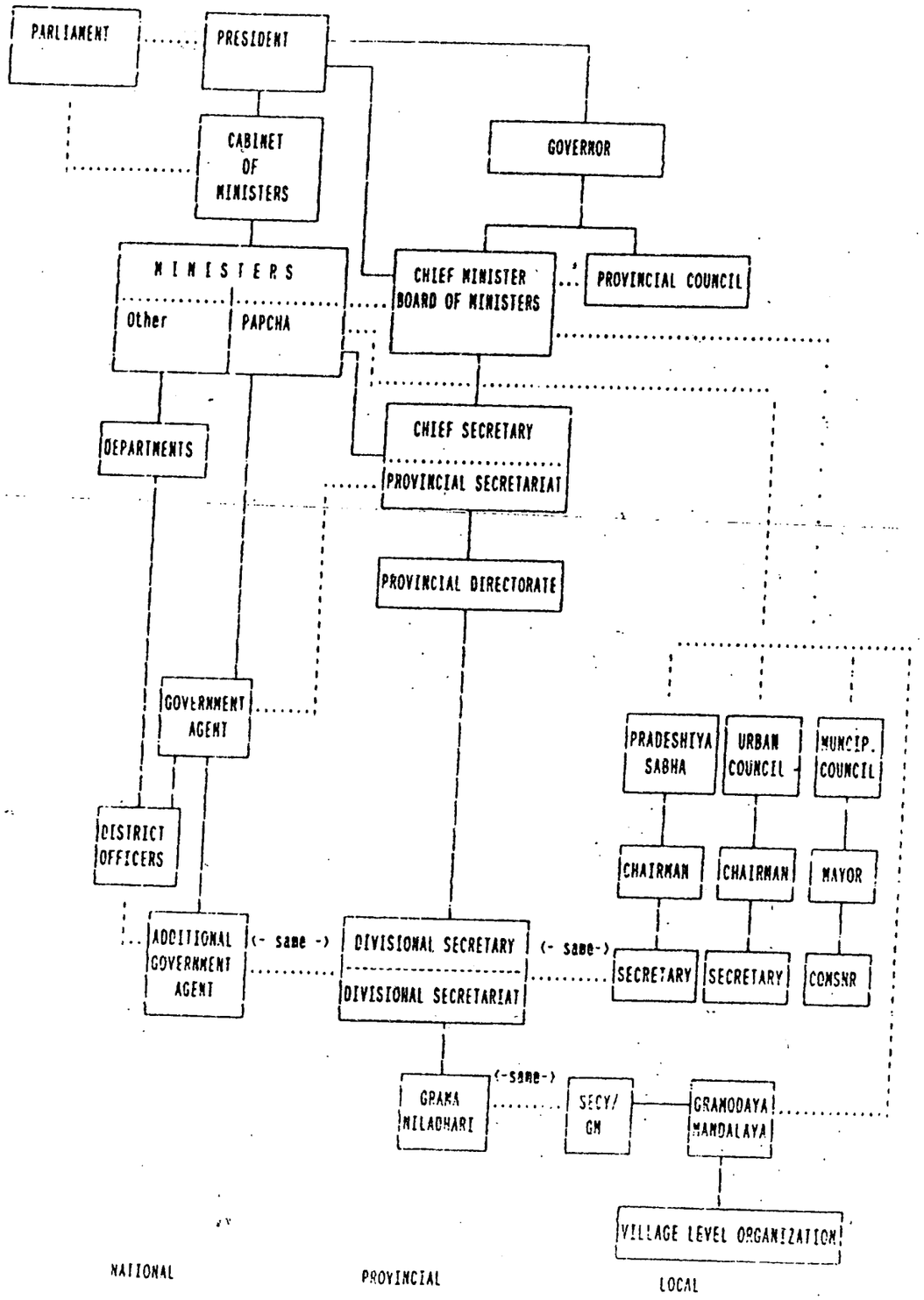
It's objectives are:
a) protection, management and enhancement of the environment
b) the regulation, maintenance and control of the quality of the environment
c) prevention, abatement and control of pollution.

An Environment Council of 30 members (of whom 7 represent NGOs and other representing different ministries) advise the CEA. At District level, a District Environment Agency chaired by the Government Agent of the District deals with some aspects of monitoring the environmental damage, and functions as an advisory body ad liaison agency for CEA.
CEA is indeed a pre 13th amendment institution. Under list A of the 13th amendment, a Provincial Council has the right to protect environment within its boundaries for which purpose it must be permitted by an Act of Parliament. The Northwestern Provincial Council enacted its own Environment Statute in 1991, and this was tabled before Parliamentary Consultative Committee. The statute is a replica of the CEA act. NWP Council has now gazetted regulations under the statute. The effect of these regulations have not yet been tested in court. Uva PC within which Moneragala District falls, has yet to take a similar initiative. Apart from monitoring and coordination and initiating/supporting environmental activities, CEA has since 1989, begun to enforce Environmental Impact Assessment of all development projects, and to enforce regulations regarding industrial pollution, particularly in and around Colombo.
The subject of land, irrigation, forests and wildlife and the institutions dealing with them fall within the purview of the Ministry of Lands, Irrigation and Mahaweli Development. Even then, when it comes to land-use panning the responsibility for surveys and studies is split between the Land Use Division of the Irrigation Department and the Land and Water Use Division of the Agriculture Department, whilst planning function is vested in the Land-Use Policy Planning Division of the Lands Ministry.

The functions relating to agriculture, export crops (other than tea, rubber & coconut), fumigation, pesticide control, agrarian services, livestock and veterinary services are handled by Departments and institutions under the Ministry of Agricultural Development and Research. The subject of marine and fresh water fisheries is handled by the Ministry of Fisheries and Aquatic Resource. Coast Conservation Department has recently been transferred to the Defence Ministry.
The Ministry of Health and Womens Affairs deals with the subjects of communicable disease control, community health and sanitation, a food hygiene, medical research and special programms for women. National Water Supply and
Drainage Board under the Ministry of Housing and Construction handles drinking water supply schemes in urban and rural areas in association with the local authorities such as Municipal/Urban Councils and Pradeshiya Sabhas. National Buildings Research Organization, under the Ministry of Housing & Construction undertakes research and surveys on industrial waste disposal and industrial pollution in the urban centres.

Industrial growth is the responsibility of the Ministry of Rural Industrial Development, and of t he Ministry of Industries and Scientific Affairs. The Ceylon Institute for Scientific and Industrial Research and NARESA function under the latter ministry. On the other hand, Foreign Investment Advisory Committee in the Finance Ministry approves the projects, whilst the Greater Colombo Economic Commission regulates the setting up for export processing within industrial zones. GCEC also regulates and monitor the environmental effects. Under the Industries Ministry, public corporations manage industrial production of tyres, steel, cement, petroleum refining, ceramics, paper, leather, mineral processing, whilst milk, animal feeds, alcoholic, textiles, beverages are under other ministries. The private sector too engaged in the light industries and manufacturing sector.

FIGURE 2.11: STRUCTURE OF GOVERNMENT ADMINISTRATION



PAPCHA - Minister of Public Administration, Provincial Councils & Home Affairs

4.3 The Sub-national Institutions

From 1989, many powers and functions of the central government were devolved on 7 newly created Provincial Councils. Environment management is one such function devolved. 13th amendment to the constitution creating the Provincial Councils, specifies environment management as a concurrent subject. However, the Provincial Councils have not yet developed the capacities to exercise all the devolved powers. In the future, environmental planning, management and control will have to reckon with the Provincial Councils except in so far as any matter, as water resources, wildlife and forest reserves, crosses provincial boundaries, in which event, it becomes a responsibility of the centra government. Since the subject of the environment straddles most sectors and ministries, it will remain primarily a central government function.

For implementation purposes, the 3 separate functions of (a) central government, (b) local government (Pradeshiya Sabha) and (c) Provincial Council are gathered at the divisional level where a Divisional Secretary-cum-Additional Government Agent-cum Secretary to Pradeshiya Sabha, as a multipurpose officer coordinates virtually all activities and implements many programs. Similarly at sub divisional level, a Grama Niladhari (village officer) functions as the next and terminal level as a multi-purpose officer, covering an area inhabited by about 250-300 families which is usually coterminous with a small village. There are about 300 Divisional Secretaries/AGAs and 14,000 Grama Niladharis in the country. At each Grama Niladhari division, there will be set up a Gramodaya Mandala (village-awakening Board) which will comprise of the heads of all NGO and informal organizations in the village, with an elected chairman and the Grama Niladhari as ex-officio Secretary.By these measures administration has been brought closer home to the people.

4.4 District Environment Agency

In each of the 25 administrative districts, CEA has established a District Environment Agency, under the chairmanship of the Government Agnt. DEA consists of 6 to 7 other members, who are district heads of environmentally related departments, whilst the Asst Com. of local Gove. functioned as the Secretary, during the early years.From 1991, the membership has been expanded and even altered.

The Moneragala DEA has the following as member

a) Addl. Government Agent, Moneragala, Secretary
b) Divisional Forest Officer
c) Game Ranger,WLD
d) Regional Director of Education
e) Project Director, IRDP, Moneragala
f) Regional Director of Health
g) District Land Use Planner
h) Regional Manger, State Gem Corp.
i) 9 Addl. GAS/Divisional Secretaries

The scheduled meetings are usually held quarterly, and minutes kept and circulated.

The function of the District Environment Agencies (s specified in section 9 of the national Environment Act No. 47 of 1980) are as follows.

(1) Collection of data and information at the district level on the environment and natural resources.
(2) Investigate the district level implementation of field programmes of the Central Environment Authority.
(3) Submit proposals for the predication and management of the environment following investigations on the environmental impact of various government and private projects implemented in the district.
(4) Keep the Central Environment Authority informed promptly about events substantially connected with the environment and especially with potential adverse effect to environment and natural resources.
(5) Conduct reviews and inspections on environmental issues and matter referred to the committee by the Central Environment Authority.
(6) Plan and implement a programme which increases the awareness of the environment at the district level with the approval of the Central Environment Authority.
(7) Assist the Central Environment Authority in conducting a study and survey at the district level and implement research projects in the district.

Constituted as a coordinating body, DEA has no staff no resources of its own to carry out even the limited

functions entrusted to it. It is a committee of officials mostly. Who are full-time engaged on their own parent departmental functions. Spheres of environment-related action in which DEA has been most successful are (a) awareness programs, (b) school based programs such as celebrating World Environment Day, (c) tree planting campaigns.

In the list A are given the important topics that were discussed by DEA at its meetings from 1986 - 1989. It illustrates helplessness of DEA to deal with certain pressing problems in the area, such as illicit forest clearings, illicit gemming, adverse effects of large scale development projects, or the inordinate delay which occurs, in drawing attention of the relevant authorities.

Perusal of List B, shows that many environment matters were taken up at the District Agricultural Committee. Such matters were: prevention or regulation of encroachments, dealing with illicit forest clearings, elephant damage to cultivations etc. DAC has adopted a much broader perspective on environmental questions, for example, when provision of alternative lands to Geelong mountain encroaches was made.

School Environment Pioneer Brigades were started in 1987 in some schools in the district with the objective of creating an environmental awareness among school children and as a channel through which the environment message was taken to the community . Thee groups took a leading role in the tree planing campaign and in celebrating the World Environment Day. However the program had short-timed success largely because DEA was not able to give much financial or institutional support.

In the district, there are hardly any environment NGO. The directory of NGOs in the island,who are registered with the CEA has no entry for the moneragala district for 1990. (Vimaladharma, 1990). Therefore one does not find a representative of NGOs in the membership of the DEA.

LIst A: Matters discussed at District Environment Agency Meeting 1986 -1989

	Major Topics Discusses		Decisions and Dates
1.	World Environment Day		
	a)	Tree Planting in Govt office premises	- proposed (07/05/86)
	b)	Oratory Contest amongst Gramodaya Mandalas	proposed (07/05/86)
	c)	Oratorical contest and posters competition	-discussed (23/09/87) (28/10/87) (27/05/88) (24/04/89)
2.	Tree Planting Week	a)	Programme discussed (24/04/89)
		b)	Distribution of planting materials to villages proposed (23/09/87)
3.	Seminar & Fields visits on environment matters		Program Proposed (07/05/86), (11/03/87)
4.	Environment Education		Propose to prepare and distribute handbook on forest conservation to school children (11/03/87)
5.	Transaction of District Environment Committee	a)	Call for Eia reports from CEA (07/05/86)
		b)	Exchange DEA minutes with other districts (07/05/86)
		c)	Call for list of NGOs registered with CEA

			(30/09/86)
		d)	Appoint a District Representative from State Timber Corp. to DEA (08/12/87)
		e)	To establish school Env. Societies (23/09/89),(28/10/89)
		f)	To establish Env. Extension Committees with NORAD aid (23/09/89)
6.	Wildlife Conservation	a)	Proposed an office in Monaragala of WLC Dept. (09/30/86), (18/12/86)
		b)	Discussed problem of destruction of wildlife (28/10/88)
7.	Forest Conservation	a)	Request Forest Dept. to provide maps showing during boundaries of forest reserves (09/30/86); Since no response from Consentor of Forest, attention of CEA was drown (18/12/86)
		b)	To obtain air photos to prepare situation report on forest resources (08/12/87)
8.	Illicit Gemming in reserved ares	a)	To address the relevant heads of Depts. (08/12/87)
9.	Environment effects of large scale development projects	a)	palwatte Sugar Project and need for soil conservation,damage to roads, need for other food crops (07/05/86)
10.	Environmental pollution from		To call for report from industrial waste Director of Industries (27/05/87)
11.	Tobacco cultivation	a)	Discuss ill-effects on environment (08/12/87)
		b)	Draw attention Director of Agriculture (28/05/87)
		c)	Draw attention of Ministry of Industries (27/02/88)

Source: Minutes of DFC, Kachcheri, Moneragla

4.5 Recent Changes

Recent development have transformed the once passive DEA into an active environmental agency. These are

(a) appointment of a District Land-Use Planner from 1989.
(b) establishment of a Core Group for directing and overseeing enforcement work in 1990.
(c) establishment of an Environment Cell in the Kachcheri.
(d) Implementation of NORAD funded Yala block 4 project in Aug 1991.
(e) Establishment of Divisional Environment committees in 1991, inn the 9 Divisions.

Figure 14 shows the compositions of the several bodies concerned with environment development and protection.

Figure 14: Composition of Environmental Bodies, Moneragala District

Designation	DEA	Core Group	Cell	Divisional Env. Agen.
1. Govt. Agent, Moneragala	Chairman	Chairman	-	-
2. Addl. GA, Moneragala	Secretary	Member	Head	-
3. Divisional Secretary/ Addl GAs of Divisions	Member	-	-	Chairman
4. Suptd/Asst. Suptd of Police	member	member	-	-
5. Divisional Forest Off.	member	member	member	-
Forest Beat Officer	-	-	-	member
6. Game Ranger, WLD	member	member	member	-
7. Regional Director Education	member	member	member	-
Chief Educ. officer/AD	-	-	-	member
8. Director Planning Moneragala	member	-	-	-
- Asst Director	-	-	member	-
- Planning Officer	-	-	-	member
9. District Land Use Planner	member	-	member	-
10. Regional Director of Health	member	-	-	-
DMO/PHI	-	-	-	member
11. Regional Manager State Gem Corp.	member	member	-	-

5. ENVIRONMENTAL PLANNING

5.1 National Strategy

For over a decade now, government has been pursuing a combined strategy of market liberalization, promotion of private enterprise in economic ventures and service industry, and government investment on infrastructure development and poverty alleviation programmes. However, government is mindful of the deleterious influence of these several programmes, if left uncontrolled, on resource exploitation and environment degradation. Since 1984, all development projects are subjected to a mandatory Environmental impact Assessment. the Central Environment Authority is empowered to ensure that such assessments are made before projects are approved. Even on-going projects have been brought under CEAs surveillance.

Two other policy developments must be note. These are;

a) Restructuring of the state sector with an emphasis on peopalisation of certain hitherto state run commercial enterprises and a reorganization of the stat administrative apparatus and the pruning down of excess cadres.

b) Devolution of power from centra government to subnational units of the Provincial Councils, and further decentralization of administration to locally elected institutions, viz., Pradeshiya Sabhas. There is a still further decentralization of decision making to the grass-roots levels, statutory institution called the Gramodaya Mandala.

The process of devolution and deconcentration of powers will result in dismantling of the District as a unit of decision making and the debilitation of the Government Agent as the focal point of administration.

The current trend is to concentrate administration on the Divisional Secretary and decision-making at local level on the Pradeshiya Sabha. There is also a progressively increasing trend to involve Non-governmental Organizations in both welfare as well as development activities at the grass-roots level.

5.2 District Strategies

presently there is no comprehensive District Development Strategy in which are articulated the investment programmes of the government agencies and private investors. What there is, has an array of programme activities implemented by respective agencies at district and sub-district levels. Of course, most of these activities are framed within national guidelines and objectives, but reflect the agencies different relationships to political power, resources and other organizations in the district. In short the current approach to resource development planning is a fragmented one, which places impediments to the application of an environmental perspective.

Apart form the difficulty in integrating the disparate programs, one is even more disturbed by the conflicting interests and resulting poor management of resources, as between the programs of the different agencies. Some of the cases in point, highlighted in the Monergala District Environmental Study (page 48), are:

a) Commercial and national interests versus district sectoral strategies in regard to the expansion of sugar cane cultivation.

b) State Plantation versus sectoral and village level concerns over factory wastes from rubber estates discharged into the rivers.

c) State Gem Corporation versus line ministry concerns over indiscriminate gem mining in environmentally sensitive areas; and

d) Health Department versus Town Administration concerns on pollution through biological contaminants of water supplies or public places.

Moneragla District Environment Study pinpoints certain instances where the beneficial relationship that could be drawn upon from the disparate programs, for the conservation of environmental resources, have not been seized upon, largely due to the absence of efforts to integrate such programs. The following programs are by themselves environmentally sound, though they have not been incorporated into an overall environmental action plan. Some of these programs in Monergala District are:

a) Reforestation (Dept. of Forest Conservation)

b) Supervision of encroachments in national parks (Dept. of Wildlife Conservation)

c) Regularizing encroachments (Land Commissioner's Department)
d) Provision of extension services for soil conservation (Dept. of Agriculture)
e) law enforcement on encroachment state lands (Govt. Agent)
f) Promoting pest control without chemicals and the practice of minimum tillage (Dept. of Agriculture)
g) Protecting wildlife habitats and improving the carrying capacity within reserves (Dept. of Wildlife Conservation)

There is no single body that monitors the implementation of these programs. The Deaf does not have the authority or capacity or competence to perform the role of monitoring. Therefore, the Deaf could only give a layman's attention.

Moneragala District does not attract the more qualified/experienced personnel since it is treated as a "difficult" (and even punishment) station. The great majority of the government officers that do remain in the district thus have little incentive. This in turn has negative consequences for environmental programs which demand qualified personnel with a commitment to development and sympathy for the environment problems.

5.3 The IRDP Approach

The style and strategies that have evolved over the years and are presently well consolidated in the Monergala Integrated Rural Development Project (MPNDEP) supported by NORAD, are noticed here for the following features relevant to the planning and implementation of projects with an environmental content.

a) "Targeting investments to identify poverty groups such as estate workers, marginalized farmers, landless families, food-stamp holders, poor women and female-headed households and other disadvantaged groups.
b) Directing investments to multi-sectoral action programmes in identified high poverty regions, thus achieving an integration of strategies which will have long term impact on the poor as well as lay the foundation for sustainable development through strengthening peoples organizations and institutions.
c) Enhancing economic opportunities for the target groups and specially youths; and
d) Direct investments towards complementary sectoral activities in order to improve the delivery mechanisms of social and economic inputs to the rural poor (e.g. health science, education, roads, market development et.)" (MODES, pp. 49-50).

The MONDEP approach thus builds on popular participation, located the target groups within the larget context of development, adopts an area concentration strategy, harnesses the environment management experiences of the local community, and encourages interaction and feedback with the local people. Selected youths as community leaders are trained and used as social mobilizers.

In regard to environment, in the planning phase of a MONDEP Project, an Environmental Impact Assessment (EIA) is undertaken and during the implementation stages, projects are monitored in relation to the E?Ia bench-marks. These activities ar supported by a computer-based Management Information System (MIS). The computerized database system includes key data on physical resources and environment, land use patterns, poverty, socio-economic factors and administration. Se Annex 2 for details of the information system.

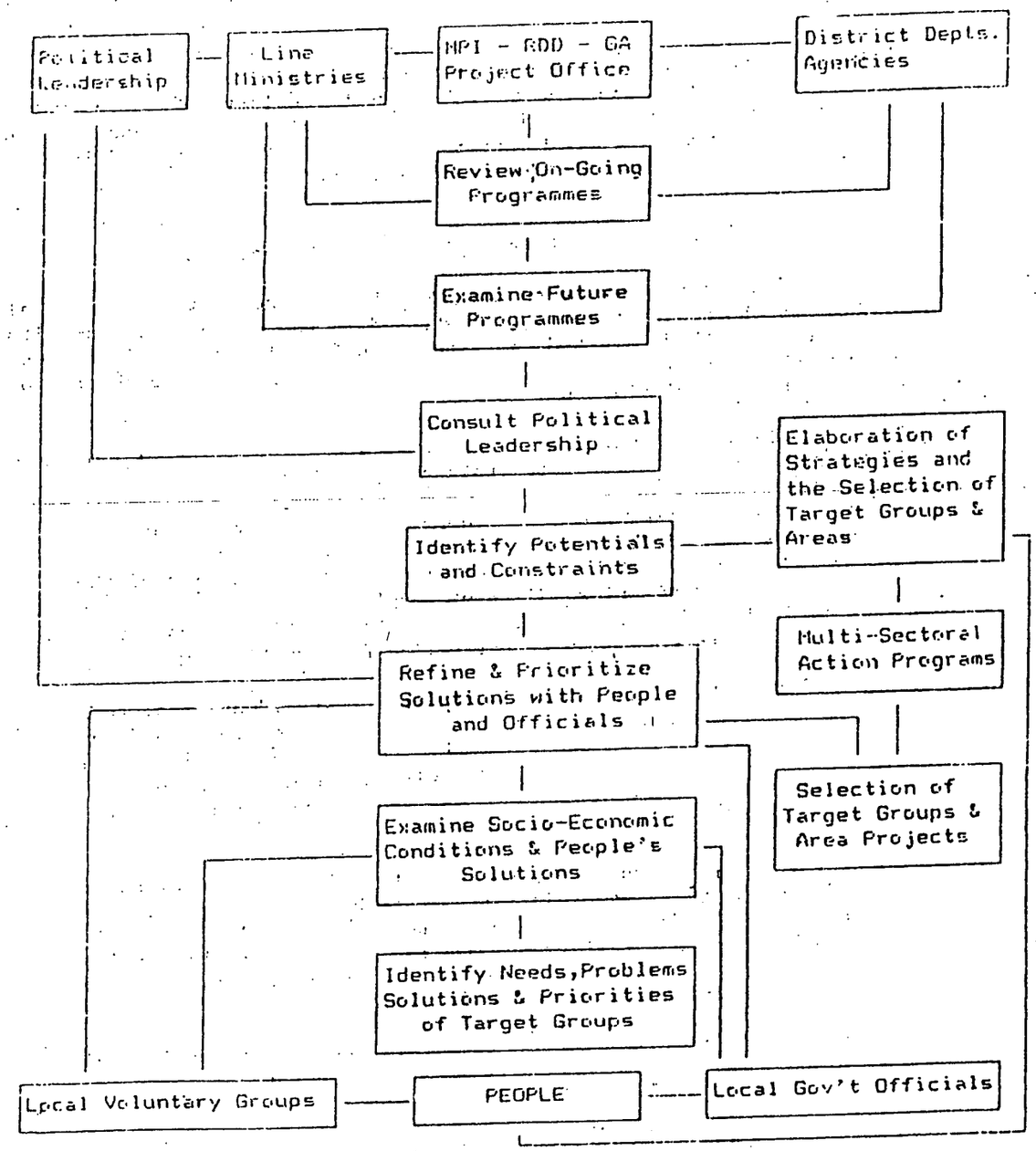
5.4 A Participatory Approach to Environment Management

MONDEP has successfully applied its participatory approach to implement certain environmental projects. This approach is commended and its continuation recommended. Excerpts from the Moneragala Environment Study (pp. 51-55) are reproduced, in extenso, in the ensuing pages.

"The approach taken by MONDEP in conserving environmental resources in the district can be illustrated in the elaboration of its participatory method adopted in the plan formulation for investment projects (shown in Figure 5.01). This is an integrated approach of 'top down' and 'bottom up' planning.

FIGURE 12

POPULAR PARTICIPATION IN PLANNING MONDEP



In the context of a discreet strategy for conservation, the following elements of this participatory approach are relevant:

(1) The planning mode considers national policy, national programmes, and their operational effectiveness and relevance to problems in the district with the participation of the 'top'; line ministries, district level line agencies and the political leadership. This ensures that action plans remain within the accepted government policy framework.

(2) Once the priority areas and groups are identified, then planning starts from below. This bottom up method involving those who are affected and those local level functionaries who are operating with programmes: the people, people's organizations (NGOs) and sub-divisional and divisional level government officers.

(3) The approach provides opportunities for the planners and the intended beneficiary people to have a dialogue on the proposals. This leads to an incorporation of technically feasible, economically sound and socially acceptable solutions into plans which are implementable with beneficiary participation.

(4) The approach enables a consideration of technological factors in the context of viable local practices an solutions through beneficiary participation.

(5) A planned effort is made through this approach to achieve participation, integration and gaining momentum for continuation.

The adoption of this approach over the past 5 years in MONDEP has resulted in the planning and implementation of the following project activities with concern for the conservation of environmental resources:

(1) Rehabilitation of village tanks for the use of migrant settlers, as well as local wildlife;
(2) Reforestation of tank catchment ares with local species to protect water bodies form siltation, making available the future needs of timber and fuel wood of the setters and improving the general physical environment of settlements;
(3) Introduction of fresh water fish into suitable tanks to increase the availability of nutrition food for settlers as well as increasing viable and environmentally sound economic opportunities available to them;
(4) Involvement of local settler for catchment planting and community forestry;
(5) Implementation of stabilized rainfed farming systems with solid conservation in marginal land and chena cultivation areas;
(6) Land alienation and encroachment regularization to encourage permanent settlements in order to reduce the damage tot he environment caused by chena cultivation on encroached lands, while involving them in activities to protect the environment;
(7) Dissemination of efficient fuel wood stoves, proven to be 40% more efficient in fuel wood consumption, with the target of reaching 25,000 households;
(8) Agricultural training and extension, with provision of credit, to enable farmers to maximize resource use with minimal damage to the environment;
(9) Provision of assistance for shelter improvement through housing loans and beneficiary self help development to encourage permanent settlements and stabilize seasonal migration by chena farmers;
(10) Improvement of social and economic infrastructure in isolated areas, linking rural villages and new settlements to the closest administrative and commercial centres, thereby discouraging the illicit use of forest reserves;
(11) Planning for the establishment of two wildlife protection units in two identified regions to protect endangered wildlife from poaching and the expansion of human settlements;
(12) Improvement of preventive health care and curative services, involving over 4000 volunteer health workers throughout the district, in activities of improving environmental health and sanitation;

(13) Assistance to 20,000 families for construction of sanitary latrines;
(14) Provision of safe drinking water and the promotion of nutrition based planned home gardening to help improve living conditions of the beneficiary people; and,
(15) Support people's voluntary organizations to actively take part in the planning for environmental and development programmes with government functionaries.

Integration and Participation in Environmental Management

The approach taken by MONDEP to development and environmental management stresses two themes in its programmes: integration and participation. The effectiveness of this approach must necessarily start with the relevant line agencies and the beneficiary people in both planning and implementation. However, as discussed in the beginning of this chapter, this approach faces many constraints when considering the institutional context of Moneragala and the motivation and quality of line agency officers who take up duties sin the district. Nevertheless, MONDEP has succeeded to involve various line agencies and people's orgnisations to improve their capacity in dealing with environmental concerns.

One particular success of MONDEP has been to involve the Deaf in a NORAD funded project to upgrade public awareness of environmental protection and management and mobilize community support for environmental conservation. This was the first such proposal for environmental conservation submitted to the government through the CEA for approval.

The basic objective of this project is to mobilize community support and relevant line agencies to protect the environment through;

(1) Programmes to increase the awareness among community people on the consequences of chena cultivation, denudation of forests, decimation of wildlife and other adverse environmental impacts;
(2) Involving people's organizations and interest groups in conservation programmes and environmentally related community health campaigns;
(3) Providing administrative support to the Department of Wildlife; and,
(4) Providing training to members of the Deaf in environmental conservation in order to build a detailed plan for district conservation.

These objectives are to be met through 3 components:
(1) Forestry conservation activities;
(2) the establishment of school brigades for environmental protection; and
(3) the establishment of wildlife conservation units.

An important aspect about this MONDEP initiated programme is the attempt at integration and community participation. Under the coordination of the Deaf, the various activities of the project will involve the Conservator of Forests, Department of Education and Department of Wildlife Conservation. the Project also has other linkages to programmes already being implemented under MONDEP, as well as the sectoral programmes of the agencies concerned in this project. This project promotes the efforts of the DEAF to establish itself as a viable umbrella environmental organization.

The strategy of integration and community participation is at present not firmly institutionalised across line ministries.This is an objective which is being perused, however, but which will ultimately depend on human resource development and the strengthening of capacity within line agencies. The effects on attitudinal change and the development of broad based increased environmental awareness is what's most urgently needed at the moment. This should be incorporated into the formulation of district level environmental management strategy which would involve the Deaf as a key institution".

6. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and the recommendations drawn from them are stated as an aid to systematic planning of resource development and environmental management in Moneragala District.

(1) Sustainable development is a difficult concept to work with. The balance between environment conservation and economic growth is an elusive one. However, one strategy that can be fruitful is that of developing integrated development plan for the district and eventually for the province in which the sectoral plans are incorporated into a single strategy in which economic growth, poverty alleviation and environment conservation are kept uppermost as key goals.

(2) In the preparation and implementation of such an integrated plan, the approach and lessons of the MONDEP strategy has been found pragmatic. Particularly the participatory approach reaching to and from village to district and mobilizing community involvement and support can serve as useful guidelines.

(3) Though the district as a key administrative unit will no longer play its earlier historical role, yet for environmental purposes it will still play a major role as the channel for the exercise of central government responsibilities, one of which is environment conservation and control. However, the future trends of strengthening Provincial Councils, Pradeshiya Sabhas and Divisional Secretaries have to be reckoned with. It is recommended that

   (a) District environment strategies and plans be related to the neighboring districts and eventually inter-provincial strategies. Whilst the leg-work can be done by the District Environment Agency, key responsibility has to be assumed by the Central Environmental Authority.

   (b) The Government Agents/Chairman, Deaf of the neighboring district where environmental issues have cross-border relationships, should be afforded a common forum to discuss and resolve such problems. One mechanism could be inviting the G.a. of the neighboring district to attend the DEAF meeting of the other, especially where cross-border issues are involved.

(4) Divisional level land use plans that are already prepared for the nine divisions in the district has thus predetermined that the unit of planning shall be the division. Though the division might be the most convenient for planning certain types of resources and human resources development and infrastructure and welfare facilities yet for environment a planning, it cannot be as useful or helpful. The rationality of adopting a river basis or drainage area basis for environmental planning has been strongly urged, especially by the Presidential Land Commission of 1988. DEAF should explore the practicability of directing the attention of the divisional planning units to adopt such a drainage areas basis and should also take the initiative to integrate such plans.

(5) Decentralization of administration and decision-making to divisional level is a known fact. What is not yet clear is how the divisions will perform. The establishment of Divisional Environment Committee is a salutary occurrence.

The divisional secretaries horizontal linkages with local level government institutions and grass roots level non-governmental organizations, on the one hand, and the vertical linkages with the Deaf should be encouraged and further strengthened. This can be done in several ways.

   (a) A divisional level environment protection council at which local officials and NGO representatives could find a common forum to articulate concerns in the area and which could mobilize social and political pressure upon flagrant violations of the environment.

   (b) Provide a small but separate budget to the divisional secretary who would then have the necessary flexibility to promote local institutions in mobilizing community support, mount awareness programmes and surveillance campaigns.

   (c) Designate one amongst the 4 - 6 Development Officers available at the divisional secretariat to function as Environment Officer who will also function as Secretary to

the Divisional Environment Committee.

(d) Involve the community organizations and NGOs in conducting simple bench work surveys and monitoring surveys. The Transect Surveys conducted in 10 locations for this study could b a good starting point, for which simple on-the-job training should be given to the community leaders and youths in the area.

(6) The DEAF in Moneragala has demonstrated resilience and ability to respond to the changing needs in the district. However, there is need to strengthen it institutionally, financially and personnel-wise to that it could perform more effectively in coordinating and integrating the efforts of relevant in ministries in conserving environmental resources in the district. It should be assisted to perform its agency function not merely its committee role. NORAD project for Yala has given the moneragala Deaf a much needed boost. Specific recommendations are:

(a) Manpower development and training of key personnel of DEAF and related agencies
(b) Provision of adequate and appropriate cadre to make it into an operational arm (e.g. Land Use Planner could be given a key role as an executive of the DEAF)
(c) Improving secretarial support (the Environment Cell presently has only one clerk) and improving mobility of staff
(d) Developing the existing Environmental Cell to perform functions of an Environment Intelligence Unit supported by relevant data base, studies and documentation facilities
(e) Establish Environment Education Unit including publishing and distribution of literature, hand-outs on environmental issues and action by which means it could service, the Divisional Environment Committees community reach programmes
(f) Implement Environmental impact Assessments for all projects ongoing as ell as planned.

(7) The MONDEP approach has demonstrated the utility and validity of community involvement. Drawing on the experience and other similar exercises it is recommended that community information, planning and monitoring systems be institutionalized. This will require the linking of community level organizations such as grass root societies. Grama Niladharis, school teachers, voluntary community workers with the planning agencies and DEAF, and the creation of a feed-back flow information. This would help to surface indigenous knowledge systems on land-use and resource management.

(8) In the preparation of an environment and resource managementplan, a commendable guideline is "that the objective must be that the nation should learn to live in productive equilibrium with natura resources, that access to resources should be widely and equitably distributed and the basic needs should be safeguarded for all citizens." (Henry West). A plan that is prepared, especially in its long-term perspectives, will be subject to periodic reviews in response to changing socio-economic circumstances. However, changes that are effected should have the widest publicity and consensus.

As it is presently ordained, there is no statutory recognition to environment plans, i.e. they are not justiciable. There is a presumption that the culprits are only the members of the public. It is time that officials and politicians are also treated as those who violate environmental plans and laws. Interest groups should be able to resort to courts on environmental issues.

it is suggested that environmental plans be invested with statutory character and be required to be given publicity and made justiciable by any aggrieved party or interest group. One may note that in an earlier era, the "mapping out plans" under the Land (Development Ordinance once approved by the Ministry, was gazetted as an order and any changes to the plans had to go through the process of public inquiry. It may also be note that in pre-colonial times for the offence of illicit clearing of crown land, the peasant was fined about Rs.10 by courts, but for the same incident the village headman was fined five times that by the G.A. for failure to report/prevent such clearings.

Environmental Information and Data Sources

a. .. of Environmental Information and Data

The information and data relating to environment come under four major categories: (1) vegetation; (2) water; (3) soils; and (4) wildlife. The information and data under each of these categories is summarized as follows:

1. Vegetation

- Total vegetation cover. percentage natural vegetation of the total land area; extent under reserved forests, forest plantations, natural grassland, savanna forest, number and distribution of medicinal plants. Indigenous species, naturalized aliens; types and extent of deforestation, effect of peasant colonization and land development.

- Land use pattern extent under different land use and their suitability and sustainability, amount and effect or agro-chemicals on vegetation and other environmental components.

2. Water

- Extent of inland water bodies, their qualities, level and availability of ground water, extent and use of ground water, distribution of shallow and deep wells and their sustainability.

- Rainfall, rainfall regime, seasonality, variations, extent and/or pr cent or run-off, flow flow and volume of seasonal and perennial streams and their variations.

3. Soils

- Major soil groups in the district and their distribution, types and degree of erosion, degree of silting in water bodies, effect of different and uses on soil erosion and degradation, degree of destruction in sold structure, texture and soil micro-biology.

4. Wildlife

- The abundance and distribution of wildlife. Nature and severity of dis...ment of wildlife, types and frequencies of conflicts between wildlife and land uses, and carrying capacities of different species within natural reserves.

b. Sources of Information and Data

According to the type of source of afore-mentioned information and data so may easily divide the existing agencies/departments into three categories as identified by Dias at. al (1984)

Table 1.
Identification and Availability of Environmental Information and Data

Data needs	Category (a)	Category (b)	Category (c)
Vegetation Cover, extent. plantation. nat. species & alients	Depts. of census & Stats/Survey	Forest Dept	-------
Deforestation. colonization & land development	-----	Dept of Land	-------
Medicinal species	Dept. of Indigen. Medicine	------	Local Aur-vedic
Water Water bodies	Depts. of Census & Stats. & Survey	-------	-------
Ground water	Dept. of Geological Survey & Water Resources Board	-------	-------
Rainfall, run-off flow & volume of streams	LUD/Irrigat. Dept		
Soils Groups & distribution	Dept. of Agri. Eng	---------	----------
Erosion, silting & degradation, microbiology	----------	---------	----------
Wildlife Abundance, distribution	---------	Dept. of Wildlife	--------
Displacement conflicts carrying capacities		Depts./Wildlife & Land Comsnr.	

c) Departments/agencies which collect and process data as one of their functions.

b) Departments/agencies which collect data as an indirect consequence of their regular functions and which do not process these data in asystematic way regularly.

c) Department/agencies which collect little data incidental to their regular work and which rarely process them.

The environmental information and ata that are available fall into these categories and afore-mentioned environmental components and information needs that are related to them are summarixed in the table 1. The table includes only the available and usable information data.

c **Nature and Reliability of informaiton and data**

The information and data which are collected as the primary function of a given agency (category "a") are very often presented in a reliable and usable manner or form. As they produce them for use of a wide range of clientale. The second type agencies (category (6)) who collect dat as an indirect consequence of their regular function have information and ata which are not readily usable and sometime not reliable. These data has to be

either processed into a usable form or refined by supplementary coross-checking, studies or surveys.

There is still a vast gap of environmental data, which has to be supplemented by special studies. e.g. the total extent under sugar cane vary from one source to other and the difference is incredible.

The nature form of availability and reliability of basic environmental data is given in the table 2. The information data given in visual objects like maps andd diagrams are always clear and reliable rather than the unprocessed or semi-processed data and insufficiently commissioned surveys/studies.

The environmental information/data gap is in the areas of annual loss of natural vegetation, medicinal plants. ilicit felling amount of annual loss of topsoil, amount of annual gilting in main waterbodies, amount of chemicals in foods, contamintion of drinking water, annual direction of ground water etc. To fill this information gap new strategies have to be fomulated.

Table 2
Information availability and reliability under different agencies.

Information /data needs	Dept/Agency	Form of availability	Reliability
VEGETATION			
1 Cover extent plantation and land use	Survey Dept	Topo & Land Use Maps.	Reliable
2. Natural species aliens afforested areas.	Forest Dept.	Reports and Papers.	<75%
3. Deforestation colonization and land Development	DLC	Reports, files, DCC minutes	Reliable
4. Medicinal plants	Dept. of inde. Medicene. Universities Local Aurvedic Practitioner.	Books, Reports, Pap. Survey Rep./ Dissertations Ola leaves.	Reliable.
5. Land use by different crops.	Agri. Dept. SL. Sugar Cooperation	Reports, files and Imple. Programs etc.	<75%
6. Use of Agro-chemicals and Fertilizer.	Dept. of MEC Dept. of Agrarian Services, Ministry of Agriculture (on sugar - cane etc.)	Reports, files and imple. Programs.	50-75%
WATER			
1. Inland Water Bodies their extent and cover	Survey Dept.	Topo & Land Use Maps	
2. Rivers and Streams their flows & volume	Irrigation Dept. MDA	Reports, Publication & files Reports, publications and Maps.	Reliable
3. Ground Water, their availability & quality	Dept. of Geological surveys & Water		75% Reliable

4. Rainfall, run-off, evaporation.	Resources Brd. Meteorological Dept. Irrigation Dept.	Reports, Charts Publications and files	>75%
SOILS			
1. Soil groups, Distribution and qualities	Survey Dept. LUD of Irrigation Dept.	Soil. Map, report and publication.	Reliable
2. Erosion, silting, degradation and Micro-biology	Universities, Dept. of Agri. Engineering, Dept. of Agriculture Irrigation Dept.	Research papers, reports, and publications.	Reliable
WILDLIFE	Dept. of Wildlife		
1. Abundance, distribution	Dept. of Wildlife	Reports, files	Less reliable
2. Displacement and carrying capacities		?	?
3. Conflicts between alternative uses of land and wildlife movement	D/LC IRDP and other projects.	Reports. minutes of DCC, DFC etc.	Reliable

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Some comments on map reliability and availability should be given. Several shortcomings have been found in new land use maps produced by the Survey Department. Concerning both the 1:50000 and the 1:100000 land use/topographical sheets covering moneragala, the following shortcomings cazn be noted.

* Incorrect interpretation, thus leading to other land use categories than are actually found in the field. Several faults have been defected in certain well-known areas.

* Incorrect and use of old administrative boundaries.

  For instancae, Wellawaya A.G.a. division was a reality years ago, but the boundaries can not be found n the new maps.

* Many incorrect names on places and tanks

* Boundaries of protected areas are partly missing

* concerning the 1:100000 maps. important needs are missing

These shortcoming reduce the maps. Accuracy and their utilization potential. However, the quality is far better than the old "one inch to one mile" - maps. Possibly some of the shortcomings can be corrected in the next revision.

Another problem relates to map availability in Moneragala district. New maps are not widely distributed and

planning units in governmental agencies seem still to a large extent use old maps, even though some of the new maps ahve been available for 2 year.

The Survey Department sells a variety of maps covering, partly or fully. Moneragala District in their headquarters in Colombo. The Survey Department Provincial Office in Badulla distribute some of these maps. At the district office in Moneragala, however, only the old " one inch to one mile" - maps are available. the district office do not even get information about what kinds of maps are available in their own headquarters.

All maps of importance to planing in Moneragala should be available at Survey Departments District Office. This should both include maps produced by themselves and maps produced by other governmental departments/ministries. All other available maps and air photos should be recorded/indexed at the district level so that the customers can be informed whrther the products cna be bought either in Badulla, at the Survey Dept's map sales office in Fort or at their head^Quarters. If such a strategy is followed the Survey Departments District Office cab funciton as an important agent in the management of land in Moneragala District.

Demographic Profile, Moneragala District (1981 Census)

AGA/GS Division	No. of villages	Total Pop.	Pop. Density/sq .km.	Growth rate child Pop. %	Depend Ratio	Median Age	Child/Woman ratio	Male In-migr. (Z score)
BADALKUMBURA AGA	115	31887	144	14.6	75.7	19.3	700	
01. Alupotha	7	2945	304	27.3	72	20.0	736	0.63
02. Atale	11	5610	150	14.0	74	19.5	698	0.53
03. Bogahapelessa	9	2401	146	12.0	63	21.9	527	1.11
04. Hingurukaduwa	7	2020	94	27.0	88	18.1	853	0.59
05. Karawila	17	2841	149	30.6	84	17.4	949	0.16
06. Madukotanarawa	6	1863	128	21.7	79	18.6	803	0.05
07. Mivanakandura	7	1806	95	10.7	82	18.7	659	0.44
08. Moratuwagma	7	1345	60	9.4	72	19.0	632	0.40
09. Waradola	15	2933	95	3.0	72	19.0	589	0.19
10. Wasipona	12	4086	382	9.3	62	20.5	619	1.42
11. Wekumbura	11	1834	98	5.8	76	20.0	629	0.17
12. Yakurawa	6	2203	269	4.9	84	17.6	726	0.36
BIBILE	86	26505	57	7.6	78	18.9	677	
01. Bibile	3	4008	413	17.3	63	21.6	666	1.82
02. Gokagonna	6	1898	81	10.6	91	17.6	739	-1.04
03. Dodangolla	9	3106	296	6.4	69	17.4	732	-0.70
04. Hamapola	11	1294	47	1.9	84	17.8	643	-0.64
05. Kehelathawela	4	1530	87	9.4	90	17.1	787	-0.98
06. Kotagama	6	1709	68	10.2	75	20.0	631	0.17
07. Kuruwamba	4	2637	278	4.5	69	19.8	590	0.89
08. Nilgala	13	1349	6	6.8	95	16.6	822	-1.44
09. Pitakumbura	15	2182	86	0.8	84	17.8	711	-0.50
10. Radaliyadda	4	1364	36	10.6	82	18.3	775	-0.44
11. Wegama	5	3229	148	3.5	74	19.5	583	0.11
12. Yalkumbura	4	2139	230	7.1	72	19.7	606	0.50
BUTTALA AGA	98	28739	40	15.5	69	19.8	724	
01. Kukurampola	7	2678	48	15.6	76	18.3	700	0.15
02. Maligawila	13	6321	160	9.3	58	20.9	716	2.25
03. Medagama	27	6903	13	20.6	71	19.3	747	0.55
04. Okkampitiya	14	2816	99	3.2	61	20.5	597	1.67
05. Pelwatte	13	2851	133	15.6	81	18.8	760	-0.08
06. Udagama	18	3603	138	18.1	67	20.7	732	1.17
07. Yudaganawa	6	3567	131	22.3	75	18.8	778	0.14
MADULLA AGA	106	21424	31	7.6	82	18.3	714	
01. Baduluwela	7	1060	17	7.9	100	16.2	856	-1.79
02. Deliva	11	2785	45	4.8	89	17.6	738	-0.90
03. Dambayalla	10	1565	69	5.3	79	19.6	589	-0.22
04. Galbokka	6	1491	68	8.4	76	19.5	661	0.07
05. Ihawa	10	3025	57	7.6	88	17.2	731	-0.85
06. Inginiyagala	2	1545	218	1.3	50	21.9	468	2.33
07. Kottagala		409	76	-3.7	87	17.4	693	-0.77
08. Nakulla		2183	254	9.0	73	19.5	600	0.46
09. Obbagoda		1593	116	0.8	64	21.0	581	1.08
10. Polgahagama		1956	50	16.0	94	17.1	882	-1.45
11. Pothuliyadda		1731	5	14.0	97	16.3	891	-1.57
12. Ibaralawela		1281	40	15.5	101	16.3	900	-1.78
MEDAGAMA AGA	95	23366	101	8.8	86	17.8	724	
01. Pokinigahawela	9	1664	179	0.4	88	17.6	600	-0.89
02. Kandawinna	7	1222	75	0.3	84	17.8	636	-0.55
03. Kuhukumbura	7	2120	186	-0.2	81	18.3	607	-0.33
04. Kongolla	9	3134	229	7.9	88	17.4	710	-0.75
05. Kotabowa	3	1089	150	23.8	103	16.1	956	-1.75
06. Kadagama	8	2363	249	12.8	79	18.4	726	-0.02
07. Rannapurawa	13	3366	65	7.2	81	18.3	661	-0.45
08. Pitadeniya	6	1945	137	10.0	83	18.2	671	-0.54
09. Pubbara	16	2404	31	5.6	32	16.9	761	-1.18
10. POattaderiya	9	1712	121	26.6	97	16.6	964	-1.39
11. Senapitiya	8	2338	308	10.6	81	18.2	715	-0.15

AGA/GS Division	No. of Villages	Total Pop.	Pop. Density /Sq.km	Growth rate Child Pop. %	Depend Ratio	Median Age	Child/Woman ratio	Male In-minor. (Z socre)
MONERAGALA AGA	67	30766	101	19.5	78	19.1	789	
01. Patugammana	17	6529	161	18.4	80	18.7	767	-0.01
02. Kahambana	12	3352	61	23.0	71	20.4	838	1.03
03. Kaudawa	7	5950	175	20.0	78	19.4	734	0.11
04. Kolonwinna	11	2485	44	26.5	92	16.9	915	-1.17
05. Kumbukkana	6	3848	48	31.9	77	19.3	824	0.12
06. Huppana (excel. Mon. town	8	2582	103	14.3	79	18.6	725	0.15
Moneragla Town	6	6020	463	8.0	79	18.6	na	na
SIYAMBALANDUWA AGA								
01. Ethimale	126	30835	30	21.3	84	17.9	954	
02. Ethimale Colony	11	2672	38	20.7	93	16.6	1062	-0.96
03. Borawaye	8	2985	72	15.2	80	18.3	794	-0.11
04. Dambagahawela	6	3065	83	35.2	73	19.3	955	0.77
05. Kimbulawela	14	2762	119	15.5	91	16.9	998	-0.77
06. Kodayana	13	2169	96	5.1	82	18.3	738	-0.19
07. Nane	10	3057	64	18.0	90	17.2	1000	-0.72
08. Pillawela	12	1221	16	11.3	87	17.9	860	-0.58
09. Siyambalanduwa	8	1763	42	34.9	92	17.0	1315	-0.61
10. Tissapura	7	4227	45	30.7	70	20.1	901	0.99
11. Weragama	9	2749	107	21.7	81	18.4	900	-0.03
12. Wattegama	8	1637	36	24.0	92	16.9	1063	-0.83
13. Weragoda	16	1650	4	18.0	99	16.5	1010	-1.62
	4	878	14	23.8	92	16.8	874	-1.25
TANNAMALWILA AGA	79	45843	38	31.9	65	20.9	822	
01. Habaraluwewa	8	4984	88	33.3	71	20.2	848	0.85
02. Hambegamuwa	5	2828	13	9.5	74	18.5	774	0.42
03. Kataragama	7	5779	18	17.8	56	22.9	647	2.12
04. Katupilagma	11	7912	114	68.8	65	21.3	1027	1.60
05. Kotaweheramankada	8	2831	23	36.4	74	19.9	906	0.51
06. Mahagama	8	10827	120	35.4	73	20.0	911	0.84
07. Sittarama	15	6233	47	22.0	50	21.7	617	2.37
09. Suriya Ara	9	1921	27	6.3	66	20.0	621	0.95
WELLAWAYA	107	34204	58	22.8	74	19.2	750	
01. Balaharuwa	6	5585	24	29.3	56	20.0	754	1.95
02. Handapanagala	7	3254	65	35.8	78	18.5	869	0.09
03. Kotikambokka	31	4542	114	28.5	76	19.1	754	0.16
04. Kurugama	39	3240	69	21.5	94	16.8	871	-1.29
05. Tellula	9	8912	89	9.5	75	18.7	648	0.15
06. Wellawaya	15	8672	73	27.3	73	19.6	759	0.50
DISTRICT TOTAL	879	273570	50	17.7	79	19.7	713	

Dependency Ratio: Number of persons under 15 and over 65 years of age who are economically dependant for every 100 productive active persons between 15 and 65 years of age.

Child-woman Ratio: Number of children below 5 years of age per 1000 women in the age bracket of 15 tp 44.

Male in-migration Z-score Results of a principal component analysis on sex ratios the number of married males per 100 females, dependency ratio medium age & of married females of 15-34 years of age, and the % opt households which are female headed. Refer to Map 4 for spatical distribution and interpretation.

BIBLIOGRAPHY

Abeyratne F., Gunesena M.P.M., Tannakoon 1986
Shifting Farming - towards stability. A study of four rain fed farming systems in Sri Lanka. ARTI Research No. 66. 148 pp. (Partly from Moneragala)

Abeyratne S., Perera J. 1986
Change and continuity in village irrigation systems - a case study in the mOneragala District, Sri Lanka. Research Study No. 75, ARTI. 153 pp.

Agroskills Ltd 1982
Statistical information on Moneragala District, Colombo.

Attanayake M.M. 1982
Report on the survey on dairy development potential in Moneragala. Dept. of Rural Credit, Central Bank of Ceylon.

Axelsen B. 1983
How Dry is Sri Lanka's Dry Zone? Some comments on agricultural potential, perception and planning. Norwegian Journal of Geography. Vol. 37, 197-209

Batuwitage G.
Regional context of settleintn planning experiences from Moneragala IRDP. 6 pp.

Bogahawatta C. 1986
Erosion of common property resources. Evidence form villages in the Dry Zone Districts of Sri Lanka. (partly from Moneragala) Agricultural Administration 23 (1986) 191-199.

Central Environmental Authority 1983
*Environment and Development. Proceedings of a techinical workshop, Colombo, 241 pp.

Central Environmental Athority 1985
Proceeding of the CEA/NORAD all island conference on environmental protection and management - for members of all District Environmental Agencies, Colombo, 77 pp.

Central Environmental Athority 1987
Handbook on Environmental Impact Assessment, Colombo, 85 pp.

Central Environmental Athority 1985
Environmental Protection and Managemnt. Proceedings of CEA/NORAD All Island Conference for Members of District Environment Agencies, Colombo.

Central Environmental Athority 1988
Sri Lanka-Ntional Conservationn Strategy, Colombo.

Central Environmental Athority 1989
Handbook on Environmental Impact Assessment, Colombo.

Cooray P.G. 1967
The Geology of Ceylon, National Musium of Ceylon Publication, Government Press, Colombo.

Dargoe T.C.D., Epitawatta D.S., 1988
Environment succession and land use potential in semi-evergreen forests of Southern Sri Lanka. Journal of Biogeography, Vol 15, 209-213 pp. (details about Ambilipitiya, Hambegamuwa, Tanamalwila).

Dept. of Census and Statistics, 1985.
Sri Lanka Census of Population and Housing. Migration. All island tables, Vol. 2, part 2.

Dhanapala A.H., Karunaratne H.K., Weeramunda A.J. 1983
Interdisciplinary research and ruaral development. The geo-socio project research report 1. Introduction to Moneragala District. The University of Colombo 35 pp.

Dissanayake C.B., Weerasooriya S.V.R., 1985.
The Hydrogeochemical Atlas on Sri lanka. NARESA. (Details about Moneragala).

Dittus W.P.J., 1977
The Ecology of a semi-evergreen forests in Sri Lanka; in: Biotropica 9 (4) 268-286 pp.

DPA Consulting Limited, 1981.
Lower Uva Regional Development Plan. Vol. 2. Regional Analysis Draft Report, pp 145 + annexes.

DPA Consulting limited, 1982.
Lower Uva Regional Development Plan. Vol. 1. Summary 49 pp.
Maps enclosed.

DPA Consulting Limite,d 1982.
Lower Uva Regional Developmetn Plan. Vol. 3A. Proposed projects. 145 pp + annexes.

DPA Consulting Limited, 1982.
Lower Uva Regional Development Plan. Vol. 3B. Proposed projects. 138 pp + annexes.

DPA Consulting Limited, 1982.
Lower Uva Regional Development Plan. Vol. 4 Impact and assessments. pp 50 + annexes.

Drake F.H., 1979
The Sir Lanka-Atustralia Dry Zone Developmnt Projectt at Muthukandiya, Moneragala District. Paper presented at a workshop and field day on the development of tank-based agriculture in the dry zone.

Erdelen W., 1988.
Forest Eco-systems and Nature Conservtion in Sri Lanka. In:Biological Conservaiton 43 (1988 pp 115-135).

Farington J., Abeyratne F., 1982.
Farmer Power and Water Use in the Dry Zone. Research Study ARTI.

Farmer B.H., (ED) 1977.
Green Revolution. Technology and change in rice-growign areas of Tamil Nadu and Sri Lanka. Cambridge Commonwealth SEries (details from Moneragala).

Fernando A.B. 1988
Conservation and management of wildlife habitat, particularly the remaining elephant habitats in Moneragala District. Dept. of Wildlife Conservaitona nd the Forestry Master Plan for Sri Lanka a Review. The ildlife and Nature Protection Society of Sri Lanka, pp 76.
Gilbert M. 1988
Chena (shifting)cultivation and Land transformation in the dy zone of Sri Lanka. Sri lanka Studies, No. 1, Dept. of Geography, University of Zurich. PhD thesis. 360 pp. (partly from Moneragala).

Gunaratne W et al. 1977
Kurundankulama dry farming setlement - A socio-economic appraisal. ARTI Research Study series No. 17.

Gunaratne W et al. 1980
Rainfed farming in the dry zone of Sri Lanka. ARTI Research No. 36

Gunadasa J.M., Etanawela, Kiriwandeniya M. 1982
Technical meeting on cooperation and small farmer development. Background paper, Sri lanka document. ICA,RTI Amsterdam (mostly on Madulla A.G.A. Division, Moneragala).

Huntings Ltd., 1980
Moneragal Land-use Studies, Huntings Techinical Services Ltd., Ministry of AGric. Developmetn & Research.

Irrigaiton Department, Ministry of Land and Lands Development 1988.

Kalu Ganga multi-purpose project. Pre-feasibility study. Environmental studies. Part 1. (Weli Oya/Kuda Oya regulation, Mau Ara reservoir).

International Institute for Aerial Survey and Earth Science (ITC) 1982
The 1982 ITC field work survey in Moneragala District, Sri lanka. 63 pp. Maps enclosed.

International Institute of Aerial survey and Earth Science (ITC) Technical Report.
Development Administration, Moneragala District.

Iswaran N. 1979
Ecological studies on population of elephants in the Gal Oya in relation to distribution, habitat preference, competition and food availability. M.Sc thesis unpublished.

Jayaweera S. 1985
Prospects for expansion in the rubber cultivaiton in Moneragala District, with special reference to the small holder section Diploma dissertation, Sri lanka Institute of Development Administration.

land Commissioner's Department, 1980.
Encroachment as on 31st March, 1979. Moneragala District.

Malmgren R.C. 1980
Can money Grow on Trees? Reforestation in Sri Lanka. In Agri-business Worldwide. Oct-Nov, 1980, 46-62 pp.

Ministry of Lands and Land Developmemt, 1981.
Sri lanka-Forest Resources Development Study., (Prepared by Swed Forest Consultants AB), Colombo.

Ministry of Lands and Land Develop;ment, 1986.
Foirest Resources Development Project-Forestry Master Plan. Helsinki.

Moles J.A., 1989.
Agricultural sustainability and traditional agriculture. The past and its relevance to Sri lanka ([artly from Uva Basin).
In: Human Organisation vol. 48, No. 1 Spring 1989.

Moneragala IRDP, 1983
Moneragala Water Suppply Scheme. Summary Project Report and Feasibility Report. planning Unit, Kachcheri, Moneragala.

Moneragala IRDP, 1985
SIBAP (BASIS). A socio-economic view of the Suriy Ara, Sittarama, Balaharuwa area development programme. Planning Unit, Moneragala, 18pp.

Moneragala IRDP, 1986.
The Socio-economic structure of Moneragala District. Occasional paper No.4. Planning Unit, Moneragala, 22 pp.

Moneragala IRDP, 1985.
The Moneragala Road Transportation Network. Occasional paper No. 1, Planning Unit, Moneragala, 18 pp.

Moneragala IRDP, 1985
Venturee village Muippane. Estate community development project -2. Phase 1. Planning Unit, Moneragala.

Moneragala IRDP, 1986
KOHAP. Agricultural extension-Kotaweherakanda-ahambegamuwa area develo0pment project. Project Office, Moneragala.

Moneragala IRDP, 1986.
An enquiry into the demographic structure of Moneragala District patterns and processes. (Rural part only). Occasional paper No.3. Planning Unit, Moneragala 10 pp.

Moneragala, IRDP, 1986
Basis. Balaharuwa, Sittarama, Suriya ARa area development project. Vol. 2. Project Office, Moneragala, 285 pp.

Moneragala, IRDP 1987
Venture village Muppane. Estate community development project 2. Project Office, Moneragala.

Moneragala IRDP, 1987
Venture village Niyanakandura. Estate community development project 4. Project Office, Moneragala.

Moneragala IRDP, 1988
Moneragala District integrated Rural Development Projec.t 1989 programme. Planning Unit, Moneragala, 59 pp.

M + R International Development Project Consultants, 1986.
Proposal for an Integrated Development Project Study. Moneragala Sri lanka. Organisation and time schedue. Brussels, Belgium, 24 pp.

Nallainayagam v.
A New Approach to Eradication of Rura Poverty. Integrated Rural Development Programme, Kalamana. IDA Vol. 2, 1981.

Nanayakkara V.K. (ed) 1985
Proceedings of a UNDP/UNESCO/CEA National Seminar on Environment Protection and Management. Central Environmental Authority, Colombo 143 pp.

National Science Council, 1976.
Environment Management in Sri Lanka, Colombo

National Science Council, 1976.
Man and His Environment, seminar report, NSC, 1976

NORAD/Moneragala IRDP, 1988.
Women and Development in Moneragala District, pp 44.

NORAD 1989.
Environemnt Study of Sri Lanka-Status Assessment and Programme for Environmental Cooperation. NORAD, Colombo.

NORAD 1989.
Sri Lanka/NORAD Environment Study - Moneragala District Report.
Kachcheri, Moneragala

Perera K.P.G.M. 1981.
Plan formulation for district rural development projects.
Kalamana, IDA vol. 02 , 1981.

Perera M.P., 1962
Some geographical aspects of the irrigation settlements in the dry zone of Ceylon. M.A. thesis (unpublished).

Roberts R.W., 1981.
soil conservation in Sri Lanka. Muthukandiya dry land project. In journal of soild conservation service of New South Wales, vol. 37.

Ryan M.J., 1980
The utilization oof buffalos for farm power in Sri Lanka. Paper presented at the workshop on water buffalo research in Sri Lanka. ARTI.

Sandel K., 1988.
Eco-strategies in theory and practice. Farmers perceptives on water, nutrients an dsustainability in low resource agriculture in the dry zone of Sri Lanka. PhD, Linkoping University.

Scudder T., 1988.
The Yala Project. Preliminary Project Proposal, 5 pp

Somasiri S., 1981.
Land, Water and Crop Management under Irrigation in the Dry Zone of Sri Lanka. Dept. of Agriculture, Peradeniya.

Sommer M., 1984.
Land Tranformation Processes in Sri lanka. A conservationist's approach. In: development planning review. Vol. 3. No.1 & 2, 15-33 pp.

Tennakoon M.U.A., 1982.
Water, Agricultural Calendar and decision-making process of the dry zone farmer. Paper (ARTI Library).

Tennakoon M.U.A 1986.
Drought hazards and rural development . Central Bank of Ceylon. PhD study.

Vander Pas M., Snelder H., 1977.
Basic needs and resources. Possibilities for economic development in five villages in the Moneragala District, Sri Lanka. Depth of Appropriate Technology, Eindhoven, The Netherlands, 150 pp.

Vimaladharma K.P. 19990.
Non-Government Organizations and Environemtn Development in Sri Lanka: Report prepared for South Asia Partnership of Sri Lanka, Agridev Consultants, Kandy.

Vitebsky P., 1983.
Some preliminary relfections on the sociology of chena in an area of Moneragala District, Sri Lanka. Centre for South Asian Studies, University of Cambridge, 22 pp.

Vitebsky p., 1984.
Policy dilemmas for unirrigated agriculture in south eastern Sri Lanka-social-anthropologist's report on shifting and semi-permanent cultivation in an areea of Moneragala District. Centre of South Asian Studies, University of Cambridge, 188 pp.

Water Supply and Drainage Board, 1982.
Integrated Farming Project. Moneragala District. Sri Lanka.
Domestic Water Supply Plan, Mt Lavinia, 4 pp.

Weeramunda A.J., 1985.
From chena plot to gemming pit. Case study of Okkampitiya, Moneragala District. Sociological aspects of rural and regional development, Colombo. Research paper series No.3, Dept. of Sociology, University of Colombo.

Whist et al., 1982.
Moneragala District Development Program. A Feasibility Study, 177 pp.

Wijewardhana R.A., 1987.
Report of the study group on dry zone agricultural development programme. Thibirigaswewa and Mempitigama CEA unpublished.

Wijewardhana R., Waidyarathna P., 1984.

Conservation farming. Systems, techniques and tools. Dept. of Agriculture, Sri Lanka, and commonwealth Conservative Group of Agriculture for Asia-Pacific Region, 39 pp.

World Conservation Monitoring Centre, 1988.
Directory of Project Areas, Sri Lanka. Final Draft.

Wijedasa K.H.J., Ailapperuma W.D., 1986.
Survey of Environmental Legislation and Institutions in the SACEP countries, Sri lanka. A joint SACEP and UNDP Project, Colombo CEA.

Protected Area Data Unit, Cambridge (details about protected areas in Monebagala).

Zimmermann T., 1981.
Dry Zone Farming, Sarvodaya.