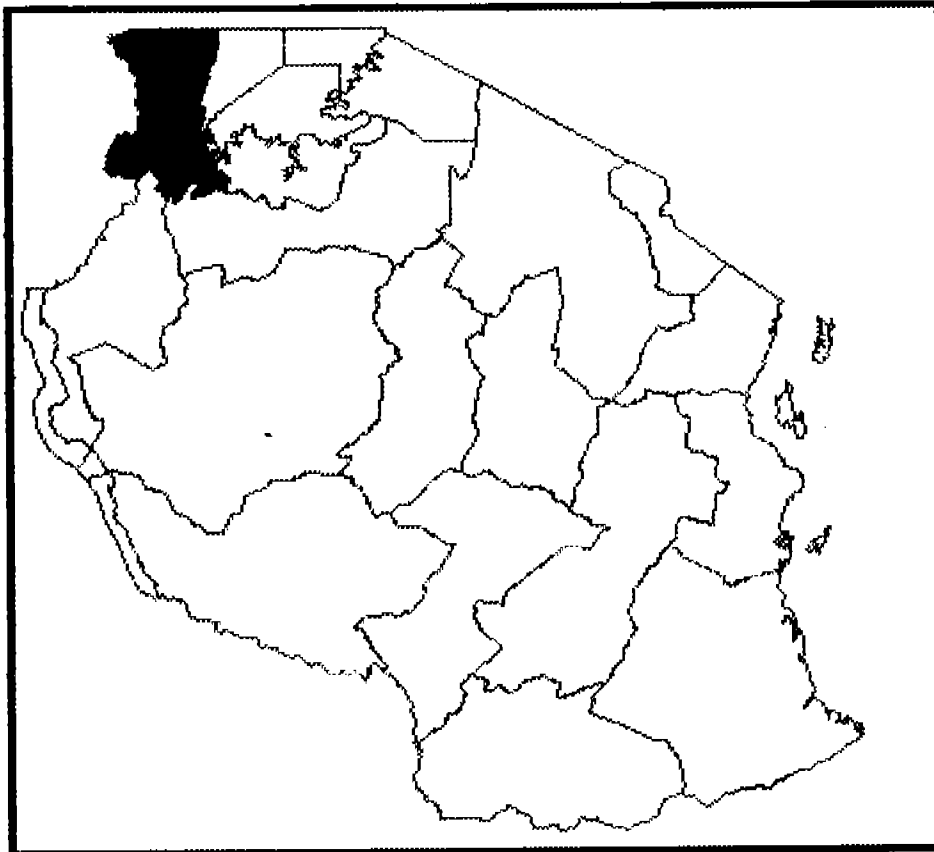


**AN ENVIRONMENTAL PROFILE
FOR
KAGERA REGION, TANZANIA**



PRODUCED BY:

**ENVIRONMENTAL INFORMATION
CENTRE OF THE NATIONAL
ENVIRONMENT MANAGEMENT COUNCIL**

KAGERA'S ENVIRONMENTAL PROFILE

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PART I: OVERVIEW OF THE ENVIRONMENT IN THE KAGERA REGION, TANZANIA

CHAPTER ONE

1. PHYSICAL ASPECTS OF THE NATURAL RESOURCE BASE

1.1 LOCATION

Kagera Region is in the North-Western Tanzania, lying between 1° 0' and 30° 0' South and between 30° 09' and 23° 0' East, occupying an area of 39,168 km²; out of these about 28513 km² covered by land while 10752 km² covered by water. Table 1-1 gives the details of the districts, divisions, wards and villages in the Region.

Kagera shares territorial borders with Uganda in the North, and Rwanda and Burundi on the West. On the South it is bordered with Kigoma, Shinyanga and Mwanza regions.

Table 1-1 Administrative data of Kagera

District	Area (Sq.km)	Division	Wards	Villages	Households
Karagwe	6,734	4	16	104	56,162
Ngara	374	4	15	70	35,378
Biharamulo	9,199	5	15	85	35,928
Muleba	3,444	5	23	116	56,759
Bukoba	5,396	1	13	13	10,147
Total	25,147	19	82	388	194,374

Source: Regional Health Office.

1.2 GENERAL OVERVIEW OF CLIMATE

The Kagera Region has infact no significant dry season due to its proximity (it is near the lake) where precipitation occurs almost in all months. The Region also benefits from the Congo moist air mass from the West. This area has two rainfall peaks, in April (during long rains) and in December (during short rains). Its annual average rainfall ranges from 1000mm in Biharamulo District to 1400mm in Ngara District. But Bukoba has an annual average of 2000mm of rain and some parts on the western shores of Lake Victoria have an annual average of well above 2000mm.

The temperatures are reasonably low due to the effects of the lake breezes. The diurnal temperature range from further inland beyond 160 km is about 14 °C to 17 °C where as around the shores it falls to around 7 °C or 8 °C. September and October being the hottest months.

1.3 Agro-ecological zones

There are six agro-ecological zones in the region:

- a) Coastal Bukoba Highlands
- b) The Central Kagera/Mwisa/Burigi Basin
- c) Karagwe highlands
- d) Ngara highlands
- e) Biharamulo uplands, and

1.3.1 Coastal Bukoba Highlands

This zone includes the whole coastal strip of Bukoba and Muleba District it extends Bukoban sandstone.

The topography is one of ridges and valleys running parallel to the lake shore.

The main natural soil types are weak dark-brown to reddish sandy loams at the surface underlined, by weak, granular brown-yellowish to brown sandy clay loams on the upper slopes, and dark greyish sandy-day loams and sands in the valley bottoms.

Along the bottoms of the drainage lines and in the flooded and seasonally flooded swamp areas the soils vary from weak unstable grey sandy loams to olive heavy clays with extensive mottling.

The soils of these areas though have reasonably adequate physical attributes, are heavily leached, having low pH and are relatively infertile.

The degree to which the soils are "infertile" appears to be directly related to rainfall, with the most heavily leached, degraded soil occurring in the North-East and the least in the South and West.

The average annual rainfall varies from over 200mm/year in the North and West of the region to around 1000mm/year along the Western boundary of the zone.

The staple food in the areas is banana supplemented by legumes and various root crops. Coffee forms the main cash crop with tea as a diversification.

1.3.2 The Central Kagera/Mwisa/Burigi Basin

Between the two escarpment of the two major geological formations in the Region is a trough-like depression with a mainly rolling to undulating topography in the middle, broken hilly terrain around lake Burigi in the South and extensive low-lying flat areas in the North along the Kagera valley.

This zone constitutes the main drainage basin in the region. On the Eastern side of the zone, Lake Ikimba and the Ngano river drain the high rainfall coastal uplands, while lake Burigi and the Mwisa river drain the central land to some extent the south and parts of the Western highlands areas.

Both the Mwisa and the Ngano flow in the Kagera which drains the entire western boundary of the region. There is a fair degree of variation in the soil types dominant in the area. The dominant soil types of the flat areas in the North area is the clay grey soils of lacustrine and alluvial deposits. Frequently, there is little differentiation between horizons apart from mottling caused by seasonal water logging.

On upper slopes in the areas, the sand fraction of the soils increases and the soil structure is poor. These areas are presumably old lake and river shores and are partially characterised by their low phosphorus content. A typical feature of these alluvial sands is the variability in fertility which is related to the origin of deposit and the amount of washing during deposition.

In the rolling mid-section of the zone, the soils are more directly derived from the shales and phyllites of the Karagwe-Ankolean System, and vary from dark-grey sandy clay loams to yellow silty clay.

The slopes and the structure are the major limiting factors on these soils. The slopes over 12% are highly suitable for perennial cropping while those less than 12% have a good potential for grain cropping. However, the high silt content of the soils renders them highly susceptible to erosion if they are abused/cultivated without protective measures.

On the hill tops of the soils are very shallow and based with a fair proportion of the surface covered by stones and boulders. Similar soil formation is also found on the hills of the area around lake Burigi in the South of the zone.

The rainfall in the zone varies from 1200mm in the East along the edge of the coastal upland to 800mm/year in the West. The whole area would appear to be in rain.

The dominant vegetation is *Acacia cambretum* bushland in the South and centre and acacia tree savannah in the North.

Parts of the Northern half of the zone have been alienated for extensive commercial ranching and a large area in the centre has been cleared and sprayed as part of tsetse flies eradication project.

1.3.3 Karagwe Highlands

The Karagwe highlands are the Northern extension of the Karagwe-Ankolean geological formation which runs from Uganda down through Kagera, Rwanda, Burundi and terminate near Kigoma and Lake Tanganyika. The formation has a more complex and mixed composition of quartzite, ortho-quartzite, quartz-rich sandstone, phyllites, micaceous schists and iron banded shales. The soils of the whole area are influenced by this formation.

The area is hilly with steep flat-topped ridges, running generally North-South and broad seasonally swampy valley bottom. A narrow strip of the Kagera river valley runs around and the West Northern boundaries of the area.

The main soils on the hilltops are deep well drain dark-reddish brown to brown sandy loams. The inherent fertility of these soils is moderate to good and neutral pH.

The raised elevation gives the area alternatively favourable annual rainfall of 850 - 1000mm year. This, in combination with the good soils gives the area a good potential for agricultural development. Consequently this area has attracted a substantial proportion of the migrant population in the last two decades. In the west and south of the areas are extensive flat valley and flood plains which are grazed by the herds of the pastoralist Nyarwanda people. With improved communications there is a good potential for development.

1.3.4 Ngara highlands

The Ngara highlands form a continuation of the Karagwe highlands to the South. Much of the area is hilly and is deeply dissected by narrow valley with fast-flowing streams. The soils of the area are deep, well-drained, dark-reddish brown sandy clay loams, becoming yellow-brown or dark-grey sandy clays on the lower slopes.

Subsistence agriculture is less relevant for banana growing in this zone than in other areas. Beans and sorghum are major staples and most farms have far greater areas of annual crops than perennials, with the major perennial cash crops being coffee (arabica). In some areas more intensive forms of agriculture have been introduced including triple cropping, manuring and furrow irrigation.

In this zone there is a serious land pressure situation particularly Buguti division. The pressure on land is associated with the traditionally-favoured settlement areas along the ridges. Below the central ridge there are extensive areas of vacant land with thick bush, making it difficult for individuals to expand cultivation into this area.

This land-pressure situation has been a major factor in a feature of recent years, which has been the high rate of emigration. This has been both permanent and seasonal emigration and it has probably been a most significant factor in the

areas of development that the bulk of emigrant population has been males between 20 - 40 years of age. For a reversal of this trend, development efforts should initially centre on the provision of infrastructure, land planning for settlement formation and the subsequent expansion of cash cropping/earning possibilities.

1.3.5 *Biharamulo Uplands*

This zone includes most of Biharamulo district west of the cotton-producing zone and South of Lake Burigi. The topography of the area is undulating to broad-ridged 130 isolated hill masses and large expanses of swamps in the valleys.

On the tops of the ridges and upper slopes, the soils are mainly dark reddish-brown sandy clay loams and yellow-brown sandy loams. The dominant soil unit of the flat low-laying areas of the Southern and of the lake Burigi are characterised by their high clay fraction and strong swelling and shrinking behaviour. These are the locally termed "Mbuga" soil. In some areas the soils are more sandy than normal which is due to erosion removing the final particles and leaving the coarser one behind. The dominant vegetation include patches of *Brachostagia lulbernadia* woodland and *Lombetum-hyperrhenia* tree-grassland.

The area has a much lower population density than many other parts and the agriculture is still very much subsistence based. The main reasons are the - Isolation and lack of income opportunities.

Fine-cured tobacco has been introduced as cash crop but only in peripheral production areas. This, together with inherent disease problems (nematodes and fusarium wilt) has meant that the production of tobacco has been low and expensive.

1.3.6 *Biharamulo and Coastal Lowlands*

A generally gently undulating to lake Victoria level. The topography in this zone differs from the other in pedological origin. The formation is derived from igneous rocks made up of granite and granidiorates. These rocks emerge as small isolated inselbarges, in an area of generally sandy soils.

The dominant soil units of the slopes are strong brown to red-yellow loamy sands with an underlying laterite horizon. The soils are fairly weak in structures but they are fairly fertile as long as they are not exposed to erosion.

On the lower slopes and the bottoms of the drainage lines are imperfectly drained light-grey to white mottled loamy sands and dark-grey clay loams. The rainfall fall to the South and inland away from the lake. The rainfall occurs at the Northern and of the zone adjacent to the lower parts of the zone.

The natural vegetation is a mixture of *Brachystagia julbernuchia* woodland with *Landetia acacia* scrub savannah. Much of the area in the South and West is heavily infested with tsetse flies, which prevent effective expansion of human and domestic livestock occupation.

The Eastern half of the zone has seen particularly rapid expansion of both the cultivated area and the human population. The areas borders "Sukumaland" (Mwanza and Shinyanga regions) which lies to the East and where there are conditions of heavy land pressures. This has led to heavy immigration from these areas as well as directly across the lake from the Jata and Kibara peninsulas of Mara region.

The immigrants introduced cotton production to the area and this zone is now major cotton-producing area in Kagera region. This heavy and continuing immigration will require monitoring and agricultural supervision if the degradation of the soil and decline in production are to be avoided.

1.4 VEGETATION

The Kagera region is divided into different zones according to specific vegetation dominating the area.

1.4.1 Lake Victoria Zone (Coastal Bukoba Highlands)

This zone is dominated by grasses mainly in steep areas such as *Blepharoglumis Kagerensis* (Eyihwe), *Ludetia digitaria*, *Hyparrhemia* and *Cynodon*. Tree species dominating the area are *Harungana madagascariensis*; *Makaranga* spp; *Schweinfurthii* spp., *Maesopsis eminii*, *Ficus* spp and *Chlorophora excelsa*.

1.4.2 Hinterland zone (Central Kagera/Mwisa/Burigi zone)

The main tree species dominating this zone include *Albizia* spp, *Podocarpus* spp, *Combretum* spp, *Bauhimia* spp, *Dombeya* spp and *Faraga* spp.

Other tree species are *Maesopsis eminii*, *Oboza* spp, *Multiflora* spp, *Senecith* spp, *Vernoia* spp and *Markhamia* spp.

1.4.3 Karagwe and Ngara Highlands

Tree species include; *Albizia* spp, *Allo-phylus* spp, *Ageratum comyzoidea*, *Mytenus* spp, *Milletia dura* and *Kigewa* spp.

1.4.4 Biharamulo Coastal Zone

This zone is characterised by closed miombo woodland, dominated by miombo tree species such as *combetum*, *Brachystegio*, *Julbernadia*, *Kigelia*, *acacia* and *Pterocarpus* species.

1.5 Drainage

The major water basin is that of Kagera river. It flows into lake Victoria in the border area between Tanzania and Uganda. Most other rivers of the Region drain into Kagera river. The rivers in the Southern part of the Region flow into a very low gradient in the narrow valleys and have formed swamps due to high amount of rainfall, especially in the coastal areas which have perennial wet conditions.

CHAPTER TWO

2. LAND USE

Various types of land use existing Kagera, like agriculture, forestry, growing-land requirements and human settlements.

2.1 *Forest and Woodland*

Forest reserves cover an area of 353,943 ha. The legally protected forest is a mere 12.4% of the total land area. The proposed forest reserves covers 13,700 ha. This includes grassland, non-reserved forests, woodland and thickets.

2.2 *Cultivated land*

This covered (in 1988/89 season) 168263 ha for annual crops and 116782 has for perennials. Agriculture is the main reason behind the depletion of forests in the region is the method of land preparation employed, and the kind of cultivation practised. Bushes and scrubs are cut, the trash is collected and burnt.

2.3 *Other land uses*

Other types of land use like grazing land requirement derived from animal population in the region is 532581 ha. Area under settlement is 503,661 ha.

2.4 *Land Tenure*

Land ownership and occupation is in accordance with the villagization programme of 1960's, ad 1970's which require household to have a homestead plot of about 0.5 ha. The programme empowers village governments to hold communal agricultural land, grazing areas, forests and unutilised reserved land. Individual rights to agricultural land in the village are well recognised and respected. The agricultural land ownership is still guided by the traditional system of land ownership. In this system an individual may occupy a piece of land provided that the piece of land is not occupied by anyone else. Another possibility is the acquisition through inheritance.

Farmland/plots are normally unsurveyed and lease system is not widely in use yet. Plans for village boundary demarcation exercise is necessary to enable and help villagers make and adopt their own land use.

2.5 Forest resources

2.5.1 Catchment forests

There are mainly two forest reserves identified as catchment forest namely Kasansye and Runga river. They cover two District of Biharamulo and Muleba, though the greater part of it is in the former.

There is proposed catchment forest reserve in Muleba district called Kituo island which is estimated to cover 1500 ha. Similarly in Bukoba District the Kishaka island, which is famous by protecting the Kemondo Bay, acting as the wind-breaker.

An important proposed catchment for the water-source and for hydro-electric power in Muleba district is called Mugugu, covering about 200 ha. Although process of gazetting these areas is going slowly, the Regional authorities are strict in controlling their destruction.

2.5.2 Natural forests for production

Except for Kasangeye and Ruiga river, all 14 forest reserves were meant for production. Two of these, Biharamulo and Nyantukara covering 164017 ha are closed miombo woodland.

The average growing stock in these plant is estimated to be $83\text{m}^3/\text{ha}$ with an annual volume increment of about $2\text{m}^3/\text{ha}/\text{year}$. Minziro equatorial rainforest with total area 24864 ha closed forest the average growing stock is estimated at $200\text{m}^3/\text{ha}$ with annual volume increment of about $3\text{m}^3/\text{ha}$.

The rest of forest reserves in productive category are having an estimated average growing stock of $40\text{m}^3/\text{ha}$ with annual volume increment of $1\text{m}^3/\text{ha}$.

The total potential wood production is over 36 million cubic metres with annual allowable cut of cover 700,000 cubic metres. The estimates on stock and yield are not based on concrete research within the Region. They are results of inventories done elsewhere with similar conditions.

2.5.3 Fuelwood Plantation

There are fuelwood plantations established all over the Region in small hectorage. They are meant to supply fuelwood to both urban and rural people. The plantation covers 1811 ha, and do not get due attention in tending them. They have the growing stock of about $100\text{m}^3/\text{ha}$ and annual increment of about $10\text{m}^3/\text{ha}$.

Table 2-1 Total Seedling distributions 77/78 - 88/89

District	Schools	Village	Individuals	Dept.	Institution	Total
Biharamulo	52,0295	44,8608	157,415	97,192	101,285	132,2795
Muleba	13,702	34,9942	199,911	469,852	64,124	1,218,531
Ngara	320,125	366,780	378,64	139,262	34,065	898,096
Karagwe	276,717	213,349	167,870	289,384	32,104	979,424
Bukoba	257,657	192,572	234,398	174,542	165,612	1,024,781
Total	1,524,496	1,581,251	837,458	1,190,232	412,190	5,543,627

Source: Regional Forest Action Plan for Kagera, 1992.

Table 2-2 Type of land use Kagera region (Areas in Ha)

Land Use	DISTRICTS					Total
	Biharamulo	Ngara	Karagwe	Muleba	Bukoba	
AGRICULTURAL CROPLAND						
Cassava	12,917	1,708	5,295	5,500	1,393	26,813
Sorghum	920	545	1,500	150	-	3,115
Cotton	12,400	-	-	-	-	12,400
Maize	18,786	502	16,500	200	793	36,781
Alizet (Sunflower)	-	1,730	-	-	-	1,730
Paddy	3,500	-	-	-	-	3,500
Legumes - Beans	9,427	25,540	25,000	10,720	1,034	71,721
Coffee	-	750	-	14,700	22,595	38,045
Sweet potatoes & Irish potatoes	-	-	5,600	-	-	5,600
Tea	-	-	-	240	-	240
Groundnuts	-	290	120	80	-	490
Finger millet	-	-	129	-	-	129
Bananas	4,437	12,030	-	29,083	39,076	84,626
Sub-total	623,887	43,095	54,144	60,673	64,891	285,191
2) AREA UNDER SETTLEMENT	163,015	72,000	101,000	62,046	105,000	503,661
3) PRIVATE LAND/RANCHES ESTATE	622	70,915	117,340 Ranches	280 Ranches	59,000	248,157
4) FOREST RESERVES						
- Central Govt. Outside reserves	318733	2,500	-	-	32,710	353,943
- Local authority reserves	-	-	-	-	-	-
Plantation outside reserve	150	30	105	1,333	193	1,811
- Proposed Forest reserve	1,500	-	7,500	1,500	3,200	13,700
5) Grazing land requirement	68,493	81,772	146,316	130,000	106,000	532,581
Subtotal	552,513	227,217	364,656	195,759	306,103	1,646,248
6) Grassland non reserved forest & woodlands and thickets	305,000	103,688	254,600	87,968	168,606	919,862
TOTAL AREAS:	919,900	374,000	673,400	344,400	539,600	2,851,300

Source: Regional Forest Action Plan for Kagera 1992.

Table 2-3 Summary of forest reserve by forest type and Institutional type

District	Name of the Reserve	Category Catchment /Productive	Area (Ha)	Institutional Responsibility
Biharamulo	Biharamulo	PRODUCTIVE	134,684	All territorial forest reserve managed and owned by central government
	Nyantakara	PRODUCTIVE	29,333	
	Kasongye	Combine forest reserve and game reserve catchment	48,782	
	Ruiga River Unsurveyed part of the reserve in Muleba District	Combined forest reserve and game reserve catchment	105,934	
Ngara	Goyagoya	Productive	2,500	Central Government
Bukoba	Kamkuna	Productive	90	All territorial forest reserves managed and owned by the central government
	Kamtale	Productive	67	
	Kiamahuru	Productive	23	
	Kiikuru	Productive	600	
	Kikongoro	Productive	17	
	Minziro	Productive	24,864	
	Mlima/Kizo/Russina	Productive	4,662	
	Munene	Productive	600	
	Rubale	Productive	11,200	
	Ruchwezi	Productive	647	
Kivu	Productive	20		

Source: Regional forest action plan for Kagera.

2.6 Forest Management and production

2.6.1 Natural forest

Natural forest of the Region include closed miombo situated mostly in Biharamulo District, Bukoba rural and Minziro forest reserve which is equatorial rainforest.

Shrubland with scattered trees covering most parts in Karagwe, Ngara and Muleba Districts are not gazetted, hastening their depletion due to shifting cultivation. There are no proper supervision and follow-up of these lands. Gazetting of these areas is very important.

The management of these areas require sufficient inputs, including community participation.

About 5.5 million seedling have been raised for planting, with more than 837000 given to communities and individuals. The seedlings have been produced from centralised nurseries at the government expenses. About 30 nurseries have been operating at different times and capacities though their development has been hampered by the lack of resources.

2.6.2 Deforestation

Deforestation is caused by overgrazing and shifting cultivation. Overgrazing mainly occurs in Biharamulo and Karagwe districts as well as in some parts of Muleba. The shifting cultivation is mainly practised in Biharamulo District.

The situation is worsened by intensive clearing of forests for cotton and paddy farming. Woodfuel demand is another cause of deforestation.

2.7 Wildlife Management

Kagera region comprises four (4) game reserves and two controlled areas, covering a total estimated area of 4730 sq. km or 16.45% of the total land area of the Region, as follows:

Large areas of game potential are concentrated in Biharamulo, Karagwe and to a lesser extent Ngara Districts. Thus, much attention is needed in these areas of priority for the betterment of wildlife conservation.

Ibanda and Burigi Game Reserves are natural projects under the direct management of the wildlife divisions in the Region concerned with conservation.

Other reserves fall under the central government, managed by the Regional authorities both financially and administratively.

Animals found in the reserves are elephants, antelope spp, buffaloes, zebras, lions, hyenas, etc. Pangolins, numerous birds and snakes, rare animals such a sitatunga, colobus monkey and wild-dogs are present in the region. Also an assortment of bird species like the vultures, guinea fowls, plovers, spoonbills etc. are in the area.

Table 2-4 Wildlife Conservation in Kagera

Burigi Game reserve	2,200 sq.km
Ibanda Game reserve	200 sq.km
Rumanyika Orugundu Game Reserve	800 sq.km
Biharamulo Game Reserve	1,300 sq.km
Masari River Game Controlled Area	180 sq. km
Victoria Nkima wildlife	50 sq.km
Total Land Area under wildlife conservation	4,730 sq. km

Problems facing wildlife conservation in the region are;

- 1) Poaching, which is a historic traditional problem, is still prevalent and rampant despite vigorous anti-poaching campaigns.
- 2) Encroachment of game reserves by pastoralism, agriculture and timber exploitation by people who live near the reserves.

2.8 Wetland of Kagera Region

Most of the wetlands in the region are associated with river systems

The wetland are important in that;

- They constitute catchment area for rivers and lakes
- They have a great biological diversity (fauna and flora)
- Provide exceptional areas for ecological studies
- Act as sources of wood for both domestic and commercial users

The wetlands are;

1. The upper Kagera River Wetland System which is in the Bukoba district, in and around Ruasima - Nurene - and Minziro forests.
2. The Lower Kagera River Wetland System which is in Ngara and Karagwe districts. The two wetlands surround the Kagera river in the districts
3. The Lake Burigi Wetland Systems, in Biharamulo / Karagwe districts, extending into Muleba district.

4. The Kasampeye - Rwiga River Wetland Systems, in Biharamulo and Muleba Districts.
5. Lake Ikimba area which is, wholly, in public land. The lake Burigi Wetland System is a swamp surrounding lake Burigi.

2.9 MINING

Kagera Region is believed to have different kinds of mines like nickel, tin and limestone. Tin is mined at Kyenva in Karagwe from 1970s. After the Kyerwa Syndicate became defunct following breakdown of the East African Community, unrest in Uganda and nationalising in Tanzania, the Commercial mining stopped. Meanwhile there are small-scale miners who cannot exhaust the reserve. A survey done by the Ministry concerned with mining found vast reserve of tin waiting for investors.

Recently, a survey for nickel concluded the presence of the mines, particularly at Kabaga in Ngara to Karagwe and neighbouring Burundi. On the Tanzania side, mining could be done for 25 years.

CHAPTER THREE

3. SOCIO-ECONOMIC ASPECTS

3.1 POPULATION

According to the 1988 population census, the Kagera region had a human population of 1,326,183, in the average annual growth rate of 2.7%. About 90% of the regional population live in rural areas and involved in diverse agricultural activities, mainly at subsistence levels. The average density per square kilometre is 46.3 persons. The actual density, however, is much higher because the central low-level area is virtually uninhabited by the people.

Table 3-1 gives the population projection per district, and tables 3-2 to 3-5 give projections for women, children under one year and children under five years respectively.

Table 3-1 Population projection

District	1996	1997	1998	1999	2000
Karagwe	400,796	418,406	436,790	455,982	476,017
Bukoba (R)	426,370	438,477	450,928	463,732	476,900
Bukoba (U)	47,637	47,780	47,923	48,067	48,212
Biharamulo	251,588	257,441	263,431	269,560	275,832
Ngara	217,959	226,627	235,640	245,012	254,756
Muleba	47,637	47,780	47,923	48,067	48,212
Total	1,672,915	1,724,941	1,778,745	1,834,390	1,891,944

Source: Health statistics abstract, 1997

Table 3-2 Women Aged 15 - 49 years

District	1995	1996	1997	1998	1999	2000
Karagwe	80,562	84,101	87,796	91,654	95,681	99,885
Bukoba(R)	87,893	90,388	92,955	95,595	98,309	101,101
Muleba	66,125	67,663	69,237	70,848	72,497	74,183
Biharamulo	53,229	54,468	55,735	57,032	58,359	59,716
Ngara	46,590	48,443	50,369	52,372	54,455	56,621
Bukoba (U)	11,902	11,938	11,974	12,010	12,046	12,082
Total	346,300	357,001	368,067	379,511	391,347	403,589

Source: Health statistics abstract, 1997

Table 3-3 Children under one year

	1995	1996	1997	1998	1999	2000
Karagwe	16,125	16,833	17,573	18,345	19,151	19,993
Bukoba(R)	15,340	15,776	16,224	16,684	17,158	17,645
Muleba	11,238	11,500	11,767	12,041	12,321	12,608
Biharamulo	10,081	10,315	10,555	10,801	11,052	11,309
Ngara	8,804	9,154	9,518	9,897	10,291	10,700
Bukoba (U)	1,662	1,667	1,672	1,677	1,682	1,687
Total	63,250	65,246	67,310	69,449	71,655	73,942

Source: Health statistics abstract, 1997

Table 3-4 Children under five

	1995	1996	1997	1998	1999	2000
Karagwe	72,562	75,750	79,079	82,553	86,181	89,967
Bukoba(R)	65,921	67,793	69,718	71,698	73,733	75,827
Muleba	6,602	6,621	6,641	6,661	6,681	6,701
Biharamulo	54,017	53,228	54,466	55,733	57,030	58,357
Ngara	45,731	46,795	47,884	48,998	50,138	51,305
Bukoba (U)	41,296	42,938	44,646	46,421	48,267	50,187
Total	284,129	293,126	302,434	312,065	322,031	332,344

Source: Health statistics abstract, 1997

3.2 Education

The development of formal education has long been traditional in the Region. Many primary and secondary schools have been built by the government, religious institutions individuals and through self-help efforts. In addition, the region has adult education programmes and workshop in each district. There are also three development training centres, in Biharamulo, Bukoba Rural and Ngara district. Total enrolment in primary schools stood at 199,000 in 1995, out of which 97,000 (49%) were girls.

Table 3-5 gives some details of the number of primary schools in Kagera region.

Table 3-5 Education in Kagera

	1989	1990	1991	1992	1993	1994	1995
Number of Public Primary School	643	644	656	658	669	678	683
Total Enrolment in Public Primary Schools '(000)	188	197	196	198	203	196	199
Girls enrolment in Public Primary Schools '(000)			93	96	99	99	97
% of Girls in the total enrolment			47	48	49	49	49

Source: Statistical Abstract: 1995, Table M. 1 - M.3

3.3 HEALTH

3.3.1 Health facilities

The region has 15 hospitals, out of which 2 are government-owned, 9 voluntary, 2 parastatal and 2 privately-owned. There are also 14 health centres, and 191 dispensaries, making a total of 220 health institutions in the region, out of 4,844 in the mainland.

Population per health facility is 7,850, which is bigger than mainland's (6,041). The number of facilities per 10,000 population is 1.3 as compared with national 1.7.

There are a total of 1709 beds in region's hospitals and 365 in health centres. All the health centres in the region are government-owned. Thus, the region has a total of 2,074 beds and hence 791 persons per bed. The ratio is better when compared with mainland's 882 persons per hospital bed.

Tables 3-6 to 3-38 gives various data on health for the Region.

Table 3-6 Number of population per bed

	Population in 1995	Number of beds	Population per bed
Kagera	1,641,104	2,074	791
Mainland	27,941,103	31,686	882

Source: Table 1.4.4 Health Statistics Abstract, 1997

3.3.2 Cases and Deaths

There is relatively low incidence of communicable diseases in the Region, particularly cholera, plague, meningitis, dysentery and rabies. For instance, of the five diseases there were only three reported cases of meningitis, and none for the remainder in 1994.

The same trend is reflected in the number of deaths from the diseases with only one death in 1994 and three in 1995.

Reported cases of measles in the region are decreasing - from 632 in 1992 to 111 in 1994.

Reported AIDS cases in the Region are increasing, whereby, in 1996 rate of AIDS per 100,000 population was 444, compared with mainland's 307. In 1992 and 1993 the Region ranked third, behind Dar es Salaam and Mbeya, through ranked fifth in 1996. The epidemic have had a devastating effect on the socio-economic activities in the Region. The disease has increased the number orphans in the Region.

The disease could also be attributed to the increased TB cases in the Region. There was doubling of new cases for relapses or tuberculosis, for instance, in 1993 - 1994 period. The most affected age-group is 25 - 34 years, followed with 35 - 44 years, which are the productive and reproductive age groups, whereas the mostly affected are the males.

Leprosy incidence in the region is fairly lower, when compared with mainland's

Oral health care in the region is fairly good, with only 8 referred cases out of 9,015 diagnosed cases, for instance, in 1993.

3.3.3 Health Statistics Indicators

Infant and Under-Five Mortality rates

IMR, Infant mortality rates in the region have a downward trend, as well as for the USMR, the Under-Five Mortality Rates. The rates are however decreasing at a much slow rate as compared with the required rate of decline. The rate of decline for IMR is 0.2 against the required rate of decline of 6.4; whereas, the rate of decline for the U5MR is 0.3 against the required 7.9.

The infant and Under-Five mortality rates are therefore higher than Mainland's. It was estimated that in 1995 IMR and U5MR for the region were 127 and 212 respectively, as compared with Mainland's 96 and 158 in the same year. There were 63,250 infants in 1995 in the Region.

MMR, The Maternal Mortality Rates are decreasing, though above the prevailing mainland's rate. In 1995, for example, the region's MMR was 242 whereas Mainland's was 208. The Region had a total number of 371 maternity beds in 1995, with a population of women aged 15 - 49 years of 346,300.

Life expectancy at birth in the Region is less than Mainland's (45 years in Kagera, 50 Mainland) in 1988.

The crude death rate is higher than mainland's 821.1 in Kagera, 14.7 mainland, in 1988).

3.3.4 Immunization Program

Immunisation coverage in the region is less than 80%. For example, in 1996 77% children under 1 year - old were immunised against tetanus and only 72% against measles. A total of 13.8% of twice immunised dropped out of immunisation programme.

Table 3-7 Health Service in Kagera

District	Hospitals	Health centres	Dispensaries
Bukoba	3	4	50
Biharamulo	1	2	23
Karagwe	2	3	29
Muleba	3	2	21
Total	11	13	153

Source: Kagera Profile

Table 3-8 Number of health facilities by ownership, 1996

	Government	Voluntary	Parastatal	Private	Total
Hospitals	2	9	2	2	15
Health centres	10	4	-	-	14
Dispensaries	140	26	2	23	191
Total	152	39	4	25	220

Source: Health Statistics Abstract, 1997 Table 1.3.2 - 1.34

Table 3-9 Population per Health facility and number of Health Facilities per 10,000 population.

Kagera	Population estimate 1995	Number of Health facilities	Estimated population per Health Facilities	Number of Health facilities per 10,000 population
	1,726,904	220	7,850	1.3
	29,264,815	4,844	6,041	1.7

Source: Health Statistics abstract, 1997 table 1.3.5

Table 3-10 Number of beds in hospitals

	Government	Voluntary	Parastatal	Private	Total
Kagera	250	1,409	50	-	1,709
Mainland	11,831	11,644	2,249	110	25,834

Source: Health Statistics Abstract, 1997 table 1.4.1

Table 3-11 Number of beds in health centres

	Government	Voluntary	Parastatal	Private	Total
Kagera	365	-	-	-	365
Mainland	5,651	183	18	-	5,852

Source: Table 1.4.2 Health statistics abstract, 1997

Table 3-12 Distribution of communicable disease cases 1994 and 1995

Year	Cholera	Plague	Meningitis	Dysentery	Rabies
1994	0	0	3	0	0
1995	0	0	41	467	21

Source: Table 2.1.18 Health Statistics abstract, 1997

Table 3-13 Distribution of deaths caused by communicable diseases, 1994 and 1995

Year	Cholera	Plague	Meningitis	Dysentery	Rabies
1994	0	0	1	0	0
1995	0	0	0	3	0

Source: Table 2.2.19: Health Statistics Abstract, 1997.

Table 3-14 Reported cases of measles

Year	Number of cases in Kagera	Total number of cases in Mainland
1992	632	13,015
1993	126	15,635
1994	111	3,558

Source: Table 2.1.20: Health statistics abstract, 1997

Table 3-15 Cumulative AIDS cases, 1991 - 1996

Year	1991	1992	1993	1994	1995	1996
Kagera	4,742	5,813	6,646	7,064	7,223	7,426
Mainland	44,195	60,066	73,572	79,445	83,351	88,467

Source: Table 2.1.21, Health Statistics Abstract, 1997

Table 3-16 Rate of AIDS per 10,000 population based on the cumulative cases

Year	1992	1993	1996	1997
Population	1,477,431	1,517,865	1,674,586	28,396,247
Rate	280	289	444	307
Rank Nationwide	3	3	5	

Source: Table 2.1.22, Health statistics abstract, 1997

Table 3-17 Smear positive pulmonary TB and Leprosy case detection rate per 10,000

Year	TB Rates		Leprosy rates	
	Kagera	Mainland	Kagera	Mainland
1992	36	48	9.0	13
1993	36	57	4.8	11
1994	1,134	1,719		

Source: Table 2.1.25, Health statistics Abstract, 1997

Table 3-18 Smear positive pulmonary TB by Age for the year 1993

Age group	0 - 14	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+	Total
Cases (Kagera)	15	108	152	129	89	43	18	554
Mainland	295	3,146	4,967	3,228	1,974	1,154	664	15,428

Table 2.1.26 Health Statistics Abstract, 1997

Table 3-19 New cases for relapses of tuberculosis and rate of smear positive by sex and year

Year	Kagera		Mainland	
	1993	1994	1993	1994
Male	334	673	9,868	20,925
Female	220	461	5,560	13,453
Total	554	1,134	15,428	34,378

Source: Table 2.1.27: Health Statistics Abstract, 1997

Table 3-20 New cases for Relapses of leprosy by Age group, 1993

Age group	0 - 14	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+	Total
Cases (Kagera)	5	12	10	18	12	8	5	70
Mainland	196	447	473	512	481	303	151	2,563

Source: Table 2.1.28: Health Statistics Abstract, 1997

Table 3-21 Number and percent of notified newly diagnosed Tuberculosis patients (all types) during the year 1995 and 1996

	Pulmonary Tuberculosis				Extra Pulmonary Tuberculosis				Total
	AFB+	%	Relapse	%	AFB-	%	Cases	%	
1995	795	51	27	2	486	31	261	17	1,569
1996	703	41	36	2	691	40	294	17	1,724

Source: Table 2.1.32 and 2.1.32, Health Statistics Abstract, 1997

Table 3-22 New cases for relapses of tuberculosis by rate of smear positive by sex and year

	Male	Female	Total	Rate smear positive per 100,000	
				1992	1993
Kagera	334	220	554	35	34
Mainland	9,868	5,560	15,428	53	55

Source: Table 2.1.34, Health statistics Abstract, 1997

Table 3-23 Annual return of attendance for oral health care by sex, age. 1993 and 1995

Year	Kagera					Mainland
	Male	Female	Total	Children	Adult	Total
1993	5,101	5,486	10,587	2,985	7,602	245,845
1995	5,245	6,264	11,509	2,616	8,893	205,490

Source: Table 2.3.1, Health Statistics Abstract, 1997

Table 3-24 Annual return of diagnosis for oral health care by type of disease, 1993 and 1995

	Diagnosis (Kagera)							Diagnosis (Mainland)
	Carves	Perio	Trauma	Neop	Others	Referra	Total	Total
1993	6,590	1,078	137	35	1,275	8	9,105	223,956
1995	9,141	995	165	46	1,758	13	12,105	243,918

Source: Table 2.3.2 Health Statistics Abstract, 1997

Table 3-25 Annual return of treatment for oral health care by type of treatment for the year 1993 and 1995

Year	Ext	Cons	Pros	Others	OHI/Scal	Surg
1993	7,408	194	71	2,174	421	45
1995	9,426	520	101	3,127	95	66

Source: Table 2.3.3 Health Statistics Abstract, 1997

Table 3-26 Annual Average Current + Required Rates of Mortality Decline

	Rate of decline for IMR		Rate of decline for USMR	
	Current	Required	Current	Required
Kagera	0.2	6.4	0.3	7.9
Mainland	1.8	5.4	1.9	6.8

Source: Table 3.1.1 Health Statistics Abstracts, 1997

Table 3-27 Infant and under - five mortality rates

	Kagera		Mainland	
	IMR	U5MR	IMR	U5MR
1975	133	225	137	231
1985	130	219	115	191
1995 (Estimates)	127	212	96	158

Source: Table 3.1.2 Health Statistics Abstract, 1997

Table 3-28 Maternal Mortality Rate for Four Consecutive Years (1992 - 1995)

	MMR			
	1992	1993	1994	1995
Kagera	304	343	190	242
Mainland	199	211	197	208

Source: Table 3.1.3 Health statistics abstract, 1997

Table 3-29 Life Expectancy at Birth by sex for the years 1978 and 1988

	1978	1988		
	Total	Total	Male	Female
Kagera	45	45	44	45
Mainland	44	50	49	51

Table 3-30 Crude Death Rate

	1978	1988		
	Total	Total	Male	Female
Kagera	18.5	21.1	22.4	20.1
Mainland	19.1	14.7	15.9	13.5

Source: Table 3.1.6, Health statistics Abstract, 1997.

Table 3-31 Maternity and Delivery Room Service Provision, 1995

Health facilities reported	Number of health facilities with delivery beds	Total number of delivery beds	Number of health facilities with maternity beds	Total number or maternity beds
174	118	155	87	371

Source: Table 5.2.1 Health Statistics Abstracts, 1997

Table 3-32 Reported newly diagnosed smear positive pulmonary Tuberculosis by Age group and sex 1994 and 1995

Age group and Sex																					
	0 - 14			15 - 24			25 - 34			35 - 44			45 - 54			55 - 64			65+		
	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F
1994	5	9	14	45	44	89	75	66	141	83	52	135	44	22	66	17	7	24	19	6	25
1995	17	22	39	73	91	164	123	87	210	140	68	208	69	26	95	31	12	43	29	7	36

Source: Table 2.1.29 and 2.1.30, Health Statistics Abstract, 1997

Table 3-33 Frequency distribution of newly diagnosed leprosy patients by age and sex in 1995

Age group and Sex																					
	0 - 14			15 - 24			25 - 34			35 - 44			45 - 54			55 - 64			65+		
	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F	M	F	M+F
PB	1	2	3	3	1	4	3	2	5	1	1	2	2	1	3	1	0	1	0	0	0
MB	2	2	4	2	1	3	9	3	12	3	5	8	3	6	9	0	1	1	3	1	4

Source: Table 2.1.33, Health Statistics Abstract, 1997

Table 3-34 The Immunisation coverage for children < 1 for the year 1996

	BCG	DPT 3	Measles
Number of Vaccination per target population	40,874	40,874	40,874
%	77	72	72

Source: Table 5.3.4 Health statistics abstract

Table 3-35 Estimates of Immunisation Dropouts for children < 1, in 1996

Totals			Dropout in percentage		
BCG	DPT3	Measles	BCG-DPT3	BCG-Measles	DPT3 Measles
31,467	29,441	29,290	6.4%	6.9%	0.5%

Source: Table 5.3.5 Health statistics abstract.

Table 3-36 Dispensaries in Kagera

District	Government	Voluntary	Parastatal	Private	Total
Biharamulo	23	7	0	5	35
Bukoba (R)	45	8	0	0	53
Bukoba (U)	4	2	0	6	12
Karagwe	26	5	2	4	37
Muleba	21	3	0	1	25
Ngara	21	1	0	7	29
Total	140	26	2	23	191

Source: Health statistics abstract, 1997

Health Facilities by Districts

Table 3-37 Hospitals

District	Government	Voluntary	Parastatal	Private	Total
Biharamulo	0	1	1	0	2
Bukoba Rural	0	1	1	0	2
Bukoba Urban	1	0	0	2	3
Karagwe	1	2	0	0	3
Muleba	0	3	0	0	3
Ngara	0	2	0	0	2
Hospital beds					
Biharamulo	0	146	0	0	146
Bukoba Rural	0	140	50	0	190
Bukoba Urban	250	0	0	0	250
Karagwe	0	245	0	0	245
Muleba	0	635	0	0	635
Ngara	0	243	0	0	243

Source: Health statistics abstract, 1997

Table 3-38 Health centres

Districts	Government	Voluntary	Parastatal	Private	Total
Biharamulo	2	0	0	0	2
Bukoba Rural	1	3	0	0	4
Bukoba Urban	1	0	0	0	1
Karagwe	2	1	0	0	3
Muleba	2	0	0	0	2
Ngara	2	0	0	0	2
Health centre beds					
Biharamulo	70	0	0	0	70
Bukoba Rural	91	0	0	0	91
Bukoba Urban	25	0	0	0	25
Karagwe	50	0	0	0	50
Muleba	69	0	0	0	69
Ngara	60	0	0	0	60

Source: Health statistics abstract, 1997

3.4 AGRICULTURE

3.4.1 Farming

Agriculture contributes about 50% of the Regional economy. The total arable land amounts to about 1,868,750 ha, while an average of 15% of this (285,045 ha) is cultivated annually. About 116782 ha are under permanent crops viz. banana, coffee, tea and cassava, whereas 168263 ha are annually planted with seasonal crops, viz. beans, maize, sorghum and cotton.

Major export crops are coffee, cotton and tea. Bananas, maize, beans and cassava are principle food crops. Production of export crops on the other hand has consistently declined, while that of food crops fluctuate. Table 3-39 give a summary of small scale farming activities in the region.

3.4.2 Livestock keeping

Livestock population in the Region according to the 1984 census show that there were 364678 cattle, 343317 Goats, 54217 sheep, 460816 poultry and 862 pigs. Furthermore, Karagwe District is leading in cattle and sheep rearing; Ngara district in goats and pigs; and Bukoba rural in poultry keeping.

The Natural Ranching Company owns about 8.5% (31,000 cattle) herd in the Region.

Livestock products supply is so low that milk from the dairy industry is slowly playing a significant role in the Regional economy. Per capita consumption of both meat and milk are very low; 2.2 kg and 1.2 litres respectively (1986/87), compared to the national average whose per capita meat and milk consumption stand at 8.5 kg and 32 litres respectively. The region still has a considerable potential in the livestock industry.

Table 3-39 Small Scale Agriculture in Kagera, 1994/95 long rains

	Maize	Paddy	Sorghum	Cassava	Sweet potatoes	Beans	Groundnuts	Total planted area
Number of holdings ('000) Growing selected crops during 1995/96 long-rains season	20	8	47	62	30	117	6	283
Holding (%) Growing the selected crops during the 1994/95 long-rains season	7	3	17	22	11	41	2	100
Area ('000 ha) planted in the selected crop during 1994/95	2	3	8	14	3	20	6	120
Average planted area (ha) per holding growing the selected crops during 1994/95 long-season.	0.08	0.38	0.18	0.23	0.10	0.17	0.13	

Source: Table G.5 - G.8 Statistical Abstract 1995

3.5 Transport and communication

The Region has roads which connect other Regions and all headquarters of Districts and villages. The most reliable means of reaching and leaving Kagera for passenger and cargo is lake transport. Two main ships operating are MV Victoria and MV Serengeti.

3.6 Power Supply

The supply of electricity in Kagera is under developed. There is a demand of 3.0 Megawatts whereas the two diesel generators produce only 1.2 Megawatts. See Table 4-35 .

Table 3-40 Electricity in Bukoba

Year	1988	1989	1990	1991	1992	1993	1994
Consumers	2,014	2,243	2,363	2,420	2,494	3,341	4,298
Electricity generated (Mill. kwh)	6.7	12.9	8.9	10.6	12.3	11.4	0.6

Source: Statistical Abstract: 1995

CHAPTER FOUR

4. PART II KAGERA'S MAIN ENVIRONMENTAL ISSUES AND IMPLICATIONS FOR DEVELOPMENT

4.1 FORESTRY

The Regional Forestry Office within the Regional Natural Resources Office is the overseer of implementation of forest policy in the Region. The district Forest Officers are the actual implementers of the policy. But in previous ten to fifteen years, insufficient funds were allocated for development of legally protected forest assets. This has resulted into poor state of the same.

The depletion of forest in non-reserved lands raised a concern which culminated into the National Village Afforestation Programme in 1970s. The basic objective of the programme was that the government would act as a catalyst of tree planting and the villagers participate fully in the programme to meet their own wood requirements. There is one 280 hectares National Forest Project which was planted during 1959 and 1969. It is situated 10 kilometres from Bukoba Town. The main objective was to supply softwood timber in the Region. There are also some smaller softwood plantation of size 1 to 40 hectares scattered all over the regions as trial plots of the Forest. Division. Further, there are about 1811 ha of woodlots owned by schools, churches and individuals. These are mostly planted with eucalyptus and pines.

Over 95% of the population in the Region depend on wood for domestic energy as well as for smoking fish, brewing, tea drying and steam engine at Kagera Sugar Company. The demand for wood and wood products in the region is estimated to be about 3.0 million cubic metres per year, while the potential supply is hardly 1.0 million m³.

For instance, a tea factory at Maruku (near Bukoba town) requires about 5000m³ of wood per annum, all from the natural forest. Yet the rate of clearing forests for agriculture is alarming. Public lands which were formerly stocked with big diameter trees are now left with bushes and shrubs.

Fast-growing tree species should be encouraged to be grown by households, though this may be hampered by lack of extension personnel, both in quality and quantity, and lack of transport facilities to enable workers to have frequent contact with farmers. There were only 133 workers in forestry sector in 1992, of whom 3 at professional level, 25 at technician level and 105 field assistants.

Forestry is an important asset in the region, yet its development is being constrained by the following;

Deforestation

Caused by overgrazing and shifting cultivation. Overgrazing mainly occurs in Biharamulo and Karagwe Districts, as well as in some parts of Muleba District. Shifting cultivation is mostly practised in Biharamulo. The situation is worsened by intensive clearing of forests for cotton and paddy farming. Lack of sufficient transplanting containers and other inputs such as polythene tubes retards afforestation efforts in the region. There is also a serious lack of seeds, chemicals and fertilisers which are used in raising the seedlings and in tree planting.

Annual fires

Both artificial and natural forests face fire threats annually. In case of artificial forests, it is estimated that about 30 - 40% of the planted trees are razed by fires annually. This affects afforestation efforts immensely.

Awareness Towards Forest Conservation and Tree Planting

It has been observed that in some parts of the Region, people are less aware about the need to conserve forests and to plant trees. This is mostly the case in areas which have low population densities and greater proportions of natural forests. On the contrary, areas with high population density are understood to be more aware of tree planting, though forest conservation is still considered not important.

4.2 SEWERAGE

The towns face problems of cesspit emptying due to insufficient cesspit emptiers, the situation health risks.

4.3 SOLID WASTE MANAGEMENT

Solid waste management is poor in towns, whereas only the Bukoba town council have a vehicle for collecting wastes, which is inoperational in most cases.

The municipal can handle 1,150 tons per annum, which is only a fraction of town's solid waste generation of 5000 - 6000 per year.

4.4 REFUGEE PROBLEMS

The Kagera region host refugees from neighbouring countries from distant past. In recent years, that is when the 1994 Rwandan genocide occurred, hundreds of thousands of refugees crossed the border and enter the Region to seek safety.

The refugees settled in different camps in various numbers, the main camp being Benaco.

Table 4-1 Refugee camps in Kagera Region

DISTRICT	REFUGEE CAMP
Ngara	Benaco (Kasulo)
	Lumasi
	Lukole
Karagwe	Murongo
	Chabalisa a & b
	Kagenyi 1 & 2
Muleba	Burigi

Table 4-2 The number of refugees by 18/08/1994

Camp	Number of refugees
Benaco/Kasulo	260,930+
Lumasi	47,276+
Lukole	9,277+

Though most of the refugees returned home by the end of 1996, their influx caused various impacts to the region;

- Development and community services were greatly affected.
- Deforestation due to increased use of firewood
- Increased rates of crime.

Benaco (Kasulo) camp was by far the largest of all the camps in the Region. In terms of population, it was the second largest 'city' in Tanzania next to Dar es Salaam. It was located at Kasulo village along the Kahama-Rusumo Highway which was built by a company called Benaco. A building camp by the name of Benaco was located at the present site of the camp hence the name Benaco. Benaco camp was estimated to cover about 300 ha.

Lumasi camp was established in July 1994 following the need to split the Greater Benaco camp into smaller camps. Covering an area of about 50 ha, Lumasi was a major recipient of spill out from Benaco.

Lukole camp also occupied an area of 50 ha but relatively much smaller in terms of population. The Benaco-Lumasi-Lukole-Msusura (The Greater Benaco Refugee Camps) occupied an area of about 20 sq km.

Burigi Refugee camp, occupied by Tutsi, was amalgamated with the former Nyakasimbi camp which was also previously occupied by Tutsis. Kagenyi has parts one and two, the latter of which is quite close to the Kagera River, which forms the boundary between Rwanda and Tanzania. Kagenyi one is further south on the shores of Lake Rushwa. The camps were established close to the local peoples settlement. In this area there is an acute shortage of fuelwood and the hilly landscape makes the area quite susceptible to soil erosion.

Due to the large size of some of camps like Benaco decongestion had to be done hence the establishment of Lumasi, Lukole and Msusura as part of the so called 'Greater Benaco Camps'. Also there had been proposals to decongest Chabalisa camp by taking some of the refugees to Umukalilo camp. However, this was resisted because of water scarcity at the proposed camp site.

4.5 REFUGEES AND THE ENVIRONMENT

Right at the beginning of the refugee influx into Tanzania, the UNHCR realised that there were going to be many environmental impacts. This is reflected by the number of missions sent to the area to address the environmental issues caused by the coming of refugees. The environmental issues are both physical and social. Let us begin our discussion with the issues related to the physical environment.

4.5.1 The Physical Environment

The various aspects of the physical environment which are impacted by refugees are treated under the subheadings of forestry, wildlife, water, agriculture and sanitation.

4.5.1.1 Vegetation

Ngara and Karagwe have always faced shortage of trees. In the woodlands of Biharamulo the stocking rate of wood is estimated to be 70 - 120 cubic metres per hectare. It is much less for the woodlands in Ngara and Biharamulo. However this long standing shortage of trees in Ngara and Biharamulo has been aggravated by the large number of refugees through the procurement of the various forest products. The procurement of the forest products has been mainly for construction of shelter and provision of household energy.

x a) Shelter Construction

Invariably all the huts have a wooden structure, small size wood ranging from poles to which is required as framework for construction of the refugee huts for new arrivals, camp movement and repair. Furthermore wood is also used for construction of different infrastructures like storage, classrooms, offices, latrines etc. Grass, palms, reeds and papyrus are extensively used for thatching, fencing and partitioning. A medium size pole shelter requires about 0.32 cubic meters of wood (solid) (Kikula et.al. 1984). Thus the wood requirement for shelters alone is quite substantial.

The longer the refugees stay, the more the need for renovation of shelters and hence more demand for construction materials.

b) Wood as an Energy Source

Fuelwood is used in the camps for cooking food. But also there is a lot of brewing. Two and half to three kg of wood is used every day per person in the camps. Thus the total consumption per week is about 2.10 cubic metres, which is quite high. This rate is against the average national consumption rate of 1.8 kg. and that of 0.75kg in Burundi. As will be seen latter, twenty percent (20%) of the wood is provided for while the remaining eight percent (80%) is self procured.

The high fuelwood consumption rate in the camps can be attributed to the high abundance of wood. Similar findings have been established in Tanzania (Kikula, et; al. 1984).

Some wood is sold within the camp presumably to those who cannot walk to the distribution posts and the source areas. Also to those who need more wood for what ever reason. Prices of wood have been going up. In some areas the price of fuelwood has increased from Tshs. 50 to 300 per headload while the price of charcoal around the camps has gone up from Tshs. 500 to 1500, most likely reflecting progressive scarcity due to increased demand.

c) Timber and Handicrafts

There are reports that timber extraction around the camps is high. Some of the timber is reported to be finding its way out of the country albeit illegally. Extensive wood curving is done using 'Mbinga' (*Afrmosia angolensis*). The scale of wood curving was not alarming at the time of the visit. But with improved market the scale is bound to intensify.

The implication of the above observations is extensive deforestation. The refugee influx has brought in a new dimension to the issues of deforestation. In July 1995, the estimated impact area around the camps was 10 to 15 km (UNHCR, 1995). At Benaco camp the impact area was certainly more than that by November 1995.

It is too early to see the effects of deforestation in the area but they are bound to appear not far in the near future. Investigations have suggested that even the refugees themselves are aware of their impacts on the woodlands and that they know woodlands are at risk (James, Pes Comm.).

Soil erosion is inevitable in most of the area particularly in Karagwe. Also drying of streams is likely to occur given the extent of deforestation particularly in the catchment areas.

4.5.1.2 Wildlife

Poaching is rampant in all the areas around the refugee camps.

Burigi Game Reserve has been severely poached because of its proximity to Benaco refugee camp. The poaching is done using snares, nets and guns (SMGs, SKs and G30). Large numbers of snares are regularly collected from the reserve. The main species killed are buffaloes, topi, impalas, reedbuck, waterbuck, (*Korongo*), hippos, elands, zebras, warthogs and antelopes. Game meat is openly sold in the camps. It is estimated that 3 to 7.5 tons of game meat is sold every week. Rough estimates indicate that 100 wild animals are killed every day (*Daily News*, 28.1.1996).

According to the acting manager of CARE, estimated off-take of wildlife per month is as follows: Impalas-6,000, Topi-3,000, warthogs-2000, Zebra-1600. Baboons are also killed.

Reports seem to indicate that poaching is highly organised. Poaching camps are built right in the reserves. Lack of manpower, money, transport etc. is limiting the antipoaching operations. For example at the District Office in Biharamulo there is only one Landrover which is not fully operational anyway.

Despite these constraints many poachers have been apprehended. Statistics indicate that out of every 10 poachers caught, 7 are likely to be refugees. These statistics confirm that most of the poaching is done by refugees.

The exact impact of poaching operations has not yet been assessed because of lack of up to date survey data. Furthermore aerial surveys are expensive and risky because the area is near the troubled borders. Casual observations, however, indicate a severe reduction in herd sizes. Also, tourist hunting in Ibanda/Rumanyika Game Reserve which in 1993 fetched US \$ 53,000 is no longer attracting any hunters.

In Kitali Hill area, zebras, topi and other wildlife have been wiped out from the area. Animal congregation was observed at Nyunbwe Game Reserve headquarters presumably due to rampant poaching. This concentration of wildlife may lead to congestion in 'safe areas' and hence high predation at these points. Most likely the intensified poaching will push animals into farmlands. It is being reported that predation of cattle in ranches has intensified during the last two years. This is probably caused by the reduced number of game because of poaching.

4.5.1.3 Water

The majority of the villages in Ngara and Karagwe Districts have traditionally depended on water from rivers, natural wells, springs and small lakes. Thus, the mere size of the refugee camps poses a problem to the water supply. For example the water supply at Benaco camp has been shrinking and can hardly meet the demand of 10 litres of water per person per day.

Before the influx of refugees, time spent to collect water ranged from 0.8 to 1.5 hrs. Following the coming of refugees, the range of time spent to collect water is between 2.4 to 2.7 hrs (Masongo and Kosongi, 1994). This certainly signals a potentially serious problem.

The sharing of water between humans and refugee livestock, has polluted the sources. Water is also being polluted by human faeces. Consequently, many water borne diseases like dysentery have been reported in both refugee camps and the local villages (Masongo and Kasongi, 1994).

Furthermore, due to the increased demand of fish as caused by the influx of refugees, legal and illegal means of fishing are being used. There is, for example, an increased use of thiodane which is seriously polluting the lake waters.

4.5.1.4 Other Environmental Issues

There are many issues which fall under this category. Let us site only one related to sanitation. Waste disposal strategies are in place. An NGO (IRC) was appointed by UNHCR to deal with sanitation issues. Seven metre deep toilets are dug in the camps. There is also a team appointed to inspect sanitation cleanness. But despite all these measures, there are significant sanitation problems in the camp areas. Cultural habits are contributing to the problems of sanitation. There are people who have the culture of not using toilets. They instead go in the bush. This, certainly helps in spreading diseases. Also the handling of the large volumes of wastes generated by the large number of refugees is in itself overwhelming.

4.5.2 Social and Administrative Implications of Refugees

An idea of the magnitude of refugees influx in the impacted area was given in section 3.0 above. Thus such large numbers of refugees all confined in localised places are bound to cause wide ranging social impacts. This section address some of these issues.

Most certainly, the social implications of refugees in any given area can best be appreciated when the refugee population is compared with that of the local population. The local population in Ngara was estimated at about 190,000 people. Thus the local population was by far outnumbered by the refugees. In Karagwe, however, the population of the local people was estimated at about 350,000 people.

The refugee population when compared with that of the local population clearly indicates the level of social impact that is inflicted upon the local communities. Some of the traditional villages had been completely engulfed by refugee camps. Examples include, Benaco, Kyabalisa and Rubwera camps. Thus the traditional lives in the villages inevitably changed. Intermarriages between the locals and refugees were reported to be on the increase given the large number of female refugees. The implication is that increasingly the social habits of the two social groups were bound to be merged. For example, it was reported that use of French words is slowly creeping into the local language as a result of the presence of the refugees some of whom have French as their second language. The spread of sexually transmitted diseases including AIDS could be predicted to increase. Related to diseases, the majority of the estimated 1,500 dogs which crossed the border with refugees were reported to have rabies (Masongo and Kasongi, 1994).

Other social implications of refugees relate to conflict in resource utilisation, agriculture being one of them. Although cultivation in refugee camps was extensive. This is an additional, but a significant factor of deforestation. It is however difficult to estimate the value of wood cleared through cultivation due to absence of statistics on the total land under cultivation.

However, estimates indicate that the status of cultivated land in February and July 1995 was approximately 800 and 3,000ha respectively. Certainly the figures must have been much higher by November 1995. This was obvious even from casual observations.

Cultivation is taking place even on steep slopes and near water sources. Consequently, the water sources are being depleted and silted. The responsibility to control this cultivation lies on the Ministry of Internal Affairs and other line ministries. The UNHCR has no responsibility on such matters (James; Pes: Comm.).

Some refugees crossed the border with herds of cattle and goats. The numbers are not known but the estimated figures are between 18,000 and 20,000. These are reported to have entered Kagera and Karagwe at the beginning of the refugee influx. Much fewer animals crossed the border after May 1994 (Masongo and Kasongi, 1994). Many of the livestock brought in by refugees have either been slaughtered for meat or sold live to the local people.

Nonetheless the influx of refugee livestock has been associated with overgrazing, trampling and grazing of crops, increased diseases, water shortage among many problems (Masongo and Kasongi, 1994).

Other social impacts of the refugee influx include the question of food security. The common food habits between the refugees and the local people means that the local supply of bananas and other food stuff like cassava are under severe stress. There are reports, for example, that there has been substantial theft of local foodstuff especially bananas. Grazing and trampling of local peoples farms by the refugee livestock is also reported.

The UNHCR's policy is to provide dry rations of maize and beans which are not preferred by the refugees. Some of this dry ration is sold for cash to buy the local food items or exchanged for the locally grown food stuff. This severely undermines the food security of the area. Consequently, the presence of refugees has significantly inflated the food prices in the various areas of Kagera.

Though not quite serious, complaints from the local people have been reported concerning the cutting of grass for shelter and bedding of refugees because this denies farmers of mulch for their crops (Masongo and Kasongi, 1994).

Other social impacts include banditry. Banditry including cattle rustling is also reported especially in villages along the refugee routes. Acts of banditry have, however, been reported elsewhere as well. The refugees are reported to steal cattle and kill them for meat to supplement the dry ration provided by the UNHCR. In addition to cattle rustling and theft, there are many other crimes including raping of women etc. As such, there is a lot of insecurity among the local people due to the presence of the refugees in the area.

Furthermore, the presence of such large numbers of refugees overstretch the Regional and District Administration to the extent that a big part of the local resources is directed towards the handling of refugees at the expense of handling issues related to the local population.

For example, the district administration is forced into activities like the bi-weekly environmental task force meetings which are outside their schedule of duties. Partly as a result of these unscheduled undertakings, district offices are reporting overexpenditure in their budgets as a result of being forced to handle refugee related activities which had not been budgeted for. There are also the National Coordination Committee and the Regional Coordination Committee. All these activities consume time and resources.

The UNHCR is, however, trying its best to support, in a small way, some operations in government offices. For example, the office of the District Commissioner in Karagwe has been provided with two vehicles, a fax machine, and a photocopy machine. The running costs of these equipment are, however, met by the Tanzanian Government.

The impact have not, however, been all negative. Positive impacts include, for example, the improvement of social services as a result of the refugee influx. Roads, schools, dispensaries, supply of drugs, etc. have been appreciably improved. The Japanese are investing on the construction of wells in different villages. Research on water and health are being conducted. Also an air strip has been constructed near Ngara.

4.5.3 REMEDIAL/MITIGATION AND REHABILITATION INITIATIVES

A number of initiatives are being implemented to try to minimise the environmental impacts of refugees in Kagera Region. This section evaluates these initiatives starting with afforestation.

4.5.3.1 Afforestation

Afforestation programmes are in place. But UNHCR only provides the infrastructure for nursery establishment. Nevertheless, an example of the efforts include the establishment of two nurseries in all districts i.e. Biharamulo, Ngara and Karagwe. The nurseries in Ngara have a capacity of 40,000 seedlings. CARE International is also introducing nurseries in villages. The environmental integrity of the Tanzania resources is at stake.

A joint effort between the Tanzania Government and UNHCR is therefore required to address many of the policy related issues. It is also reported that the Tanzanian Government has not been forceful in bringing out proposals for consideration in the UNHCR meetings.

4.5.3.2 Concluding remark on refugee problems

Problems related to refugees in Africa have a long history and there are specific laws related to the issue. These laws governing refugee operations are fairly articulate, although some aspects are rather outdated. Also enforcement of many aspects of the laws seem to have envisage a limited level of refugee influx at any given time. They also assumed a certain level of economic and organisational ability of recipient countries. Experiences in Tanzania indicate quite clearly that all these were wrong assumptions. Consequently, impacts on the environment continue uncontrolled.

Refugee impacts on the environment are wide ranging and severe. They take place in a short time. This is what is special about them. Also, the abatement of these impacts are done on piecemeal and on a trial and error basis. Most probably this is because of lack of institutional memory on the abatement of such environmental impacts. Other contributory factors include the prevailing attitude of viewing local resources as a "free good." As a result provision of energy, shelter construction material, etc., are left in the hands of the recipient countries which in most cases have little capacity to plan and ensure a sustainable utilisation of the natural resources in the refugee impact areas.

Furthermore not enough efforts have gone into exploring use of alternative sources of energy. Similarly more could be done by the international community to help refugee recipient countries effectively handle the mitigation measures.

Lastly, in recipient countries and specifically Tanzania, there is lack of policies on how handle refugees particularly as related to the environment. The policies would go a long way towards providing specific guidelines on how to handle refugee related issues.

CHAPTER FIVE

5. CLIMATIC PROFILE OF KAGERA REGION

5.1 INTRODUCTION

The Region lies within the tropical forest rain belt and its rainfall is influenced mainly by the meridional component of the ITCZ, the Congo Air mass and some local effects due to its proximity near Lake Victoria.

There is actually no significant dry season in Kagera Region which is near the lake where thundery showers occur almost in all months. This area has two rainfall peaks in April (long rains) and in December (short rains). Kagera Region has an annual average rainfall ranging from 1000 mm to around 1500 mm for Biharamulo and Ngara districts where as Bukoba has an annual average of 2000 mm of rain. Some areas on the western shores of Lake Victoria receive above 2000 mm annual average.

The temperatures are reasonably low due to the effects of the lake breezes. The diurnal temperature range further inland beyond 160 km is 14 to 17 °C where as around the shores it falls to around 7 to 8 °C. September and October being the hottest months.

The analysis is performed for the purpose of identifying climatic trends for the Kagera Region. Parameters used for the analysis are rainfall, temperature, radiation, wind direction and speed and relative humidity.

5.2 METHODOLOGY

A time series analysis was used for long term mean annual rainfall, short rains (October–December) and long rains (March–May) and temperature. Other parameters are mean monthly sunshine hours, wind speed (knots), humidity (%) and mean monthly radiation R_d ($M_j/2$).

5.3 SUMMARY FROM THE ANALYSIS

5.3.1 RAINFALL

Due to scarcity of data in this Region, five stations were used. These are Bukoba Meteorological station, Ngara Agriculture Office, Biharamulo Agriculture Office, Rubya Mission Centre and Igabiro Coffee Estate.

Time Series Analysis was performed to determine the annual rainfall, short rain and long rain trends of this Region using the few selected stations with data ranging from 1960 to 1996. These five stations were selected because of the continuity on the part of its data for a number of years and locality. Mean annual and seasonal rainfall data was used. Missing data (though few) were replaced by long term mean of that station.

5.3.2 *Annual Rainfall Time Series*

For annual rainfall time series analysis, Bukoba shows a decreasing trend throughout; Ngara showed a decreasing trend from 1960 to early eighties and then an increasing trend; Biharamulo has variable trend with a marked peak in existence the early seventies; Rubya shows variable trend until mid eighties when it changed to a decreasing trend; Igabiro had a decreasing trend from 1960 to early seventies and then changed to an increasing trend to late seventies and continued with a decreasing trend.

(March-May) Rainfall

Bukoba Meteorologica Station shows a decreasing trend throughout the period under discussion until late eighties; Ngara does not show a particular trend, it is variable; Biharamulo shows a variable trend; Rubya is also showing a variable trend; Igabiro has a marked variable trend.

(October-December) Rainfall

Bukoba Meteorological Station shows a variable trend; Ngara shows a decreasing trend and a larger part of it has rainfall below normal for the short rain season; Biharamulo October-December Rainfall Time Series analysis has a decreasing trend and variable; Rubya shows a decreasing trend; As for Igabiro, the trend is variable.

5.3.3 *TEMPERATURE*

As for temperature, Bukoba Meteorological Station is the only one used for the time series analysis. Other stations do not have continuous data for this parameter. Few stations made observations but for small research purposes only and the data is discrete. The station shows an increasing trend.

5.4 LIST OF STATIONS

Bukoba Meteorological Station

Biharamulo Agriculture Office

Ngara Agriculture Office

Rubya Mission Centre

Igabiro Coffee Estate

APPENDIX 1

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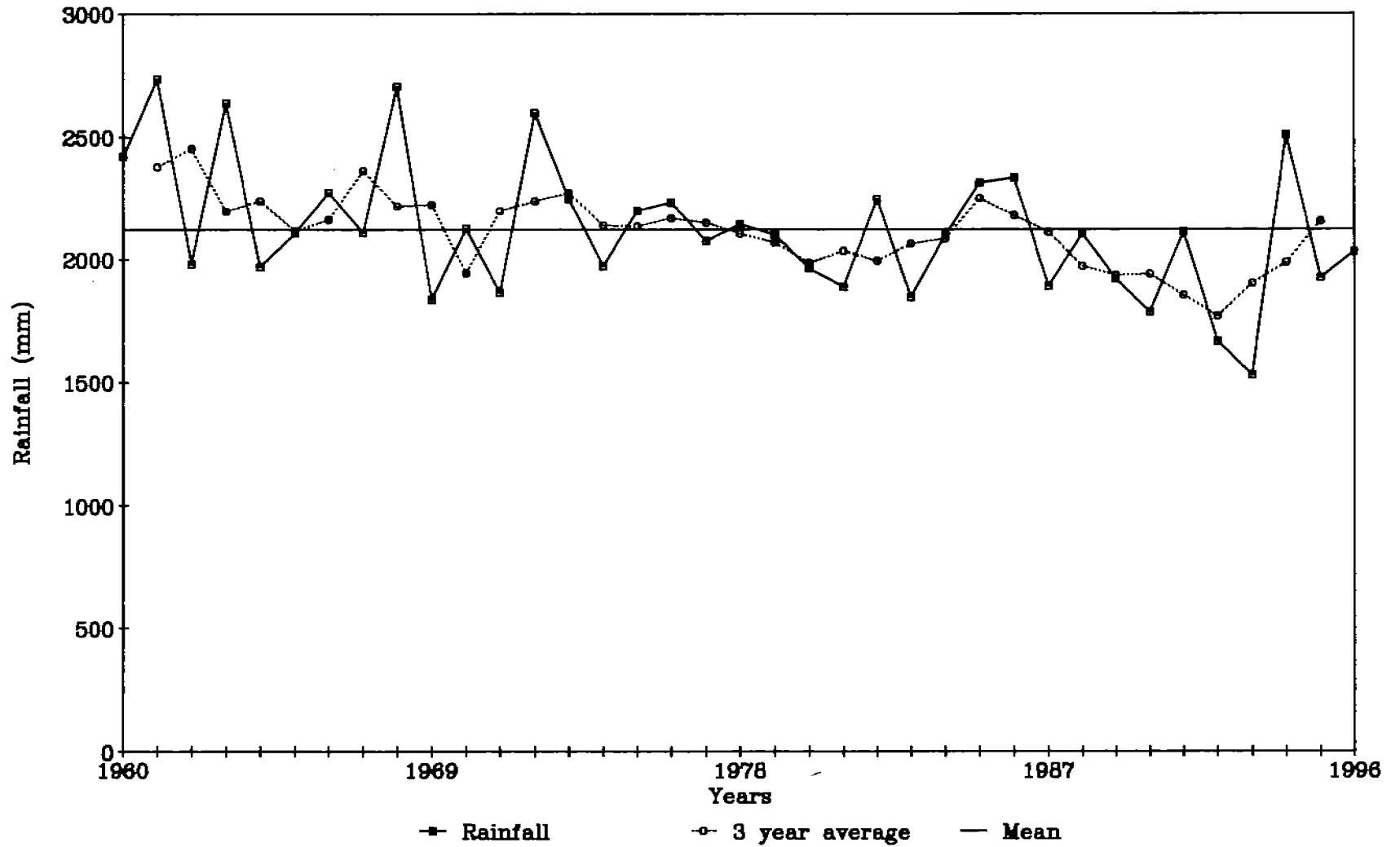
APPENDIX 2

CLIMATIC PROFILE OF KAGERA REGION

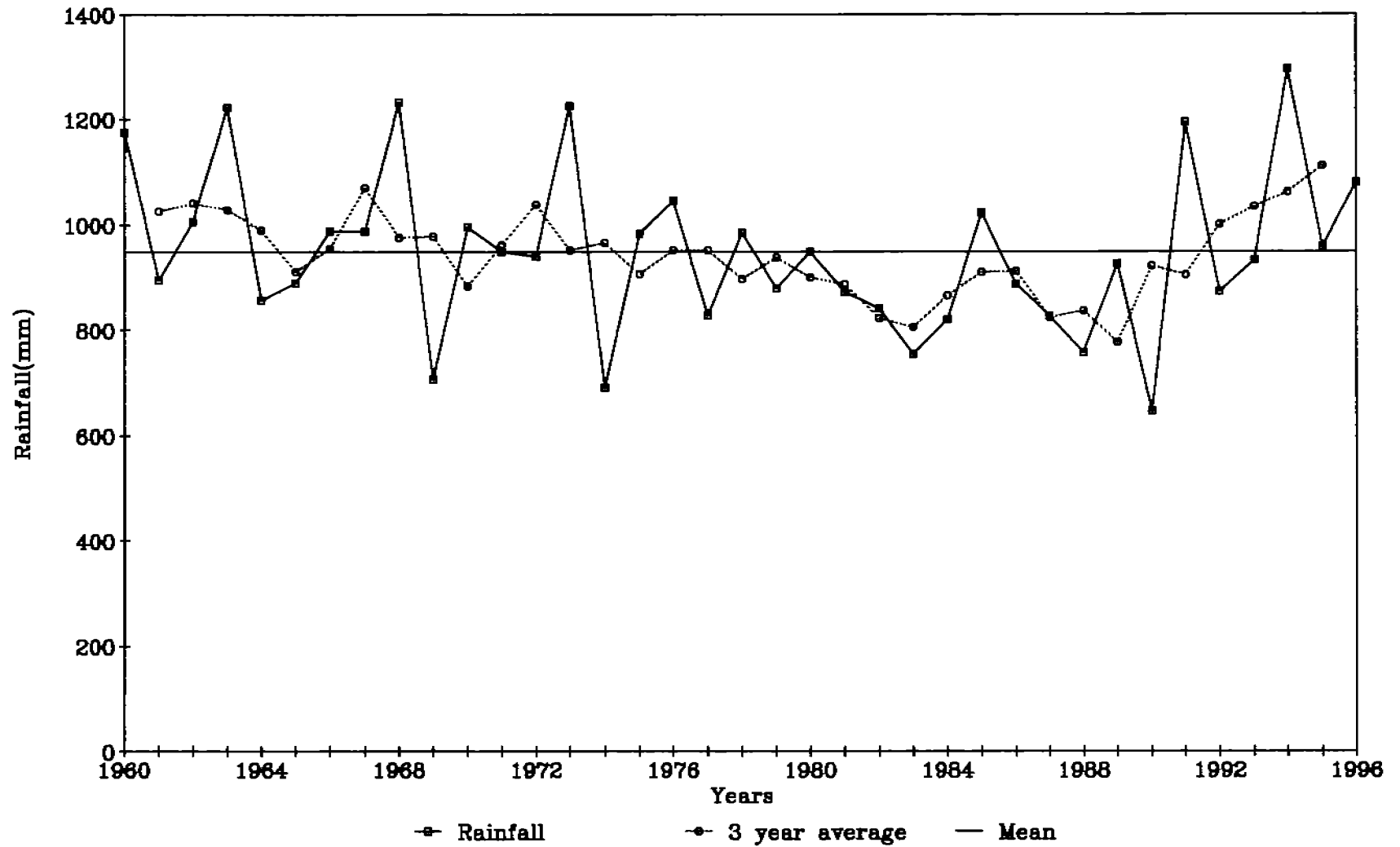
- Appendix A - Bukoka Annual Rainfall Time Series
- Appendix B - Bukoba (March-May) Rainfall Time Series
- Appendix C - Bukoba (October-December) Rainfall Time Series
- Appendix D - Bukoba Mean Annual Temperature Time Series
- Appendix E - Bukoba Mean Meteorological Parameters
- Appendix F - Biharamulo Annual Rainfall Time Series
- Appendix G - Biharamulo (March-May) Rainfall Time Series
- Appendix H - Biharamulo (October-December) Rainfall Time Series
- Appendix I - Ngara Annual Rainfall Time Series
- Appendix J - Ngara (March-May) Rainfall Time Series
- Appendix K - Ngara (October-December) Rainfall Time Series
- Appendix L - Rubya Annual Rainfall Time Series
- Appendix M - Rubya (March-May) Rainfall Time Series
- Appendix N - Rubya (October-December) Rainfall Time Series
- Appendix O - Igabiro Annual Rainfall Time Series
- Appendix P - Igabiro (March-May) Rainfall Time Series
- Appendix Q - Igabiro (October-December) Rainfall Time Series

Bukoba Annual Rainfall Time Series and 3 years moving average (1960-1996)

APPENDIX A



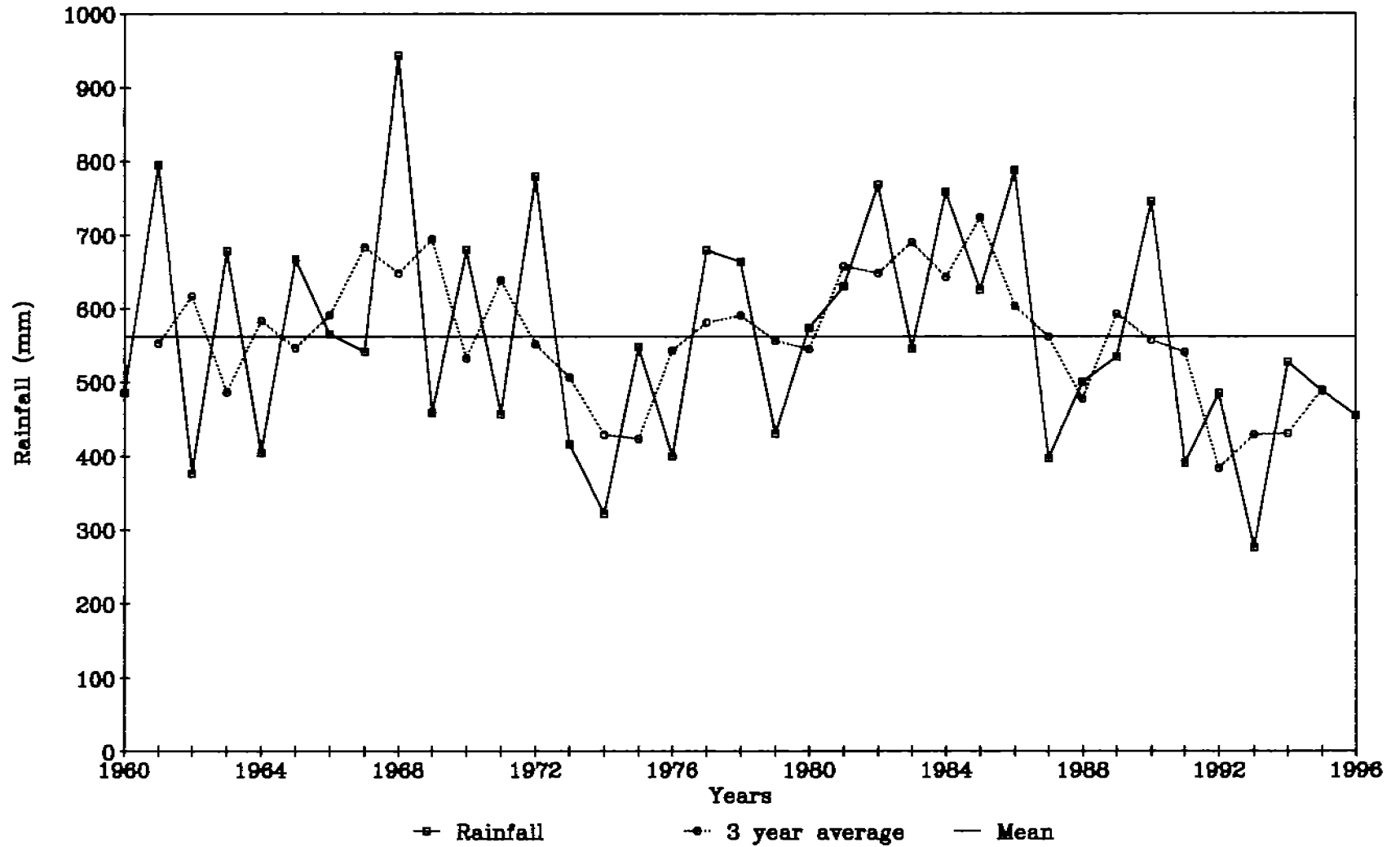
Bukoba (March–May) Rainfall Time Series
and 3 years moving average (1960–1996)



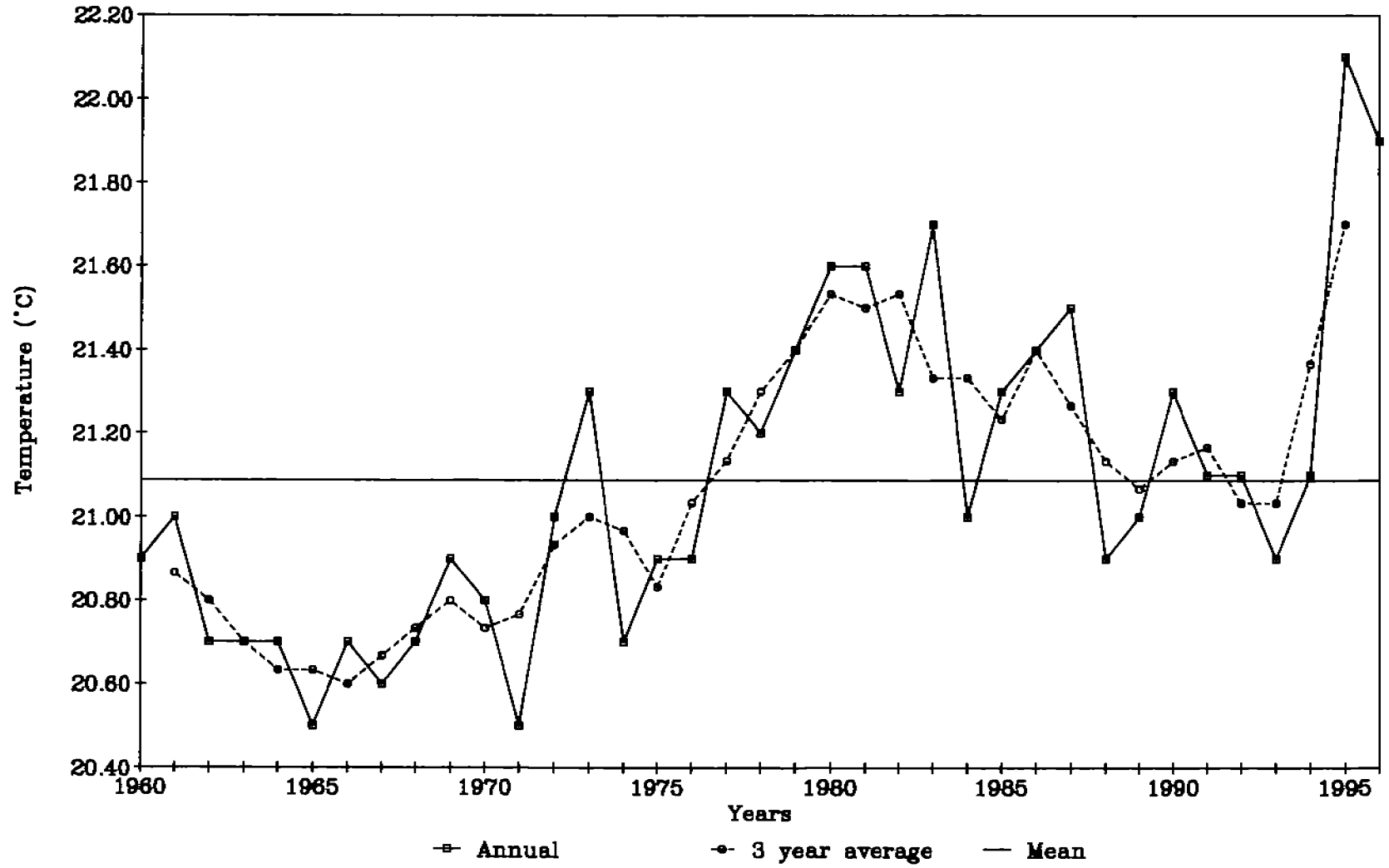
APPENDIX B

Bukoba (October–December) Rainfall Time
series and 3 year average (1960–1996)

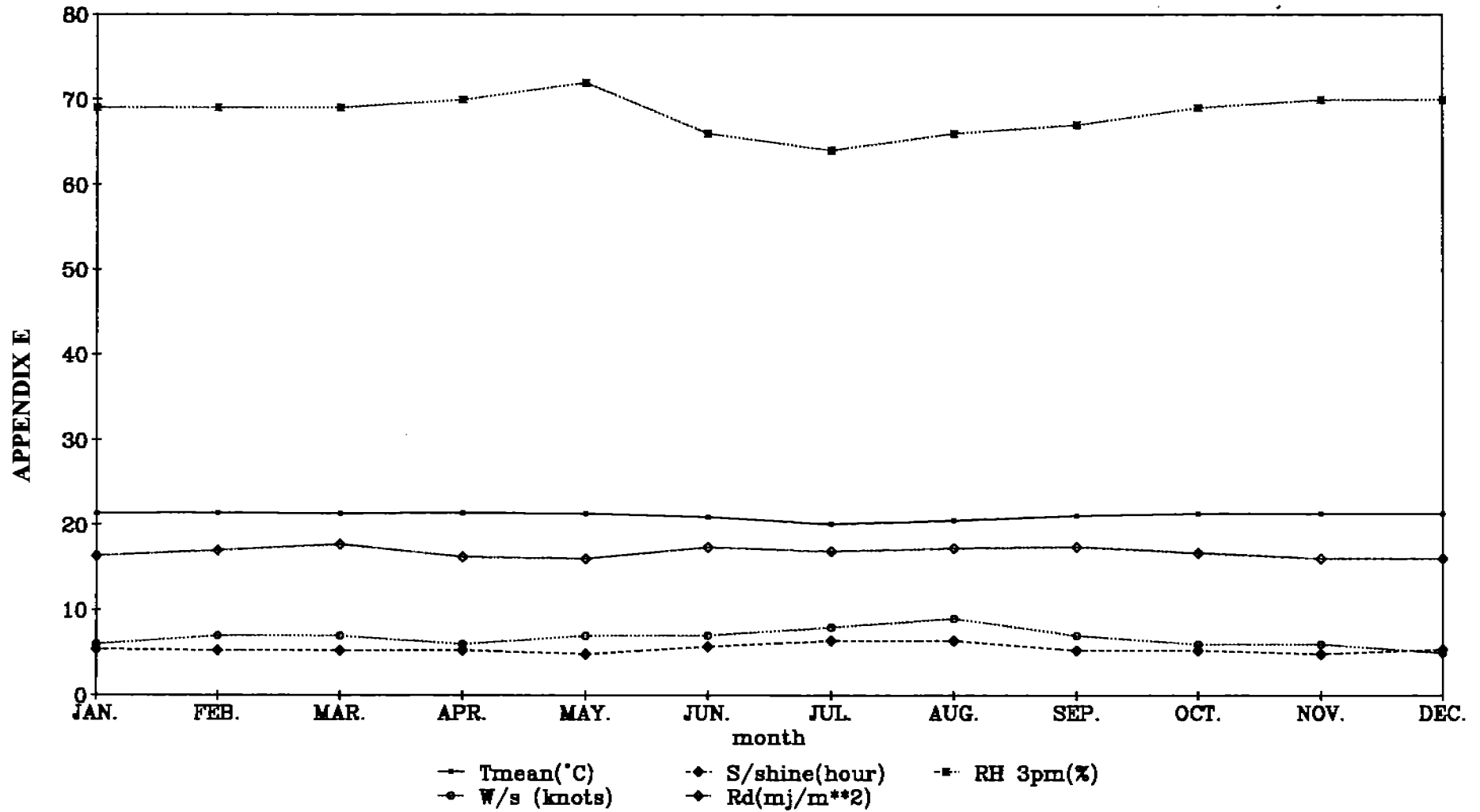
APPENDIX C



Bukoba Mean Annual
Temperature (°C) (1960-1996)

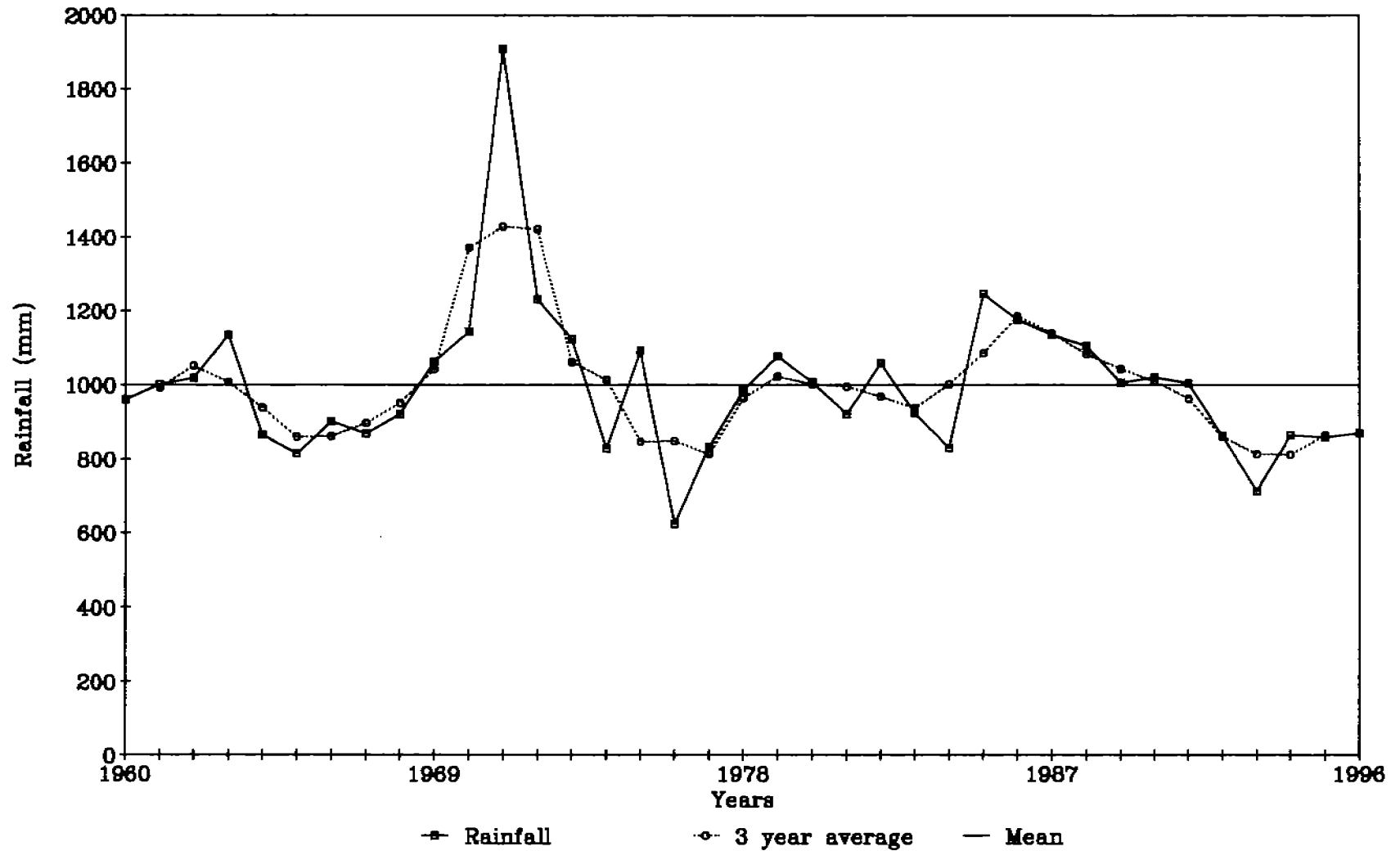


Bukoba Mean Meteorological Parameters



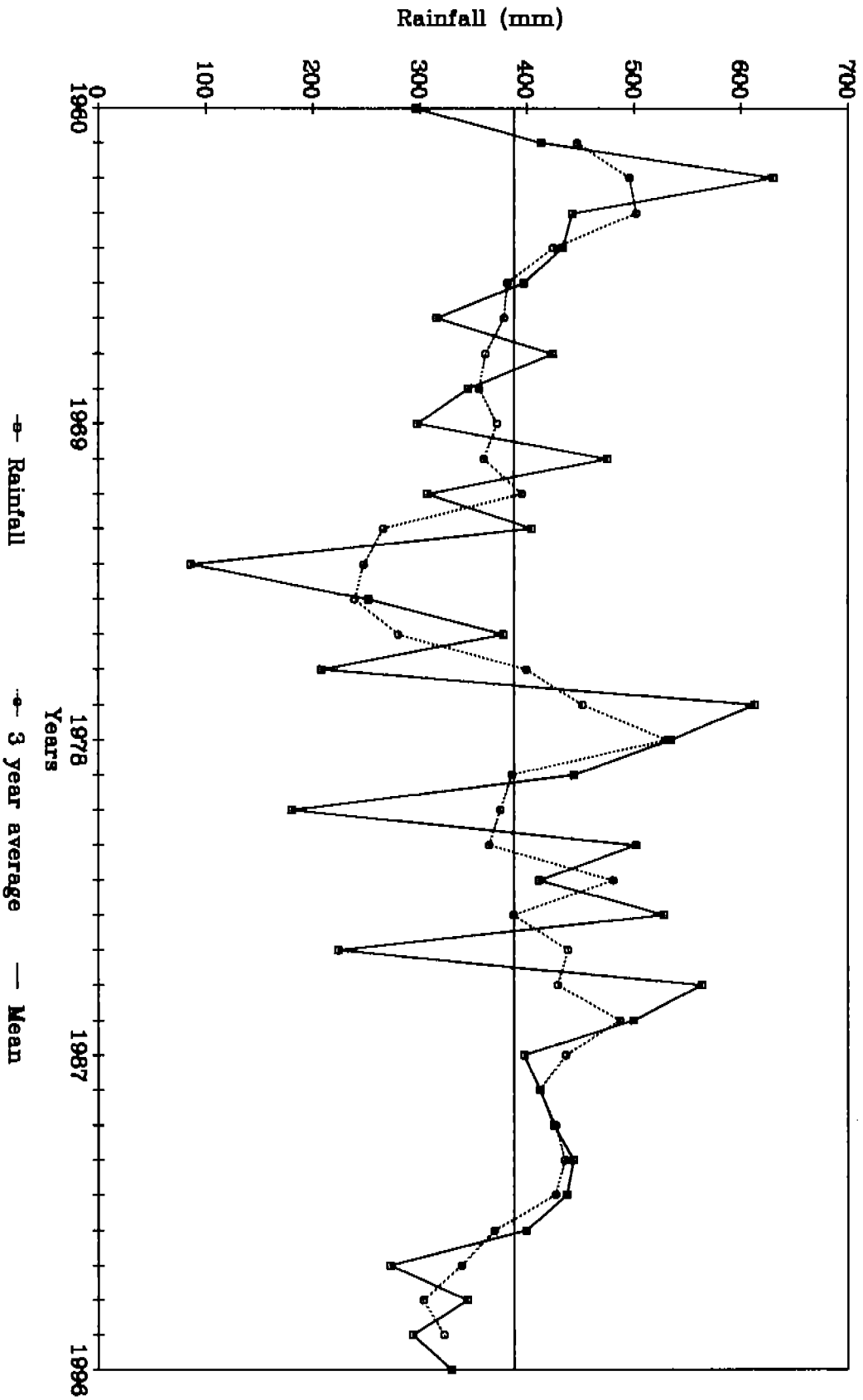
Biharamulo Annual Rainfall Time Series and 3 years moving average (1960-1996)

APPENDIX F



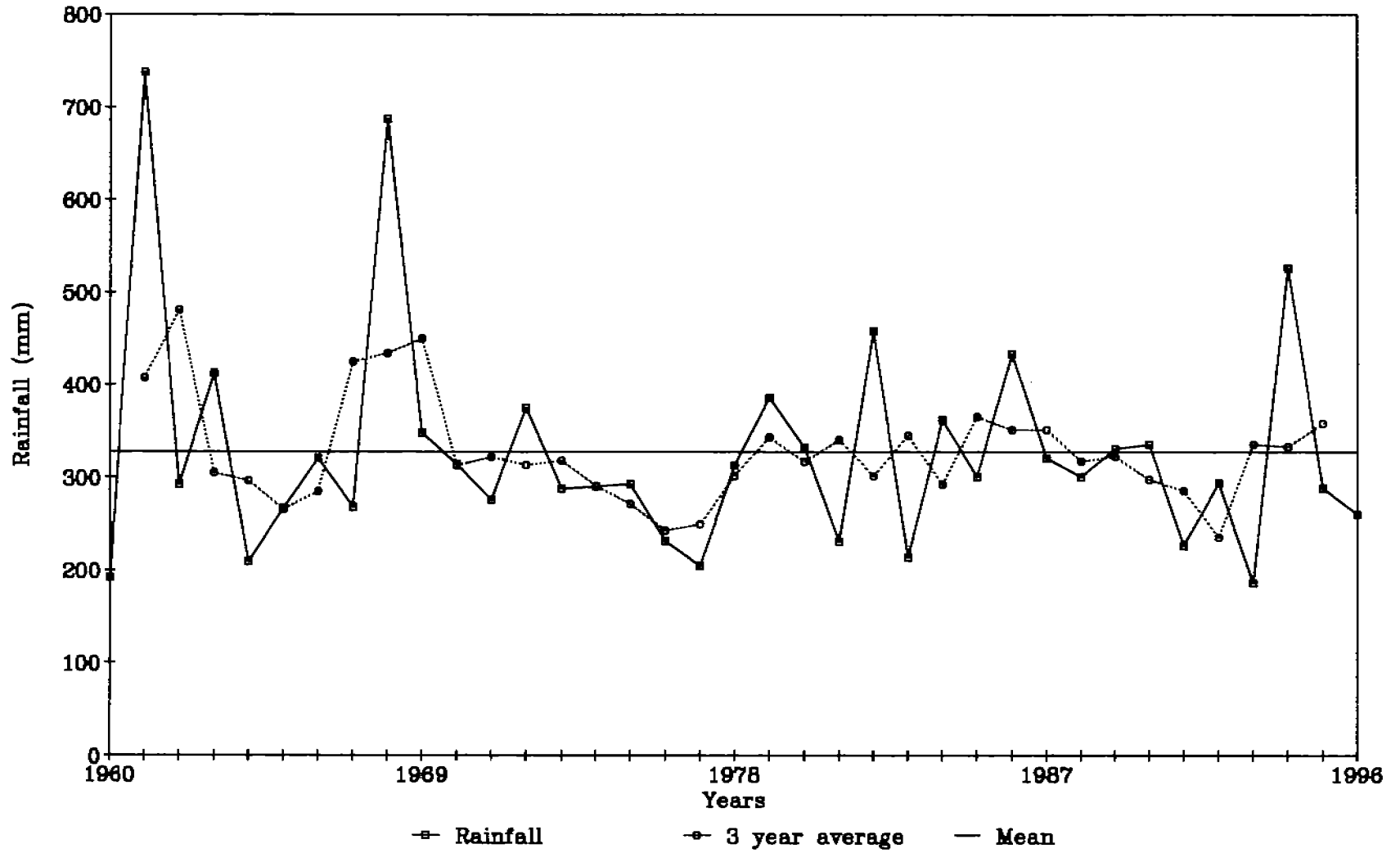
APPENDIX G

B'ramulo (Mar-May) Rainfall Time Series
and 3 years moving average (1960-1996)



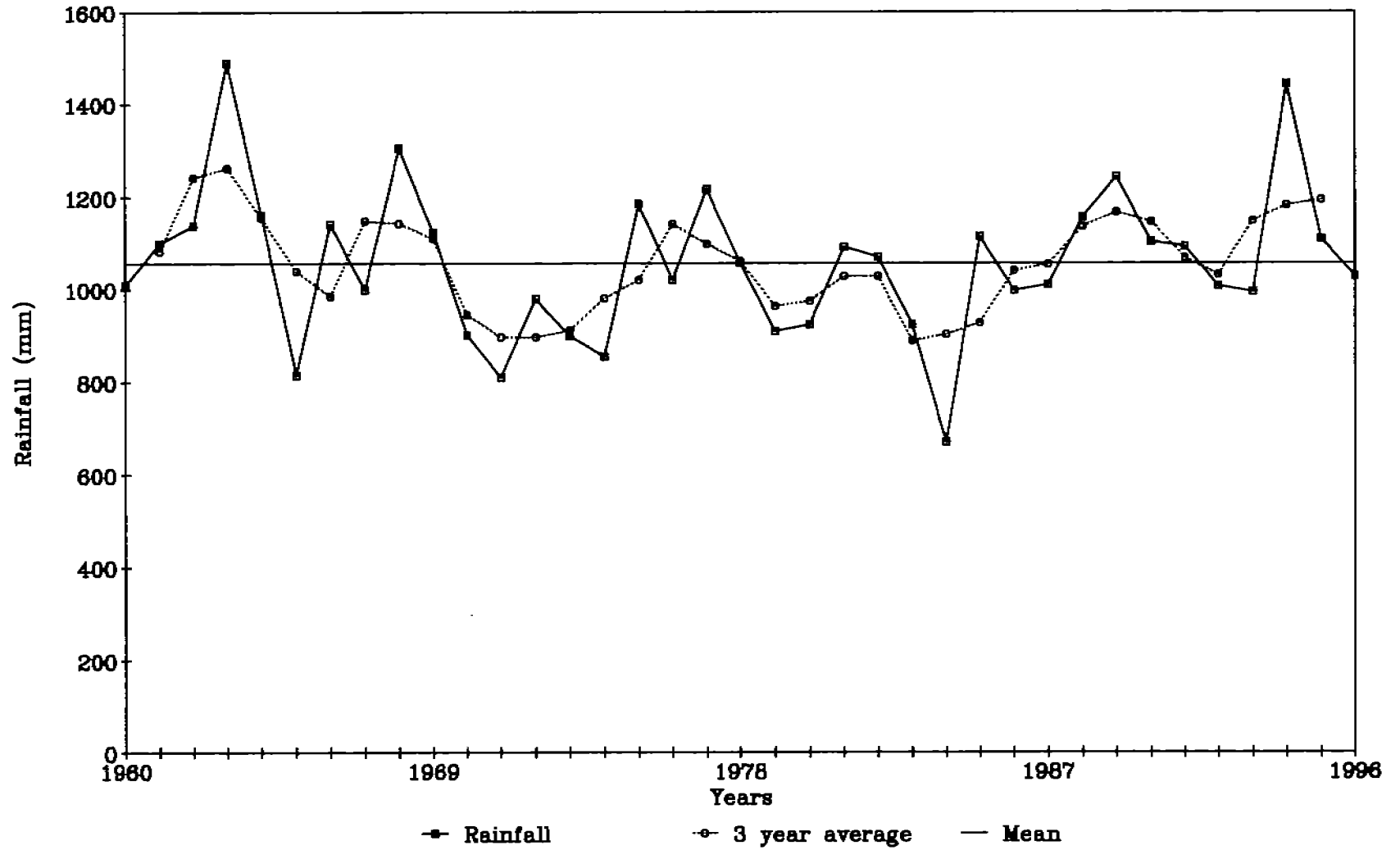
B'ramulo (Oct-Dec) Rainfall Time Series
and 3 years moving average (1960-1996)

APPENDIX H



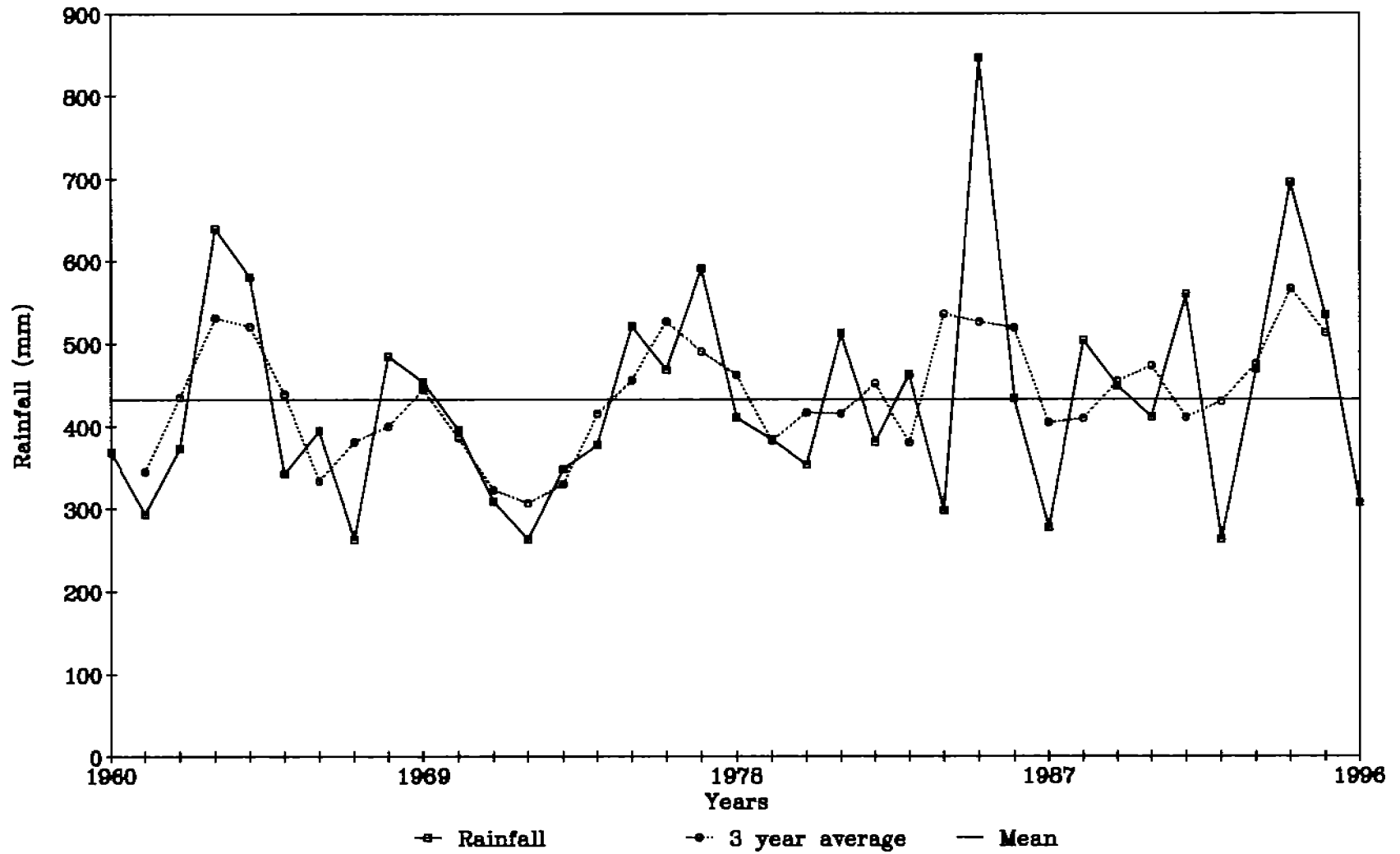
Ngara Annual rainfall Time Series
and 3 years moving average (1960-1996)

APPENDIX I



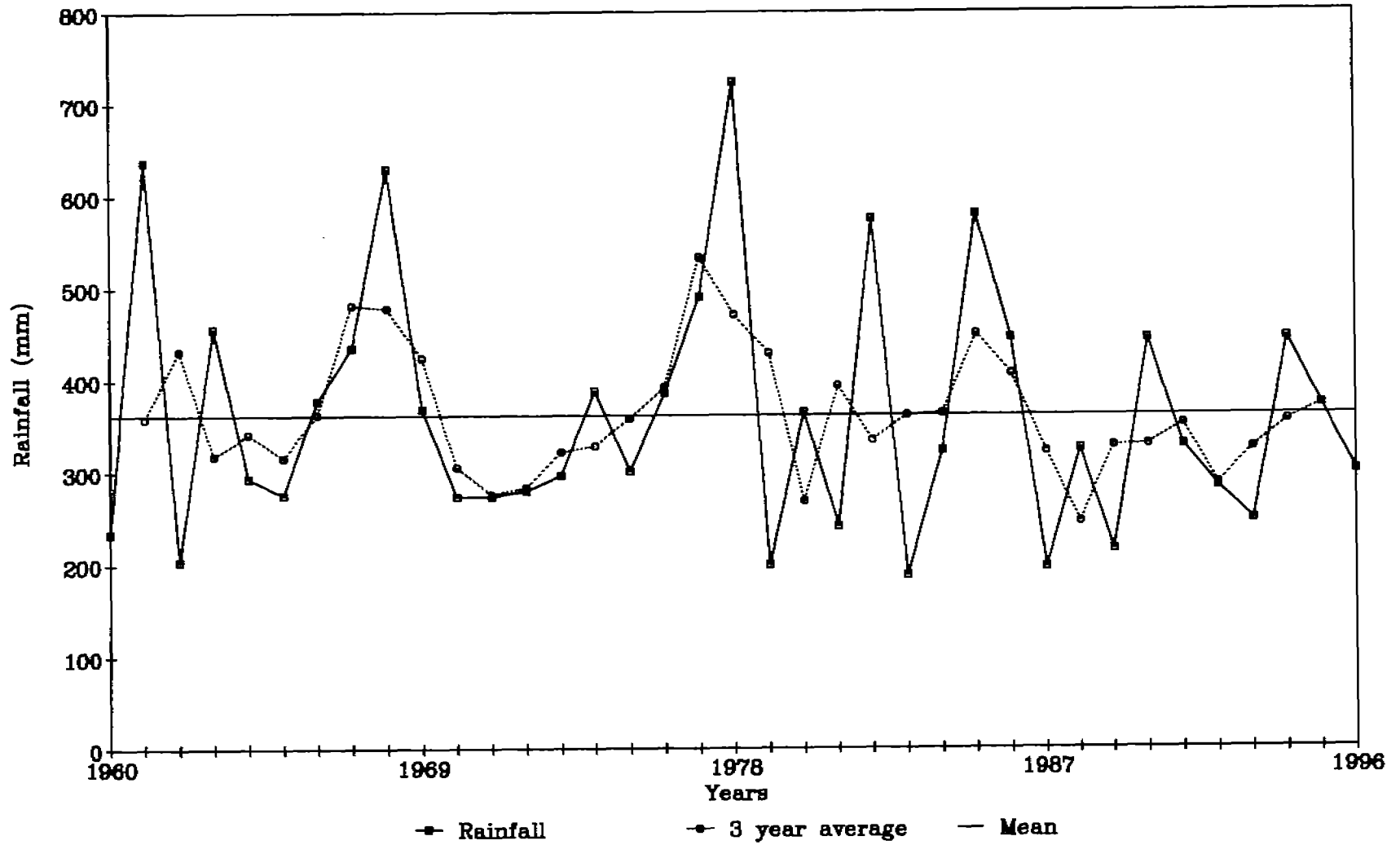
Ngara (Mar–May) Rainfall Time Series
and 3 years moving average (1960–1996)

APPENDIX J



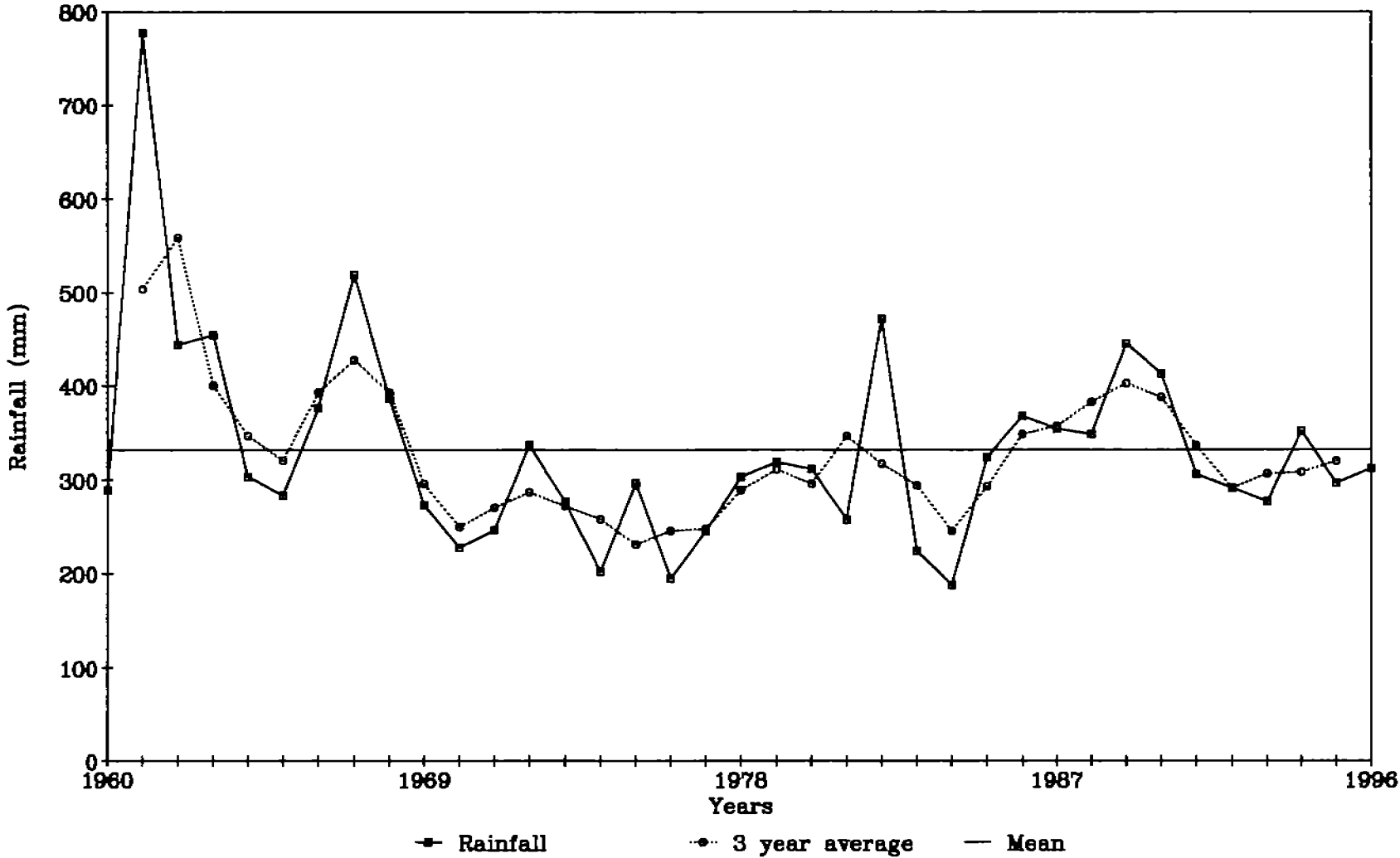
Igabirol (Oct-Dec) Rainfall Time Series
and 3 years moving average (1960-1996)

APPENDIX Q

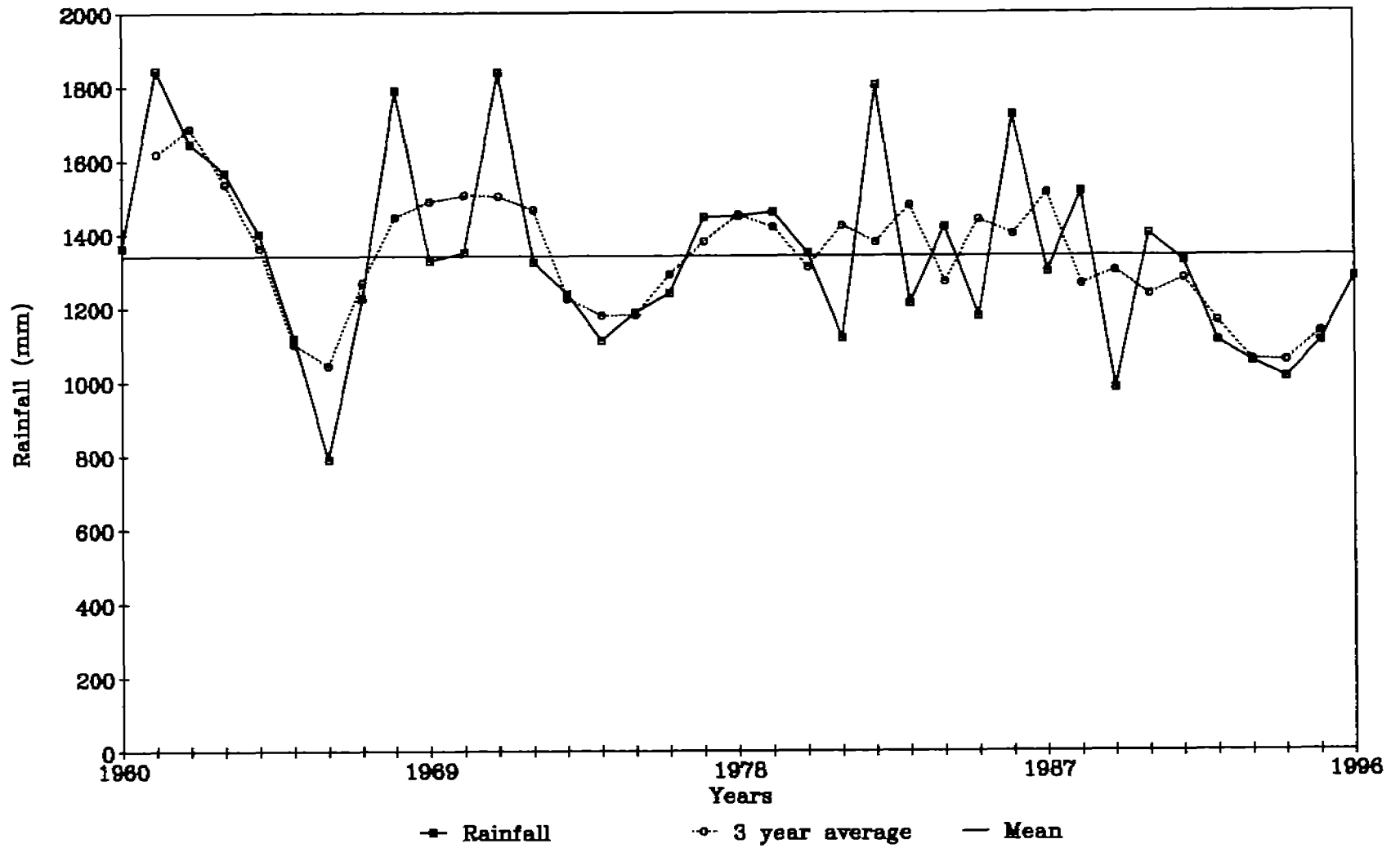


Ngara (Oct–Dec) Rainfall Time Series and 3 years moving average (1960–1996)

APPENDIX K



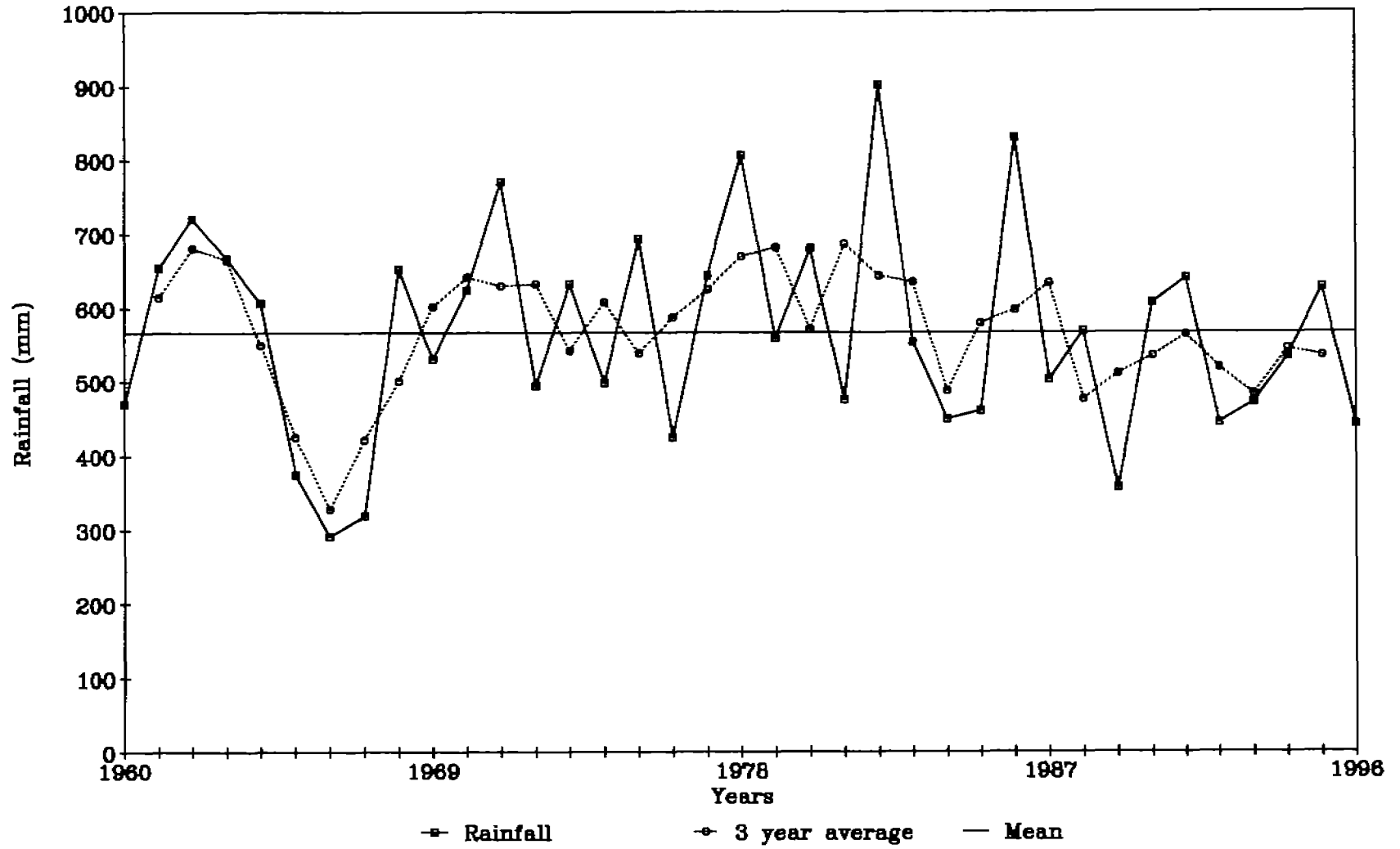
Ruby Annual rainfall Time Series
and 3 years moving average (1960-1996)



APPENDIX L

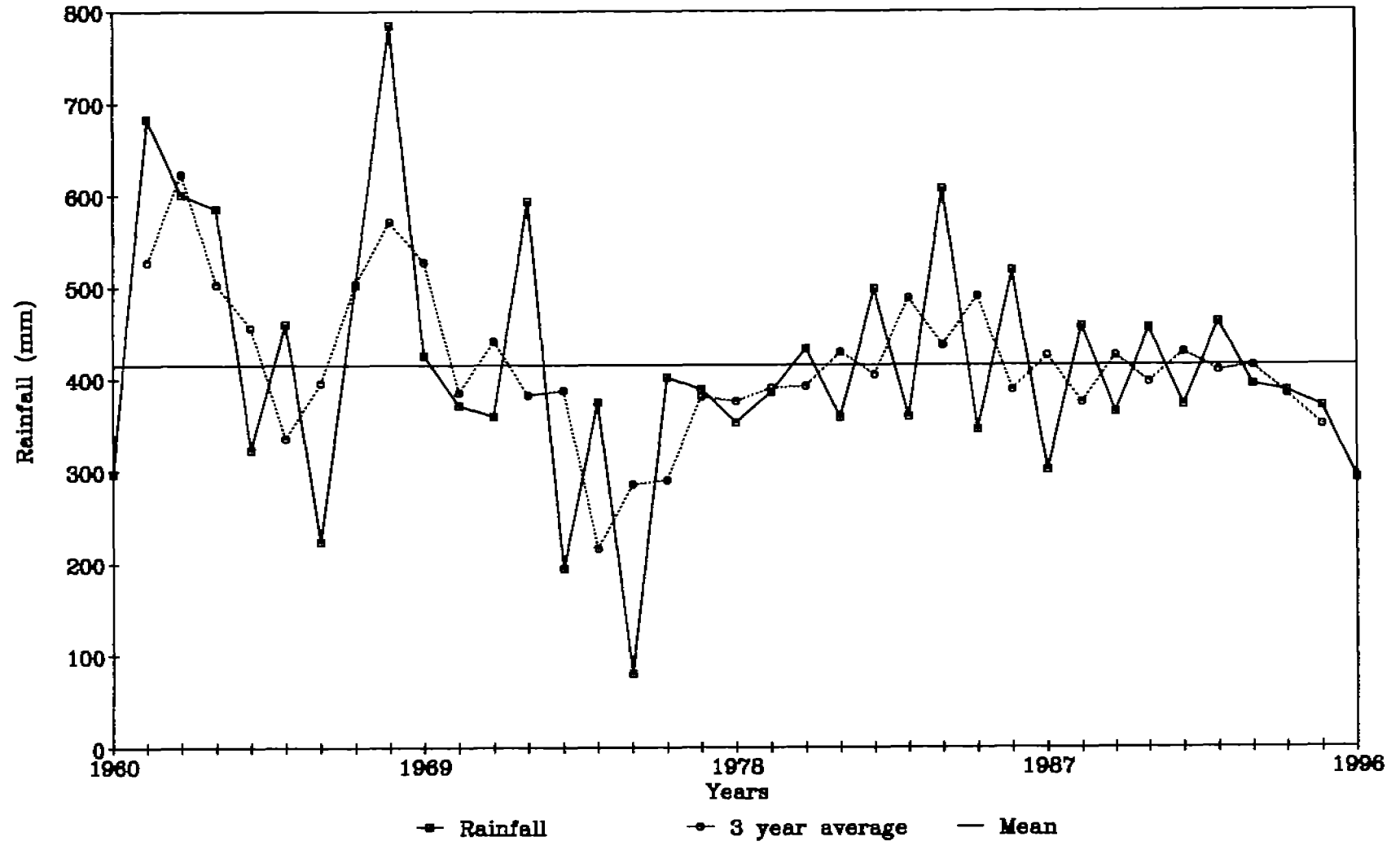
Rubya (Mar-May) Rainfall Time Series
and 3 years moving average (1960-1996)

APPENDIX M



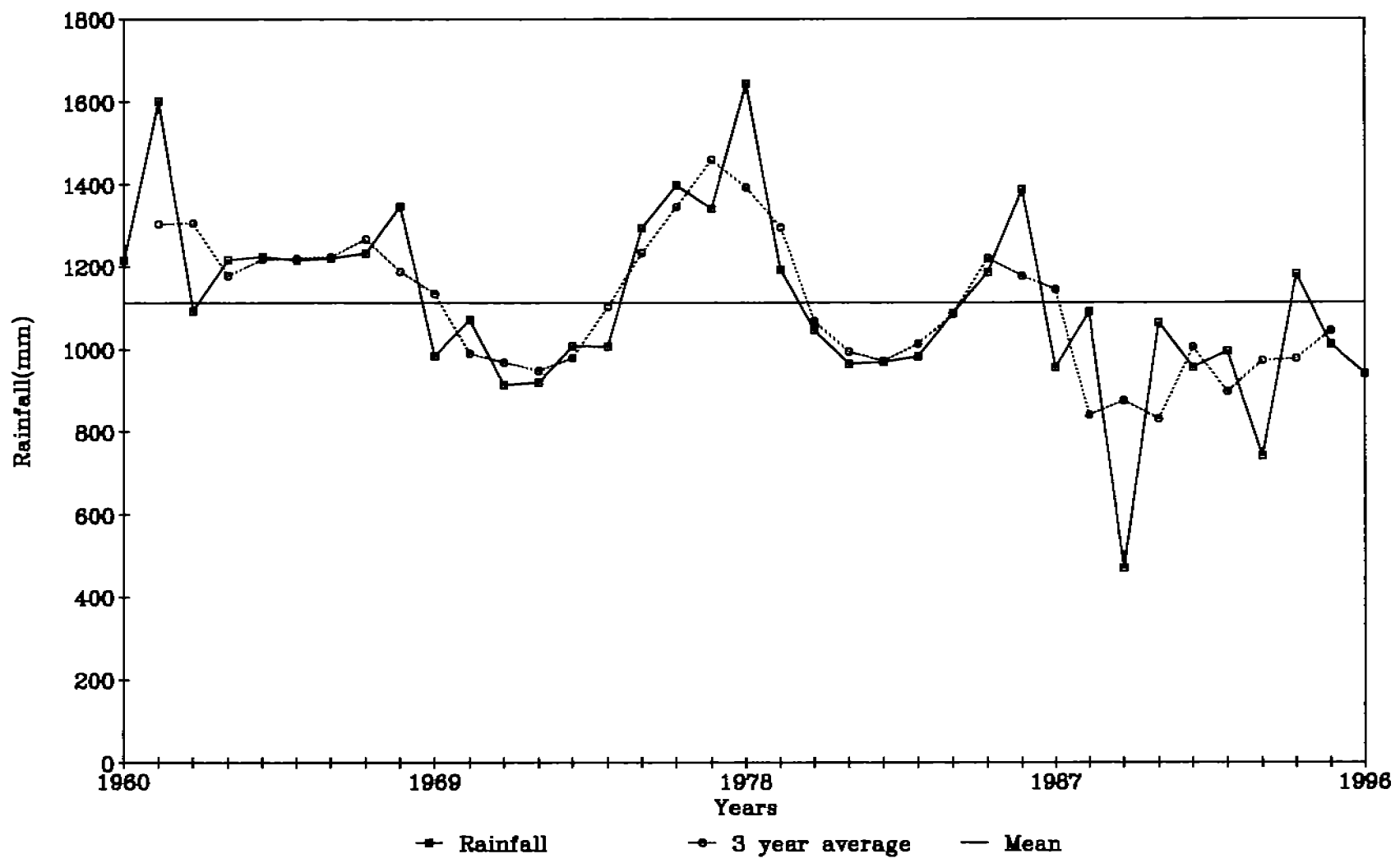
Rubya (Oct-Dec) Rainfall Time Series
and 3 years moving average (1960-1996)

APPENDIX N



Igabirol Annual Rainfall Time Series
and 3 years moving average (1960-1996)

APPENDIX O



Igabiro (Mar-May) Rainfall Time Series
and 3-years moving average (1960-1996)

APPENDIX P

