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REPORT

ENERGY PROFILE: ETHIOPIA

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CONTENTS

1. INTRODUCTION

This report is one of a series summarizing the energy situation in sub-equatorial Africa. The purpose of the series is to analyze the energy position for those organizations trading or intending to trade with those countries, or for organizations entering into joint ventures with those countries. It is also the intention to use the individual reports to determine the possibility for energy interchange in the region and the potential for energy supply and demand in the region.

Use has been made of a number of sources for the statistical information and the various sources do not always agree because of differences in definitions used for the various components of energy and national accounts. Therefore a perfect match in the resultant data should not necessarily be expected.

Substantial use has been made of World Bank information and permission to quote from their reports and to reproduce maps is gratefully acknowledged.

2. COUNTRY PROFILE

2.1 Introduction[4,6]

Ethiopia has a long history as an independent polity dating back to 500 BC. During the country's early history, rule vacillated between centralized government and provincial nobles. In 1887 Menelik II proclaimed himself Emperor of Ethiopia and began to unite the country. In 1890 conflict arose with the Italians due to the latters' occupation of northern Ethiopia and the establishment of the colony of Eritrea. Italy than proclaimed a protectorate over the whole of Ethiopia, which was rejected by Menelik. With the aid of Russian and French arms he defeated the Italians at Adowa in 1896. Italy recognised the independence of Ethiopia but held on to the colony of Eritrea. After his triumph at Adowa, Menelik implemented a large programme aimed at modernizing Ethiopia.

After Menelik's death in 1913 a power struggle took place and resulted in his daughter, Zawditu, being made Empress and Ras Tafari, a relative, became regent

and heir to the throne, enabling modernization to be resumed. Tafari gained Ethiopia's entry into the League of Nations in 1923.

On the Empress's death in 1930, Ras Tafari assumed the throne as emperor and renamed himself Haile Selassie ('Might of the Trinity'). He implemented a number of notable reforms including a decree for the abolition of slavery.

In the early 1930's Benito Mussolini, the Italian leader, took an interest in Ethiopia and invaded the country on the 3 October 1935 without any declaration of war. Despite slow progress, the Italian 'conquest' was subsequently recognized by the UK, although the USA and USSR refused to do so.

Haile Selassie lived in exile in Britain and struggled to gain recognition for the Ethiopian patriots' struggle. In 1940 after Italy declared war on Britain and France he was allowed to assist the 'common' struggle against the Italians. Allied armies supported the liberation campaign and on 6 April 1941 Addis Ababa fell to South African troops. Haile Selassie entered the city on 5 May, exactly five years after the occupation. Much debate followed amongst the Allies over boundaries and control. In 1954 Ethiopia resumed full sovereignty over her pre-war boundaries. Eritrea, the former Italian colony which had been federated with Ethiopia in 1952, was completely unified with Ethiopia on 14 November 1962 by Haile Selassie. Eritrean nationalists immediately launched a guerrilla war which has turned into a 30-year struggle for independence from Ethiopia.

The emergence of independent African states in the late 1950's and early 1960's saw Ethiopia become increasingly involved in African affairs. This was emphasized by the choice of Addis Ababa as the headquarters of the UN Economic Commission for Africa and the Organization of African Unity (OAU). Haile Selassie was made Honorary President of the first OAU conference in Addis Ababa in May 1963.

Under Haile Selassie, Ethiopia's main ally was the USA and the country received the largest US military and civil aid in Africa in the 1950's and 1960's. The last 11 years of the emperor's rule were marked by increasing opposition to him and his government. The most pressing issues were the need for land reforms, corruption amongst senior officials, the catastrophic famine of 1972-1974 (in which it was estimated that 200 000 people died), and the sharply rising food prices.

In February 1974 strikes broke out in Addis Ababa accompanied by mutinies in most of the armed forces. The government resigned and was replaced under a new prime minister with a mandate to carry out reforms. However, by June it was evident that reforms were stagnating and a co-ordinating committee of the armed forces and police took action. On 12 September 1974 Haile Selassie was deposed and died under mysterious circumstances 11 months later while in detention.

The co-ordinating committee, now called the Provincial Military Administrative Council (PMAC), instituted a provisional military government under a popular soldier Lt-General Aman Andom. Dispute arose over the correct policy for Eritrea and General Aman was shot two months later. He was replaced by Brigadier-General Teferi Benti. The PMAC opted for a socialist model to replace the feudal regime of Haile Selassie. Ethiopia was declared a socialist state in December 1974 and hundreds of companies were nationalized or partly acquired by the State. In March 1975 all rural land was nationalized, followed by all urban land four months later. In 1977 Gen. Benti was executed in the midst of a power struggle and Lt-Col. Mengistu was elevated to the position of Chairman of the PMAC and Head of State. In 1977 the PMAC announced that in future it would seek arms and aid from countries more in tune with its political ideology and a 20-year treaty of friendship and co-operation was signed with the USSR in 1978.

Ethiopia's recent history has been marked by the 30-year Eritrea independence struggle and the on-going famine. In 1984 Ethiopia sought help from the West to alleviate the famine in the northern areas affecting some 9 million people. The West was reluctant to assist until their conscience was stirred by journalists' reports of the plight of the Ethiopian people. Ethiopia also undertook a resettlement programme which was severely criticized for being ill prepared and less than voluntary. Many people died as a result of the famine and resettlement programme. In 1989-90 the West was once again asked to provide aid to 4 million people in Eritrea and Tigre affected by food shortages. The provision of food was severely hampered by civil conflict resulting from the activities of Eritrean liberation movements. The government and Eritrean liberation movements deliberately disrupted each others' food aid to famine victims.

The Eritrean independence struggle began after absorption of Eritrea into Ethiopia in 1962 by Haile Selassie. The struggle continues today 30 years later and has been marked by continued civil war and guerrilla attacks. The overthrow of Haile Selassie

in 1964 and the establishment of a Soviet-backed government did not curb the war. The liberation movements also professed Marxism, although the main group, the Eritrean People's Liberation Front (EPLF), dropped it in the 1980's. Other rebel groups have also emerged, one of the prominent movements being the Tigre People's Liberation Front (TPLF) who began to advance towards Addis Ababa in 1989 under the banner of the Ethiopian People's Revolutionary Democratic Front (EPRDF). The EPRDF seized Addis Ababa in May 1991 and has assumed government of Ethiopia for the time being. The EPLF has called for a referendum on independence for the province. This would mean dividing Eritrea from Ethiopia and depriving the Addis Ababa government of its entire coastline.

2.2 Demography

Ethiopia is situated in the Horn of Africa and stretches south and west from the Red Sea. It is bordered by Somalia, Sudan, Kenya and Djibouti, covers an area of 1 251 282 km^2, and in 1988 had a GDP per capita of US$ 120. Its population was estimated at 46,14 million in 1988[1]. The population density was 37 per km^2, and the average population growth rate for the period 1984-1988 was estimated at 2,9% per annum[1].

In 1987 the infant mortality rate was 154 per 1000 live births[1,2], the live birth rate was 43,7 per 1000 people[3], and the crude death rate was 23,6 per 1000 people (excluding infant mortality)[2,3]. Life expectancy at birth in 1985 was 39,4 years for males and 42,6 years for females[3]. In 1987, 47% of the population was under the age of 15 years and 63% was under the age of 25[3]. In 1990 only 13% of the population was urbanised, although urban population growth rates were high, averaging 4,8% in 1990[7].

2.3 Economy

In 1988 Ethiopia had a GDP of 11 539 million Birr or 5 574 million US$[1]. This equates to a per capita GDP of 120 US$ which makes Ethiopia one of the poorest countries in the world. Agriculture is the main occupation and source of income of the majority of the population. Agriculture provides some 80% of exports and engages 75% of the working population[4]. Ethiopia's predominantly agricultural

economy has felt the impact of land reforms, nationalization, a series of secessionist wars, as well as renewed drought and the external strains of world recession and declining terms of trade.

Figure 1 shows the contribution of the agriculture and industrial sectors to the economy over the period 1968-1988 in percentage terms. The effects of the severe droughts which began in 1972/73 and 1984 can clearly be seen. The ongoing drought in the country, coupled with a high population growth rate, has resulted in a high mortality rate both of humans and of livestock and the vegetation cover has suffered a long-term setback.

Ethiopia has a relatively small industrial sector with over 90% by value under public ownership. Its relative contribution to GDP was 14,3% in 1968, rising to 15,4% in 1988. This increase in share of contribution to GDP was mainly due to the poor performance of the agricultural sector during the drought. The industrial sector continues to encounter major problems as a result of the lack of new investments, raw materials, spare parts, and problems with staffing and management[(4)].

Figure 2 shows GDP in current and real terms over the period 1968-1988. The negative growth in real and current GDP in 1984 and 1985 can be directly attributed to the impact of the worsening drought. Improved rains in 1985/86 resulted in a recovery in GDP growth. Figure 3 shows the average yearly growth in real GDP, in percentage terms, over the period 1968-1988. The effects of the droughts and the recovery in 1986 after improved rains are evident. During the period 1974-1988 yearly real GDP growth rates averaged 2,3% which is below the population growth rate for the same period. This has resulted in a general decline in real GDP per capita since 1973, as shown in Figure 4. Conversely, GDP per capita in US$, although low, has shown a large increase since 1968 (as shown in Figure 5) of GDP in US$ over the period 1968-1988.

Figure 6 shows the ratio of the agricultural sector's contribution to GDP to that of the industrial sector. The shift in ratio towards the industrial sector is largely due to the ongoing drought rather than a large change in the country's economic mix.

3. ENERGY GENERAL

3.1 Introduction

Ethiopia is a low consumer of energy per capita relative to the region. Its main sources of energy are wood, charcoal, and animal and agricultural wastes. In 1988 commercial energy supplied only 8,1% of total final energy. Commercial energy carriers are made up of electricity and oil. Coal and gas do not play a role in the energy sector.

3.2 Energy institutions

(The following is based on the situation in 1984.)

The Ministry of Mines and Energy is the lead agency in policy formation and development planning for the energy sector. The Ethiopian National Committee (ENEC) was formed by the government in 1979 in order to address the pressing problems of the energy sector in a co-ordinated manner and to assist in policy-making and the setting of priorities. ENEC operates through the Ministry of Mines and Energy as a planning secretariat reporting to the Minister. The energy parastatals and the agencies established for geothermal and petroleum exploration report to the Permanent Secretary of the Ministry or to the Minister himself. ENEC is technically comprised of the permanent heads of all these agencies plus other energy-related ministries, meeting under the chairmanship of the Minister or the Permanent Secretary.

3.2.1 Petroleum Sector:

The Ethiopian Petroleum Corporation (EPC) is responsible only for petroleum refining and the regulation of additional supplies through the major oil companies. The 800 000 tpy Assab refinery, owned by the Government, is operated by the EPC.

3.2.2 Electricity Sector:

Electricity is generated under the authority of the Ethiopian Electric Light and Power Authority (EELPA) which was formed in 1956 as an autonomous parastatal and

since 1976 has been placed under the Ministry of Mines and Energy. Although EELPA maintains overall responsibility throughout the country for public electricity generation, transmission and distribution, the supply of power to the northern region is provided by its unconsolidated subsidiary, the Eritrea Region Electricity Supply Agency. Both supply regions are composed of an interconnected system and a series of satellite generation centres.

4. ENERGY RESOURCES

4.1 Fuelwood

Ethiopia's forests cover about 27,15 million hectares or 22% of the total land area. Of this, 4,35 million hectares are considered closed forests and 22,8 million hectares are considered open forests[2]. Average annual deforestation amounts to 88 000 hectares per year, while reforestation replaces only 18 000 hectares on average per year,[2] resulting in a net loss of total forestry resources.

4.2 Oil and Gas

Ethiopia has no identified sources of oil and imports all its requirements which it refines at the Assab petroleum refinery. However, promising strikes of oil have been obtained between the Web and Webi-Shebelli Rivers. These await official confirmation and suggestions on how effective exploitation can be achieved.

Gas reserves have been discovered and proven recoverable reserves of 24 million m^3 have been identified.

4.3 Coal

Ethiopia has no identified bituminous coal reserves. Lignite and sub-bituminous coal reserves have been identified and in 1987 proven reserves amounted to 23 million tons, of which 11 million tons were considered recoverable reserves[2,8]. The major

deposits are situated in Wollega, Gonar, Eritrea and Sidamo. These deposits tend to occur in the more deforested energy-poor regions[8].

4.4 Hydro-electricity

Ethiopia has a high rainfall and a precipitous topography which has endowed it with a relatively large hydro-electric potential. A number of hydro plants are already in operation, while a large number of sites have been identified at which power production could be coupled with irrigation schemes especially along the Blue Nile River. Total hydro potential is estimated to be 20 000 GWh per year, with a potential installed capacity of 4000 MW[2] which is sufficient to provide all Ethiopia's electricity requirements for the foreseeable future. In 1987 installed hydro capacity amounted to 230 MW which produced 650 GWh of electricity.

4.5 Other energy sources

4.5.1 Geothermal:

Ethiopia has considerable high enthalpy geothermal potential in areas in the Rift Valley. This potential has not yet been exploited, although estimates are now being made of the potential and feasibility studies are being undertaken to determine the optimum exploitation of identified potential. In 1984 its potential was estimated at 4000 MW[8].

4.5.2 Solar:

Much potential exists for the application of solar energy to displace electric water heating in households in the major towns and cities as well as in a number of industries including tanneries, hotels and hospitals[8].

4.5.3 Ethanol:

In 1984 the government had plans to build a 20 million litres per year distillery at Shoa using surplus molasses from the sugar industry as feedstock. The output would be used to make a 20% ethanol and regular gasoline blend[8].

4.5.4 Bagasse:

In 1984 surplus bagasse from the sugar industry amounted to 9 600 tons per year and was set to grow to 16 000 tons per year with the completion of new mills and expansion of old mills. Much of this surplus is used to substitute for fuelwood in lime-burning. With the appropriate investment, scope exists to increase bagasse surpluses by tenfold through more energy-efficient operation of the sugar mills. This would create a valuable fuel supply to industry and households[8].

5. ENERGY SUPPLY AND DEMAND

5.1 General

As in most Sub-Saharan countries, fuelwood accounts for a large proportion of Ethiopia's primary and total final energy consumption. In 1988 Ethiopia relied on traditional fuels for 91,9%[5] of its total final energy requirements. The household sector is responsible for the majority of total final energy consumption, (92,5%[5] in 1988 including traditional energy).

In 1988 primary commercial energy consumption amounted to 1080,3 thousand toe, of which 145,2 Ttoe were derived from indigenous hydro and 935,1 Ttoe from imported oil. In 1971 primary consumption of energy was 598,4 Ttoe. The total final consumption (TFC) of commercial energy is shown in Figure 7 over the period 1971-1988. These Figures have been compiled according to IEA[5] data. The general trend has been an exponential increase in the consumption of commercial energy, although the effects of the severe periods of the droughts are evident. In 1975 TFC of commercial energy amounted to 389,8 Ttoe, while in 1988 TFC had increased to 774,9 Ttoe, almost double the 1975 figure.

Figure 8 shows the sectorial breakdown of TFC of commercial energy over the period 1971-1988. In 1988 the transport sector accounted for 60,7% of TFC, followed by industry (17%), residential (7,5%), and agriculture (4,1%). Industry's relative consumption has shown a general decrease, while transport and residential sectors have shown a relative increase in consumption.

The relationship between the growth in GDP and the growth in TFC of commercial energy is shown in Figure 9 over the period 1971-1988. The growth in TFC shows a similar trend to that of GDP. Figures 10 and 11 show the relationship between the real economic growth in, and TFC of energy by, the agricultural and industrial sectors for the period 1970 -1988. The growth in the real sectorial contribution to GDP and the TFC of energy by the sectors displays similar trends, as would be expected.

TFC of commercial energy in Ethiopia is equivalent to approximately 0,64% of the TFC of the continent[5]. The country has a per capita TFC of commercial energy of 17 kgoe per capita which is low by regional standards, although the per capita TFC of all energy forms is much higher at 207 kgoe per capita, reflecting the large reliance on traditional energy. Its commercial energy intensity of 0,139 kgoe per US$ of GDP is a little below average for the region.

Figure 12 shows the commercial energy intensity over the period 1971-1988. There has been an overall upward trend during this period, interrupted by the effects of the severe droughts. Figure 13 shows the relationship between commercial energy consumed per capita and GDP per capita in local currency over the period 1971-1988.

Oil plays a major role in the commercial energy sector, making up 91,2% of TFC in 1988, while electricity catered for 8,8% of TFC. The heavy reliance on oil for commercial energy requirements is reflected in Figure 14 which shows the components of TFC of commercial energy in percentage terms over the period 1971-1988.

5.2 Traditional energy

Consumption of traditional fuel has been increasing, as shown in Figure 15 over the period 1971-1988. In 1988 traditional fuel consumption amounted to 8 765 Ttoe. Traditional fuels in the form of fuelwood (37%), cattle dung (32%), cereal straw (23%), charcoal (1,3%) and bagasse (< 1%) constitute 92% of total final consumption of energy. Almost all traditional energy is consumed by the household sector, for which cooking constitutes the only significant energy use.

Cooking is highly energy intensive due to the adherence to the traditional practice of open fire baking of thin spongy pancake-like bread on clay discs. There is a strong cultural preference for woodfuels for cooking and this together with the above has led to massive deforestation and the resultant insidious depletion of agricultural resources. This is resulting in an increasing scarcity and cost of household fuels, particularly fuelwood, and the Ethiopian landscape has changed dramatically with closed forest cover declining from 40% at the turn of the century to 3% in 1984. In response to the increasing scarcity of fuelwood, dung and crop residues are being substituted, which is having a detrimental effect on crop yields. It was estimated in 1984 that in order to check these trends and to meet fuelwood demand within the next 30 years, 5% of the Ethiopian landscape would have to be reforested.

5.3 Coal

No bituminous coal reserves have been discovered in Ethiopia. Although reserves of lignite and sub-bituminous coal have been identified, they have not been exploited. Coal does not play a role in Ethiopia's energy sector.

5.4 Oil

All of Ethiopia's crude oil and refined product requirements are imported, mostly from the USSR, and account for approximately 45% of export earnings[4]. Crude oil is refined at the Assab petroleum refinery which has an annual capacity of 900 000 tons. In 1982 production reached 800 000 tons. Furnace oil is re-exported, deriving useful revenue for the government.

TFC of oil over the period 1971 to 1988 is shown in Figure 16. The general trend has been an exponential increase in the consumption of oil, although the effects of the severe periods of the droughts are evident. In 1975 TFC of oil was 345,4 Ttoe, while in 1988 TFC had increased to 706,8 Ttoe, double the 1975 figure. The relative importance of oil in the TFC of commercial energy decreased from 89,2% in 1971 to 86,4% in 1986 and then increased to 91,2% in 1988 due to the sudden decrease in the consumption of electricity after 1986.

The sectorial TFC of oil over the period 1971-1988 is shown in Figure 17. In 1988 transport (66,6%) consumed the largest amount of oil, followed by industry (13.8%), residential (5,2%), and agriculture (4,4%).

In 1971, 94,9 Ttoe of oil were used in the generation of electricity, which decreased to 51,2 Ttoe in 1988 due to the increased exploitation of hydro potential.

5.5 Electricity

Consumption and production of electricity are shown in Figures 18a and 18b for the period 1971-1988. Since 1972 production has been increasingly based on hydro at the expense of thermal. Consumption of electricity grew steadily from 1978 to 1986, after which it dropped sharply to 1982/83 levels. In 1988 electricity consumption was 68,1 Ttoe. Electricity's relative importance as a final consumption form increased from 10,8% in 1971 to 13,6% in 1986 and then decreased to 8,8% in 1988.

Figure 19 shows the sectorial consumption of electricity. In 1988 the industrial sector accounted for 50,7% of electricity consumption, followed by residential (32,3%), and agriculture (0,6%). Relative consumption by the industrial sector has been steadily decreasing, while that of the residential sector has been steadily increasing.

Electricity is supplied by three independent grids (based on Addis Ababa, Asmara and Assab) and isolated centres powered by diesel generators. An energy development programme for the period 1982-2002 is based on the eventual linking of the three grids and the isolated centres into a unified network[4].

Figure 20 shows the total installed capacity, private and public, over the period 1950-1985. Installed capacity amounted to 338 MW in 1985, of which 225 MW was based on hydro and 113 MW on thermal. The thermal plants are all based on oil.

Total generation amounted to 815 GWh in 1988[5]. Hydro power plays an important role in the electricity supply of Ethiopia, with more than 79% being generated by hydro stations in 1988[5] as opposed to 51% in 1971, as shown in Figure 20.

6. DISCUSSION

The past 30 years of Ethiopia's history have been marred by the struggle for the liberation of Eritrea and the on-going famine. This has led to a large number of deaths, forced resettlement of people, and disruptions to the economy. The energy sector has felt the effects of these disruptions.

Ethiopia is a low consumer of commercial energy per capita relative to the region. The main sources of energy are wood, animal and agricultural wastes. Commercial energy is based on imported oil, on which Ethiopia is heavily reliant, and electricity which is largely hydro based.

The shortage of cooking fuel, especially fuelwood, and the related massive deforestation are the most important energy problems facing Ethiopia.

Although Ethiopia has relatively large reserves of gas, lignite and sub-bituminous coal, as well as geothermal potential, these have so far not been exploited. If these resources could be economically utilized, Ethiopia's reliance on imported oil, which accounts for 45% of export earnings, could be reduced, thus removing a large burden from the economy.

Once the conflict within the country is brought to a halt and consensus is reached between the various factions, the possibility exists that the food crises and economic problems will be properly addressed and solutions found. This would result in a challenge for the energy sector.

7. REFERENCES

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TABLES

TABLE 1 : ECONOMIC STATISTICS

YEAR	POPULATION MILLIONS	GROSS DOMESTIC PRODUCT AT MARKET COST							GDP AT MARKET COST	GDP DEFLATOR	GDP AT 1985 MARKET PRICES	GDP/CAPITA		EXCHANGE RATE BIRR PER US$	GDP IN US$(MILL) CURRENT MARKET PRICES MILLIONS	GDP PER CAPITA US$ PER CAPITA
		AGRICULTURE	INDUSTRY					OTHER SERVICES				CURRENT	REAL 1985			
			TOTAL INDUSTRY	MINING QUARR	MANUFACTURE	ELEC,WTR, GAS	CONSTRUCT									
1968	27.47	2011	548	NA	NA	NA	NA	1278	3837	55.84	6871.72	139.69	250.18	2.50	1534.80	55.88
1969	28.19	2120	588	NA	337	NA	NA	1348	4056	57.11	7102.51	143.87	251.92	2.50	1622.40	57.55
1970	28.94	2327	602	NA	372	NA	NA	1532	4461	58.97	7565.14	154.16	261.43	2.50	1784.40	61.66
1972	30.44	2286	707	NA	440	NA	NA	1751	4744	57.36	8270.51	155.83	271.66	2.30	2062.61	67.75
1973	31.25	2331	748	NA	464	NA	NA	1926	5005	58.63	8536.67	160.19	273.22	2.10	2383.33	76.28
1974	32.08	2605	796	NA	508	NA	NA	2150	5551	64.21	8644.64	173.03	269.45	2.07	2681.64	83.59
1975	32.95	2450	855	NA	569	NA	NA	2246	5551	64.04	8667.48	168.45	263.02	2.07	2681.64	81.38
1976	33.87	2768	824	NA	586	NA	NA	2404	5996	67.34	8903.61	177.05	262.90	2.07	2896.62	85.53
1977	34.83	3227	892	NA	636	NA	NA	2766	6885	74.96	9185.18	197.66	263.69	2.07	3326.09	95.49
1978	35.82	3497	894	NA	636	NA	NA	2904	7295	80.71	9038.46	203.64	252.31	2.07	3524.15	98.38
1979	36.79	3656	1046	NA	758	NA	NA	3285	7987	82.99	9623.48	217.09	261.56	2.07	3858.45	104.87
1980	37.72	3872	1189	NA	830	NA	NA	3438	8499	84.60	10045.82	225.34	266.35	2.07	4105.80	108.86
1981	38.79	4072	1258	NA	871	NA	NA	3573	8903	86.80	10256.67	229.55	264.45	2.07	4300.97	110.89
1982	39.88	4062	1297	NA	902	NA	NA	3808	9167	87.99	10418.65	229.85	261.23	2.07	4428.50	111.04
1983	41.01	4389	1402	NA	984	NA	NA	4240	10031	91.62	10947.96	244.60	266.96	2.07	4845.89	118.16
1984	42.17	4070	1476	NA	1009	NA	NA	4455	10001	93.40	10707.59	237.16	253.92	2.07	4831.40	114.57
1985	43.35	3916	1495	NA	1023	NA	NA	4479	9890	100.00	9890.00	228.14	228.14	2.07	4777.78	110.21
1986	44.61	4354	1596	NA	1073	NA	NA	4882	10832	102.60	10557.50	242.84	236.69	2.07	5232.85	117.32
1987	45.94	4318	1737	NA	1167	NA	NA	5141	11196	97.20	11518.52	243.71	250.74	2.07	5408.70	117.74
1988	47.36	4327	1775	NA	1200	NA	NA	5665	11767	98.50	11946.19	248.48	252.26	2.07	5684.54	120.04
1989	48.86	4666.0	1843	NA	1230	NA	NA	5982.0	12491.0	102.10	12234.08	255.64	250.39	2.07	6034.30	123.50
1990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table B : Energy Statistics

YEAR	COMERCIAL ENERGY FORMS TOTAL FINAL CONSUMPTION 000'S TOE						ENERGY/GDP kgOE/BURR 1990K	1985KWA	TRADITIONAL ENERGY 000'S TOE	COMM/ TRADI	TOTAL ENERG TRAD+ 000'S TO	TRAD AS % TOTA	ENERGY PER CAPITA TOE/CAPITA		
	COAL	OIL	HYDRO	GAS	ELECT	TOTAL	1PT	3PT MA					COMMERCIAL	TRAD	TOTAL
1970	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1971	0	375.5	0	0	45.6	421.1	0.053	NA	5101.00	0.083	5522.1	92.4	0.014	0.172	0.186
1972	0	353.7	0	0	46.5	400.2	0.048	0.051	5243.00	0.076	5643.2	92.9	0.013	0.172	0.185
1973	0	392.9	0	0	45.6	438.5	0.051	0.050	5375.00	0.082	5813.5	92.5	0.014	0.172	0.186
1974	0	395.7	0	0	44.8	440.5	0.051	0.049	5546.00	0.079	5986.5	92.6	0.014	0.173	0.187
1975	0	345.4	0	0	44.4	389.8	0.045	0.047	6712.00	0.058	7101.8	94.5	0.012	0.204	0.216
1976	0	358.6	0	0	43.9	402.5	0.045	0.045	6868.00	0.059	7270.5	94.5	0.012	0.203	0.215
1977	0	371.9	0	0	41.8	413.7	0.045	0.046	7029.00	0.059	7442.7	94.4	0.012	0.202	0.214
1978	0	386.2	0	0	44.4	430.6	0.048	0.048	7205.00	0.060	7635.6	94.4	0.012	0.201	0.213
1979	0	450.3	0	0	49.5	499.8	0.052	0.050	7376.00	0.068	7875.8	93.7	0.014	0.200	0.214
1980	0	440.2	0	0	52.6	492.8	0.049	0.051	7542.00	0.065	8034.8	93.9	0.013	0.200	0.213
1981	0	485.5	0	0	56.7	542.2	0.053	0.050	7732.00	0.070	8274.2	93.4	0.014	0.199	0.213
1982	0	454.2	0	0	60.4	514.6	0.049	0.050	7927.00	0.065	8441.6	93.9	0.013	0.199	0.212
1983	0	467.7	0	0	64.7	532.4	0.049	0.049	8122.00	0.066	8654.4	93.8	0.013	0.198	0.211
1984	0	469.7	0	0	69.8	539.5	0.050	0.052	8334.00	0.065	8873.5	93.9	0.013	0.198	0.210
1985	0	483.8	0	0	76.4	560.2	0.057	0.057	8533.00	0.066	9093.2	93.8	0.013	0.197	0.210
1986	0	591.6	0	0	76.9	668.5	0.063	0.062	8773.00	0.076	9441.5	92.9	0.015	0.197	0.212
1987	0	699.8	0	0	68	767.8	0.067	0.065	9020.00	0.085	9787.8	92.2	0.017	0.196	0.213
1988	0	706.8	0	0	68.1	774.9	0.065	NA	8765.00	0.088	9539.9	91.9	0.016	0.185	0.201
1989	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C: SECTORIAL DISTRIBUTION OF TOTAL FINAL CONSUMPTION
COMMERCIAL ENERGY FORMS (000's TOE)

YEAR	COAL		OIL						ELECTRICITY						TOTAL					
	IND	TOTAL	IND	TRANS	AGRI	RESID.	OTHER	TOTAL	IND	TRANS	AGRI	RESID.	OTHER	TOTAL	IND	TRANS	AGRI	RESID.	OTHER	TOTAL
1971	0.0	0.0	85.9	229.6	13.5	7.6	38.9	375.5	31.4	0.0	0.0	8.3	5.9	45.6	117.3	229.6	13.5	15.9	44.8	421.1
1972	0.0	0.0	67.6	221.1	13.5	10.7	40.8	353.7	33.8	0.0	0.0	7.5	5.2	46.5	101.4	221.1	13.5	18.2	46.0	400.2
1973	0.0	0.0	89.8	235.8	14.5	12.9	39.9	392.9	30.9	0.0	0.1	7.3	7.3	45.6	120.7	235.8	14.6	20.2	47.2	438.5
1974	0.0	0.0	87.8	245.5	14.5	11.8	36.1	395.7	29.7	0.0	0.1	7.5	7.5	44.8	117.5	245.5	14.6	19.3	43.6	440.5
1975	0.0	0.0	70.6	227.4	13.5	7.6	26.3	345.4	29.1	0.0	0.1	7.7	7.5	44.4	99.7	227.4	13.6	15.3	33.8	389.8
1976	0.0	0.0	75.3	231.6	13.5	11.8	26.4	358.6	27.9	0.0	0.1	8.1	7.8	43.9	103.2	231.6	13.6	19.9	34.2	402.5
1977	0.0	0.0	76.5	237.7	15.5	11.8	30.4	371.9	26.1	0.0	0.1	8.4	7.2	41.8	102.6	237.7	15.6	20.2	37.6	413.7
1978	0.0	0.0	72.1	250.0	18.6	13.8	31.7	386.2	27.2	0.0	0.1	9.5	7.6	44.4	99.3	250.0	18.7	23.3	39.3	430.6
1979	0.0	0.0	67.1	317.4	19.7	5.6	40.5	450.3	29.8	0.0	0.1	10.8	8.8	49.5	96.9	317.4	19.8	16.4	49.3	499.8
1980	0.0	0.0	78.6	278.8	19.7	16.3	46.8	440.2	30.2	0.0	0.1	13.0	9.3	52.6	108.8	278.8	19.8	29.3	56.1	492.8
1981	0.0	0.0	117.2	289.2	21.8	11.0	46.3	485.5	33.2	0.0	0.1	13.5	9.9	56.7	150.4	289.2	21.9	24.5	56.2	542.2
1982	0.0	0.0	65.0	300.1	20.8	17.4	50.9	454.2	35.0	0.0	0.2	14.6	10.6	60.4	100.0	300.1	21.0	32.0	61.5	514.6
1983	0.0	0.0	65.9	295.9	22.9	31.0	52.0	467.7	37.4	0.0	0.3	15.6	11.4	64.7	103.3	295.9	23.2	46.6	63.4	532.4
1984	0.0	0.0	66.6	314.3	19.8	26.8	42.2	469.7	40.2	0.0	0.3	16.9	12.4	69.8	106.8	314.3	20.1	43.7	54.6	539.5
1985	0.0	0.0	73.3	330.4	20.9	23.7	35.5	483.8	43.9	0.0	0.4	18.6	13.5	76.4	117.2	330.4	21.3	42.3	49.0	560.2
1986	0.0	0.0	101.1	374.3	18.7	30.1	67.4	591.6	44.2	0.0	0.4	18.7	13.6	76.9	145.3	374.3	19.1	48.8	81.0	668.5
1987	0.0	0.0	91.5	451.5	34.3	35.3	87.2	699.8	37.5	0.0	0.4	17.2	12.9	68.0	129.0	451.5	34.7	52.5	100.1	767.8
1988	0.0	0.0	97.3	470.4	31.2	36.4	71.5	706.8	34.5	0.0	0.4	22.0	11.2	68.1	131.8	470.4	31.6	58.4	82.7	774.9
1989	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table D : Installed Capacity
(Megawatts)

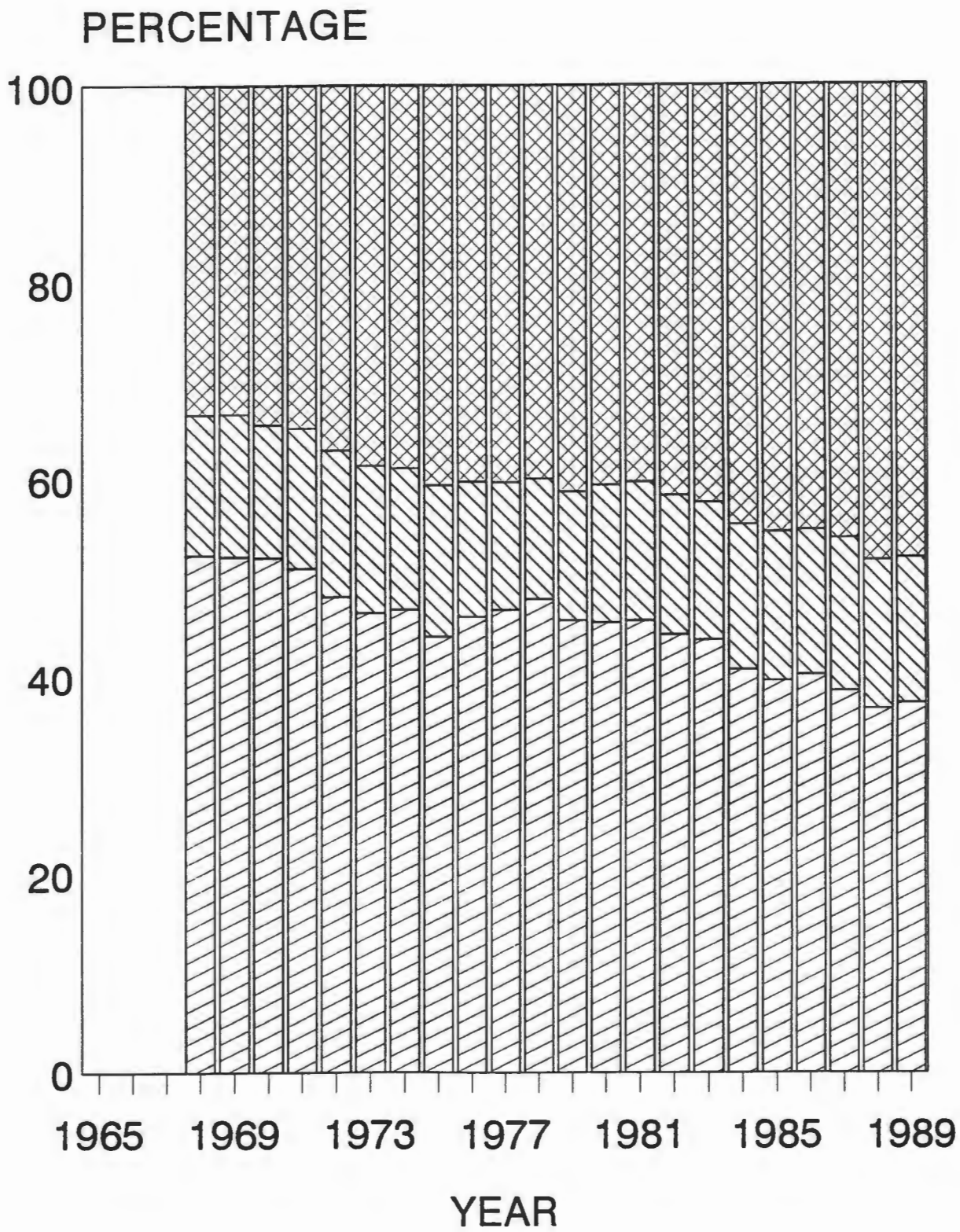
YEAR	SELF PRODUCERS				PUBLIC			TOTAL		
	HYDRO	THERMAL	NUC.	TOTAL	HYDRO	THERMAL	TOTAL	HYDRO	THERMAL	TOTAL
1950	0.0	1.0	0.0	1.0	3	15.0	18.0	3.0	16.0	19.0
1951	0.0	1.0	0.0	1.0	4	16.0	20.0	4.0	17.0	21.0
1952	0.0	1.0	0.0	1.0	7	14.0	21.0	7.0	15.0	22.0
1953	0.0	2.0	0.0	2.0	7	15.0	22.0	7.0	17.0	24.0
1954	0.0	5.0	0.0	5.0	7	16.0	23.0	7.0	21.0	28.0
1955	0.0	6.0	0.0	6.0	8	17.0	25.0	8.0	23.0	31.0
1956	0.0	9.0	0.0	9.0	10	15.0	25.0	10.0	24.0	34.0
1957	0.0	11.0	0.0	11.0	10	22.0	32.0	10.0	33.0	43.0
1958	0.0	10.0	0.0	10.0	10	23.0	33.0	10.0	33.0	43.0
1959	0.0	10.0	0.0	10.0	10	24.0	34.0	10.0	34.0	44.0
1960	0.0	11.0	0.0	11.0	64	20.0	84.0	64.0	31.0	95.0
1961	0.0	12.0	0.0	12.0	64	21.0	85.0	64.0	33.0	97.0
1962	0.0	12.0	0.0	12.0	63	27.0	90.0	63.0	39.0	102.0
1963	0.0	15.0	0.0	15.0	63	33.0	96.0	63.0	48.0	111.0
1964	0.0	16.0	0.0	16.0	73	30.0	103.0	73.0	46.0	119.0
1965	0.0	17.0	0.0	17.0	75	29.0	104.0	75.0	46.0	121.0
1966	0.0	21.0	0.0	21.0	75	44.0	119.0	75.0	65.0	140.0
1967	0.0	22.0	0.0	22.0	92	44.0	136.0	92.0	66.0	158.0
1968	0.0	21.0	0.0	21.0	92	47.0	139.0	92.0	68.0	160.0
1969	0.0	28.0	0.0	28.0	91	46.0	137.0	91.0	74.0	165.0
1970	0.0	23.0	0.0	23.0	91	56.0	147.0	91.0	79.0	170.0
1971	0.0	20.0	0.0	20.0	123	61.0	184.0	123.0	81.0	204.0
1972	0.0	20.0	0.0	20.0	123	62.0	185.0	123.0	82.0	205.0
1973	0.0	20.0	0.0	20.0	207	66.0	273.0	207.0	86.0	293.0
1974	0.0	20.0	0.0	20.0	207	68.0	275.0	207.0	88.0	295.0
1975	0.0	18.0	0.0	18.0	206	67.0	273.0	206.0	85.0	291.0
1976	0.0	18.0	0.0	18.0	206	67.0	273.0	206.0	85.0	291.0
1977	0.0	18.0	0.0	18.0	206	67.0	273.0	206.0	85.0	291.0
1978	0.0	18.0	0.0	18.0	206	75.0	281.0	206.0	93.0	299.0
1979	0.0	18.0	0.0	18.0	206	77.0	283.0	206.0	95.0	301.0
1980	0.0	18.0	0.0	18.0	222	76.0	298.0	222.0	94.0	316.0
1981	0.0	37.0	0.0	37.0	225	75.0	300.0	225.0	112.0	337.0
1982	0.0	37.0	0.0	37.0	225	76.0	301.0	225.0	113.0	338.0
1983	0.0	37.0	0.0	37.0	225	76.0	301.0	225.0	113.0	338.0
1984	0.0	37.0	0.0	37.0	225	76.0	301.0	225.0	113.0	338.0
1985	0.0	37.0	0.0	37.0	225	76.0	301.0	225.0	113.0	338.0
1986	0.0	NA	0.0	NA	NA	NA	NA	NA	NA	NA
1987	0.0	NA	0.0	NA	NA	NA	NA	NA	NA	NA
1988	0.0	NA	0.0	NA	NA	NA	NA	NA	NA	NA
1989	0.0	NA	0.0	NA	NA	NA	NA	NA	NA	NA
1990	0.0	NA	0.0	NA	NA	NA	NA	NA	NA	NA
1991	0.0	NA	0.0	NA	NA	NA	NA	NA	NA	NA
1992	0.0	NA	0.0	NA	NA	NA	NA	NA	NA	NA

Table E : ELECTRICITY

YEAR	THERMAL		HYDRO		TOTAL
	GWh	000'S TOE	GWh	000'S TOE	GWh
1970	NA	NA	NA	NA	NA
1971	289	24.9	304	26.2	593
1972	299	25.8	312	26.9	611
1973	258	22.2	333	28.7	591
1974	239	20.6	348	30.0	587
1975	229	19.7	349	30.1	578
1976	213	18.4	363	31.3	576
1977	168	14.5	375	32.3	543
1978	161	13.9	406	35.0	567
1979	187	16.1	439	37.8	626
1980	187	16.1	497	42.8	684
1981	203	17.5	507	43.7	710
1982	210	18.1	580	50.0	790
1983	216	18.6	630	54.3	846
1984	221	19.1	693	59.7	914
1985	224	19.3	774	66.7	998
1986	155	13.4	850	73.3	1005
1987	160	13.8	650	56.0	810
1988	165	14.2	650	56.0	815
1989	NA	NA	NA	NA	NA
1990	NA	NA	NA	NA	NA
1991	NA	NA	NA	NA	NA

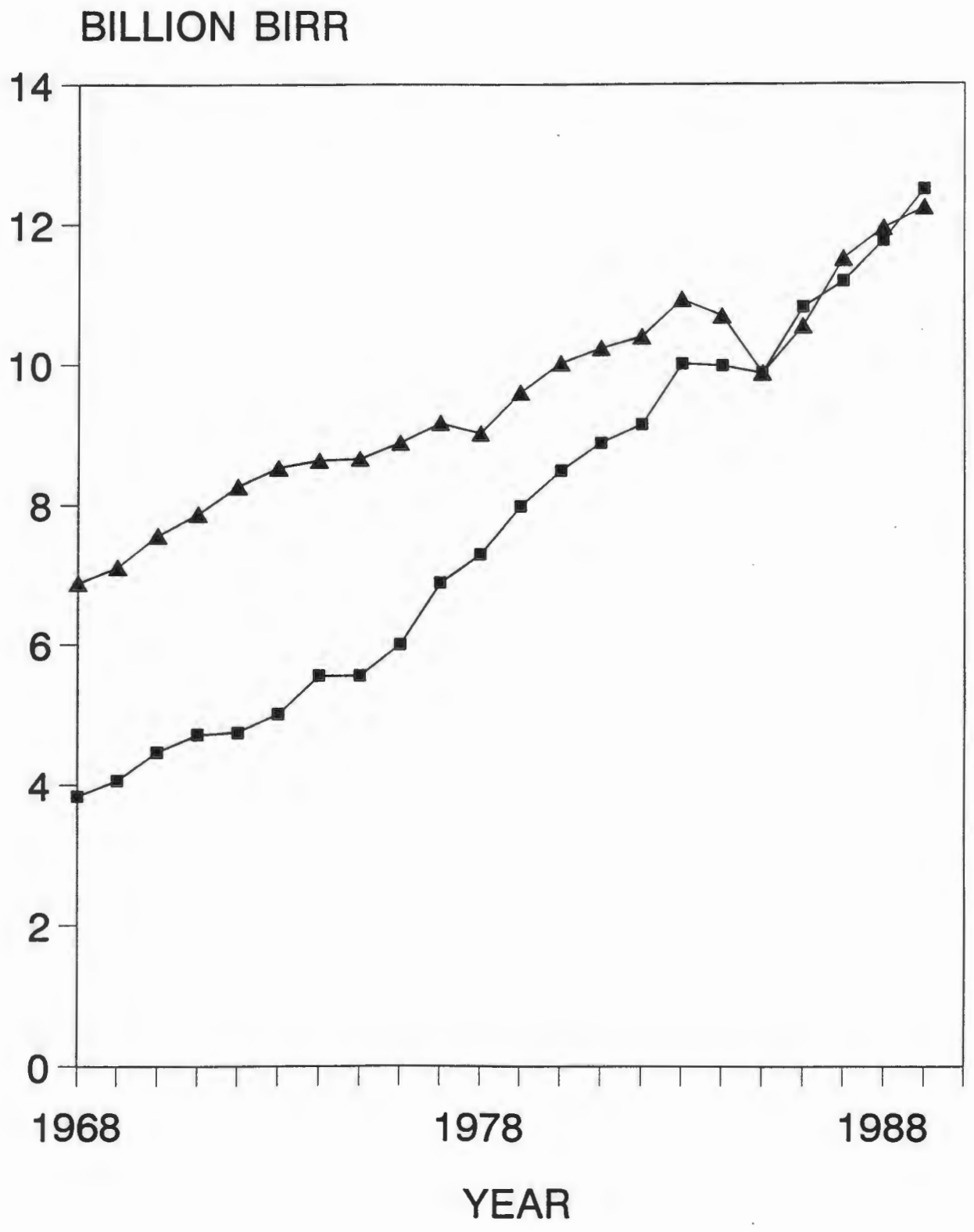
FIGURES

FIGURE 1 GDP COMPONENTS AS A PERCENAGE OF TOTAL



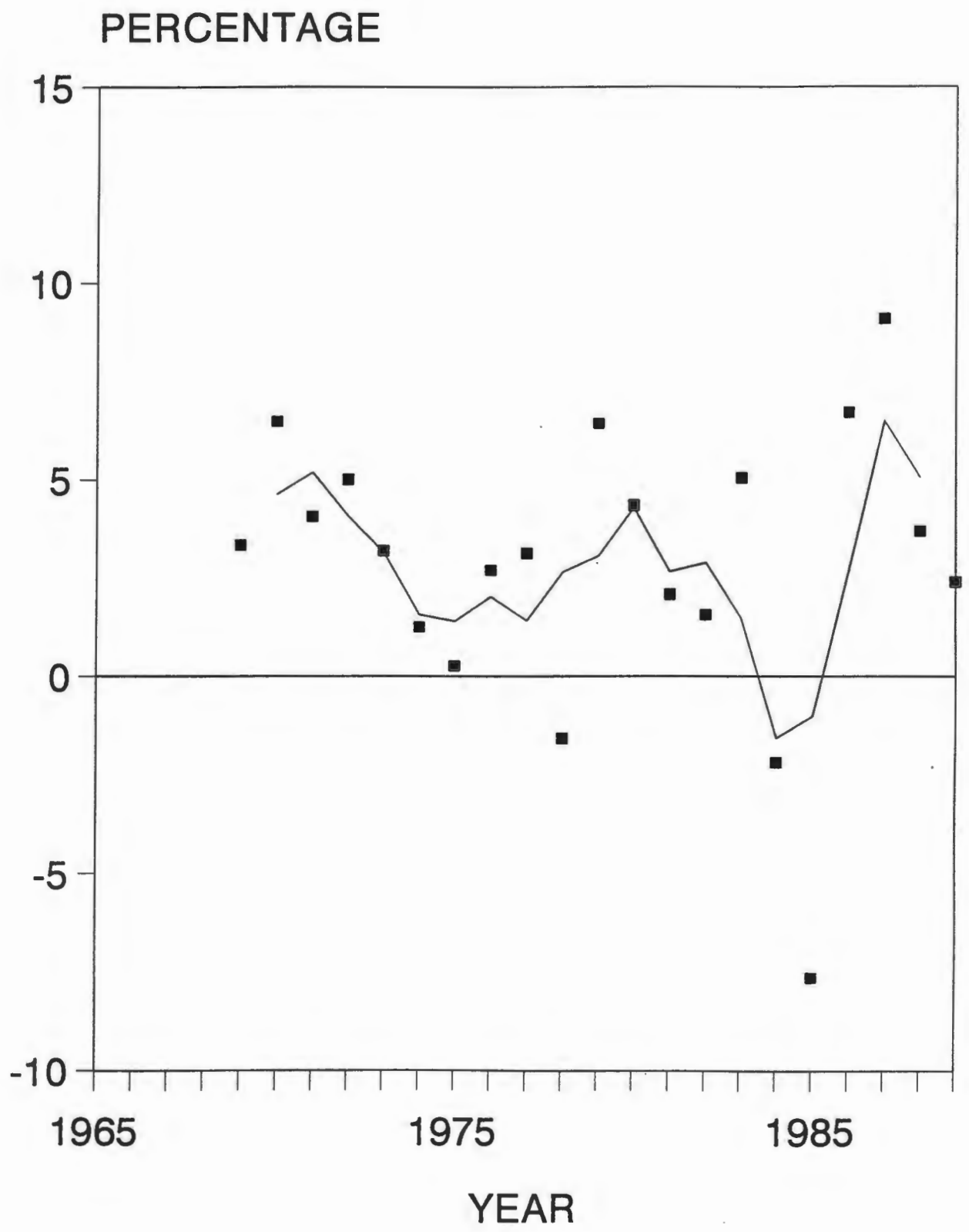
ETHIOPIA/GDP4A

FIGURE 2 GROSS DOMESTIC PRODUCT (MARKET PRICES)



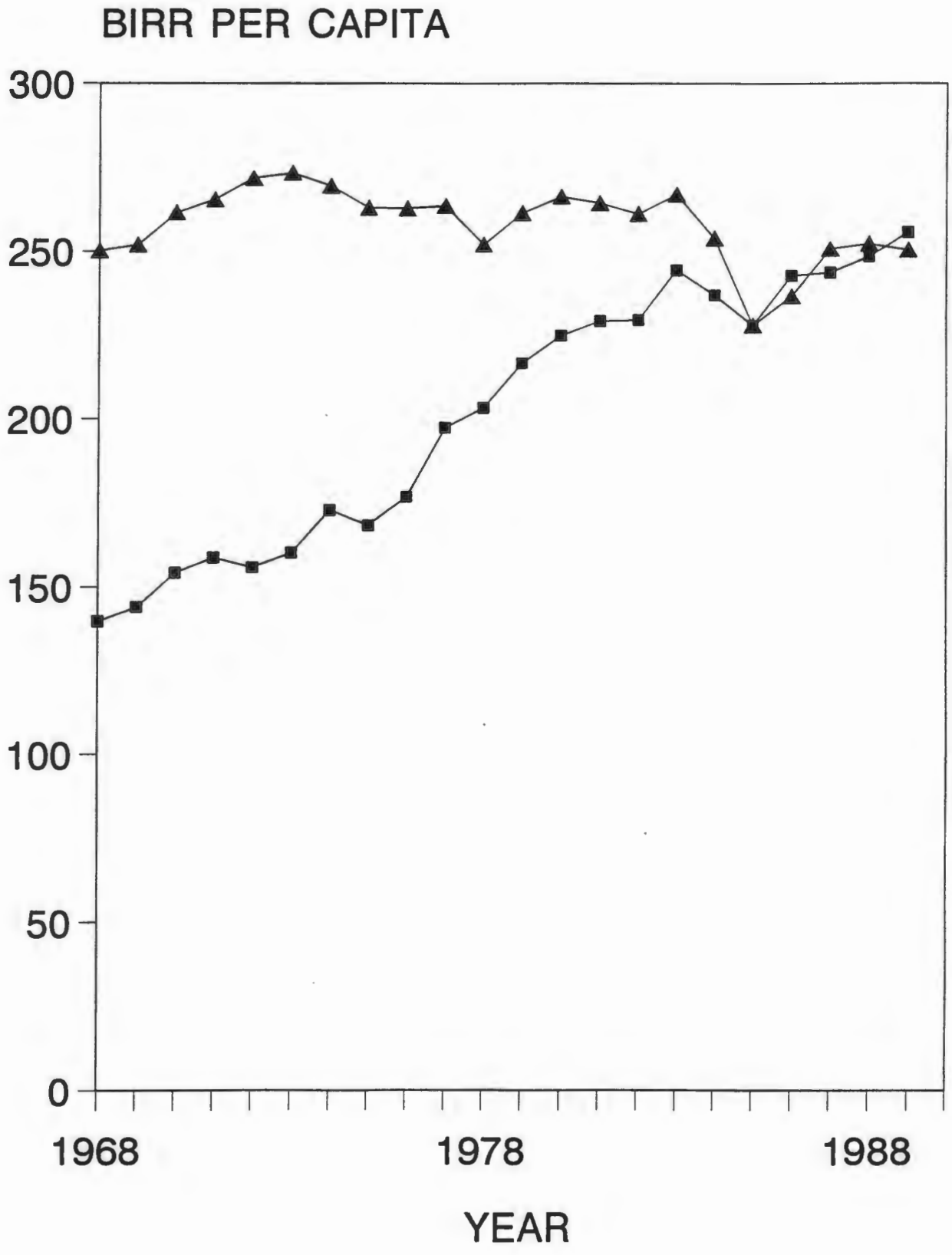
ETHIOPIA/GDP10

FIGURE 3 GROSS DOMESTIC PRODUCT GROWTH RATE
PERCENT PER YEAR (REAL 1985)



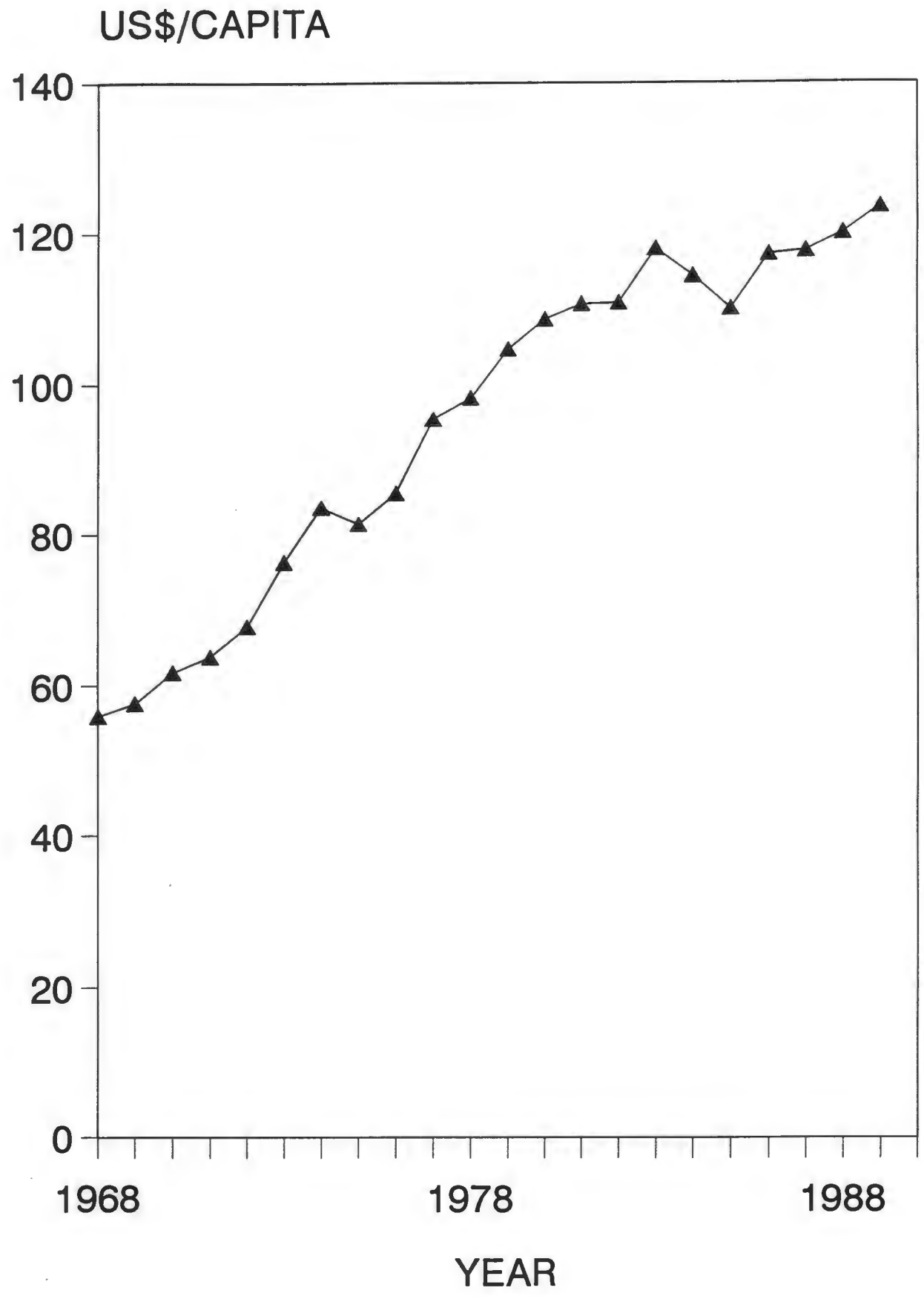
ETHIOPIA/GDP7

FIGURE 4 GDP PER CAPITA



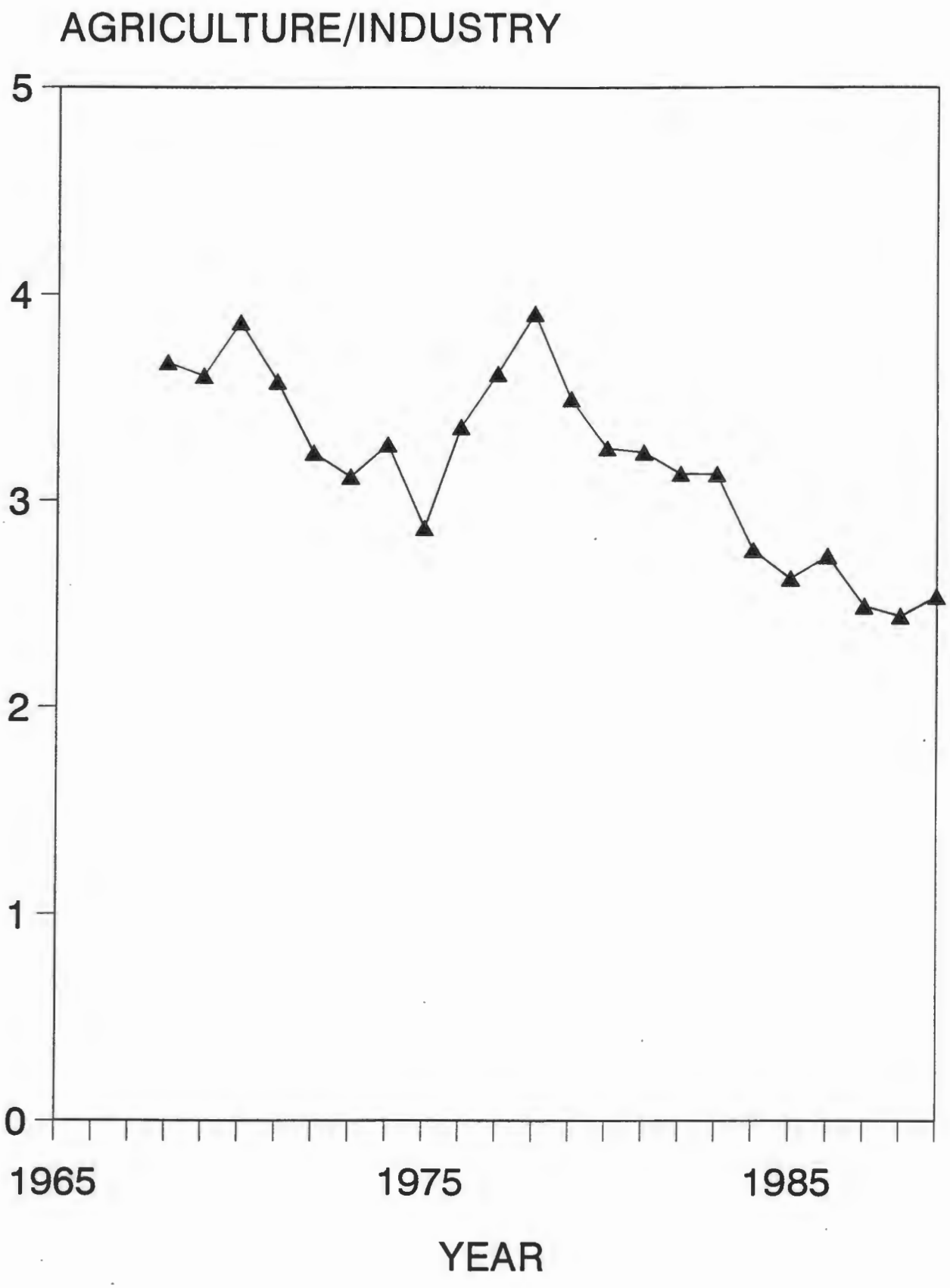
ETHIOPIA/GDP3

FIGURE 5 GDP PER CAPITA



ETHIOPIA/GDP12

FIGURE 6 RATIO OF CONTRIBUTION TO GDP BY AGRICULTURE AND INDUSTRY



ETHIOPIA/GDP1

FIGURE 7 TOTAL FINAL CONSUMPTION OF COMMERCIAL ENERGY

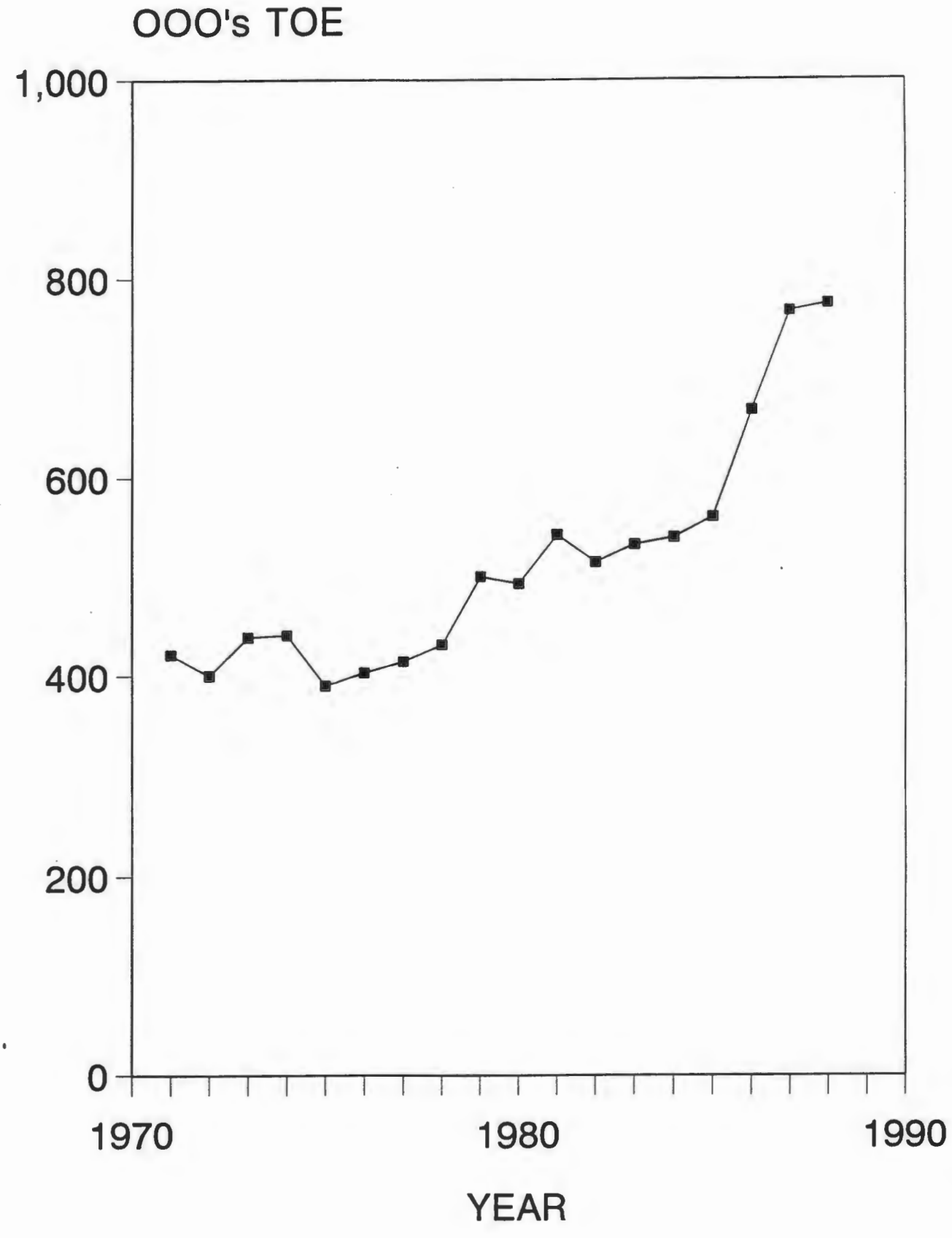
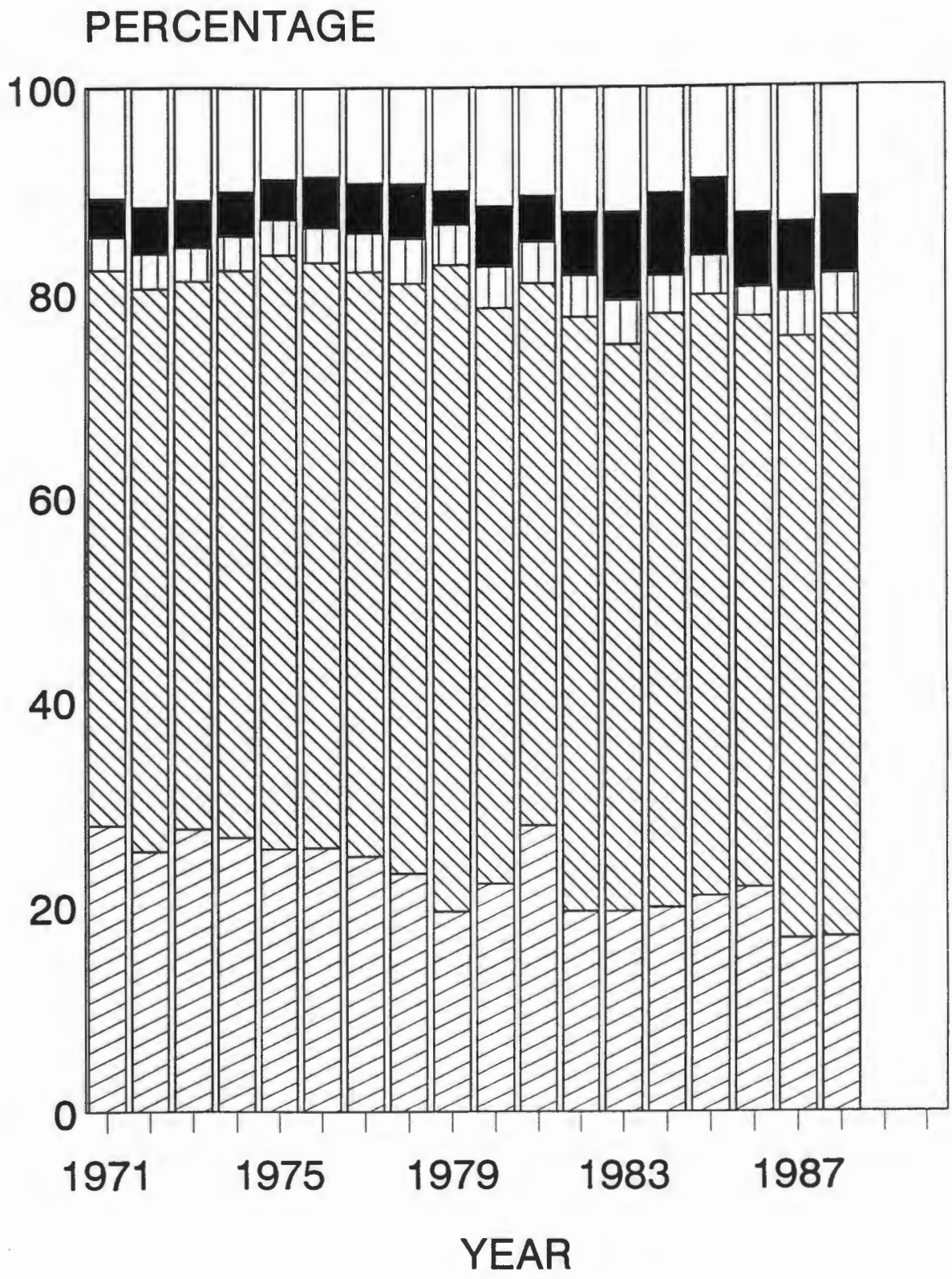
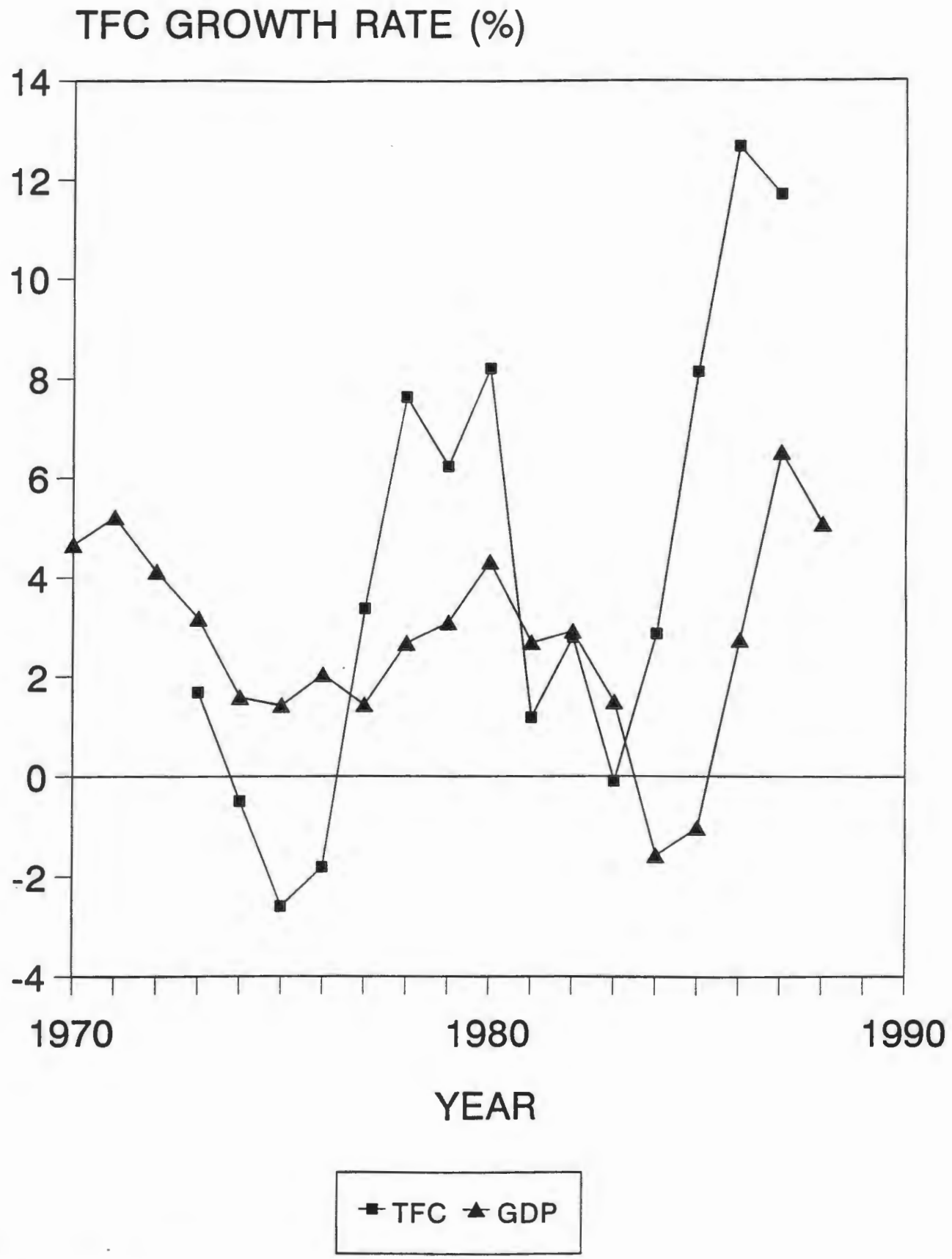


FIGURE 8 TOTAL FINAL CONSUMPTION OF COMMERCIAL ENERGY SECTORIAL BREAKDOWN



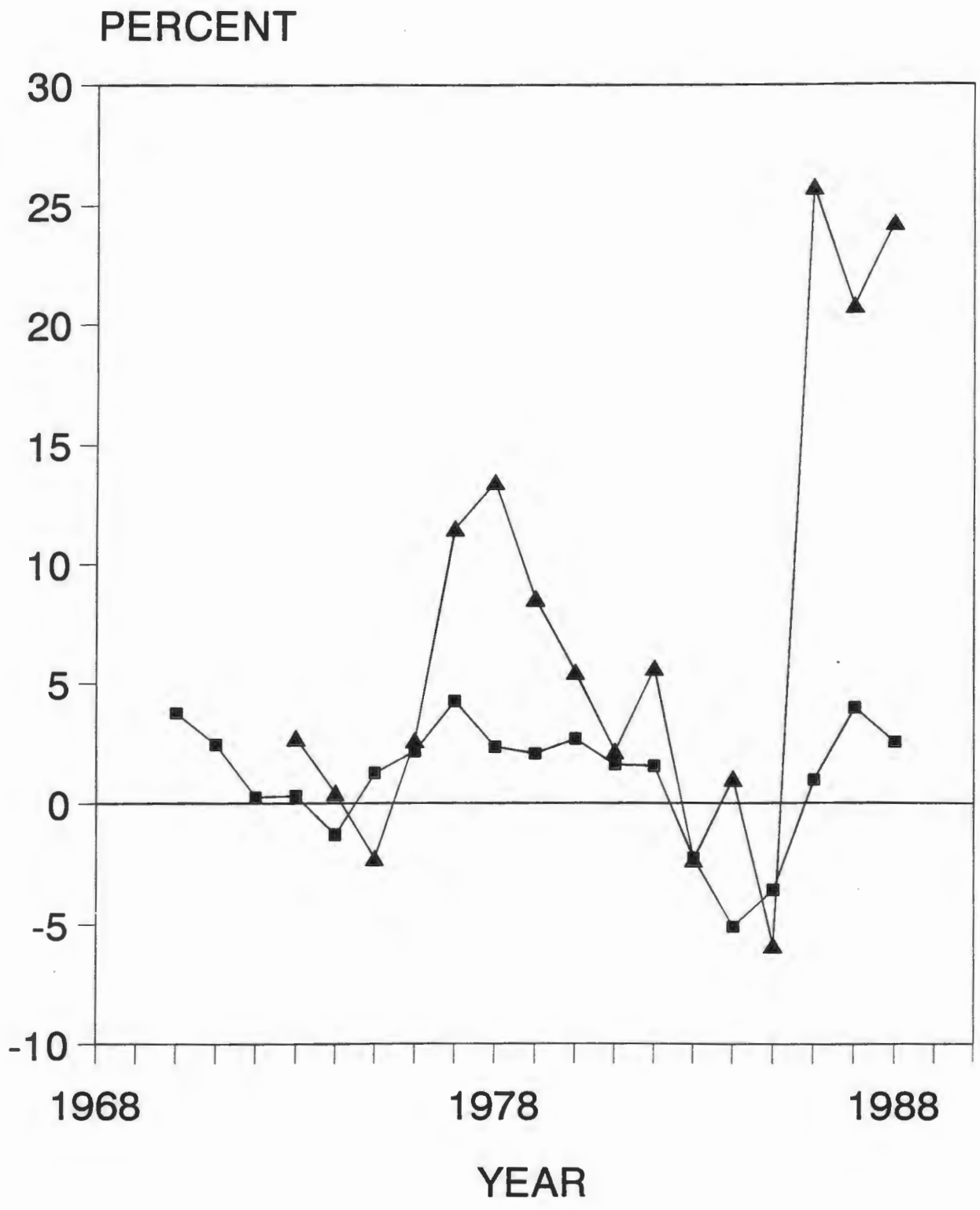
ETHIOPIA/SECTOR3

FIGURE 9 TFC OF COMMERCIAL ENERGY AND GDP GROWTH RATES, 3 PT. M.A.



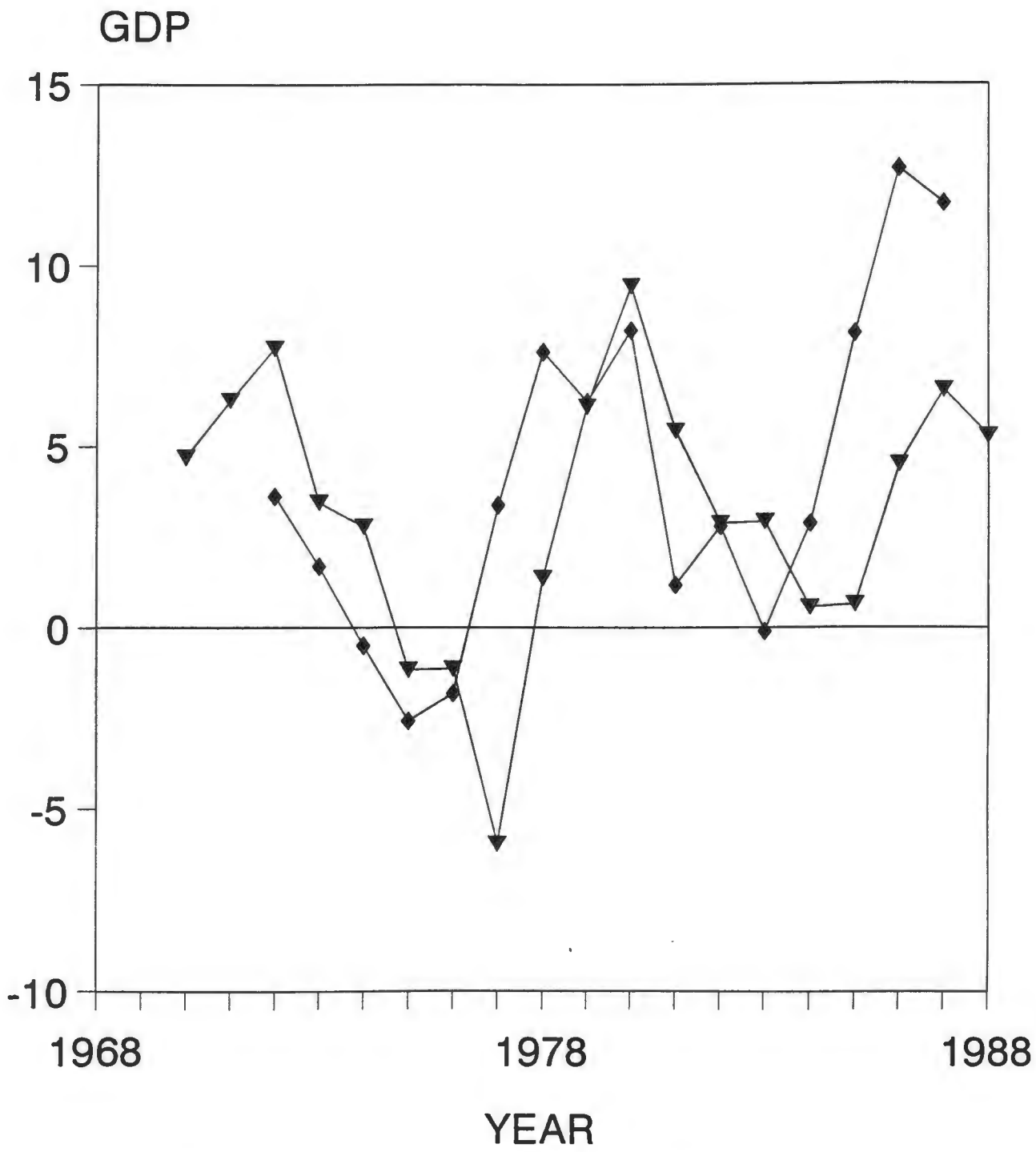
TFC - TOTAL FINAL CONSUMPTION
ETHIOPIA/TFC4B

FIGURE 10 AGRICULTURAL SECTOR ENERGY* AND GDP GROWTH RATES, PERCENTAGE INCREASE PER ANNUM



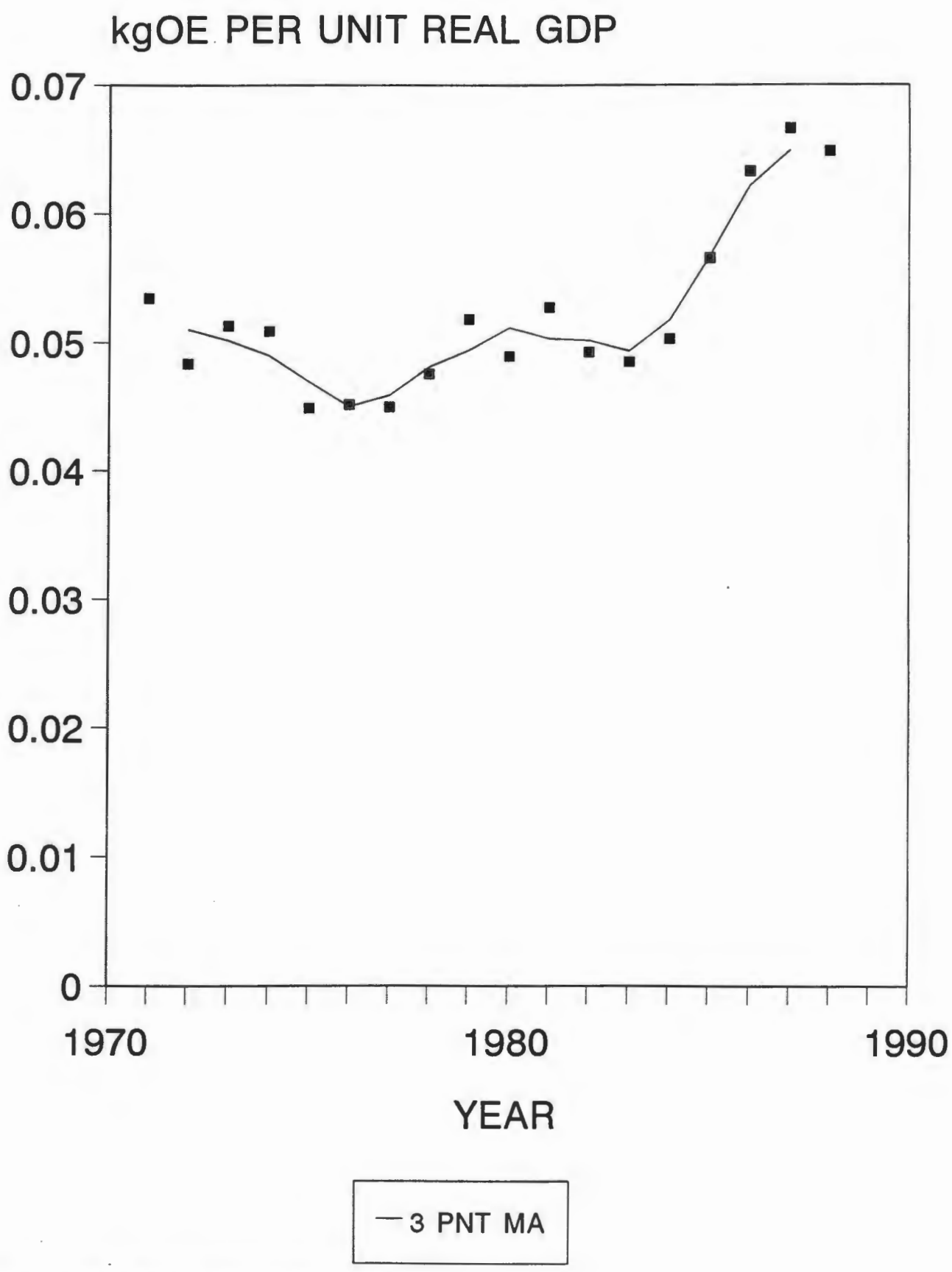
TFC - TOTAL FINAL CONSUMPTION
* COMMERCIAL
ETHIOPIA/GROWTH1

FIGURE 11 INDUSTRIAL SECTOR ENERGY* AND GDP GROWTH RATES, PERCENTAGE PER ANNUM (3 PT. M.A.)



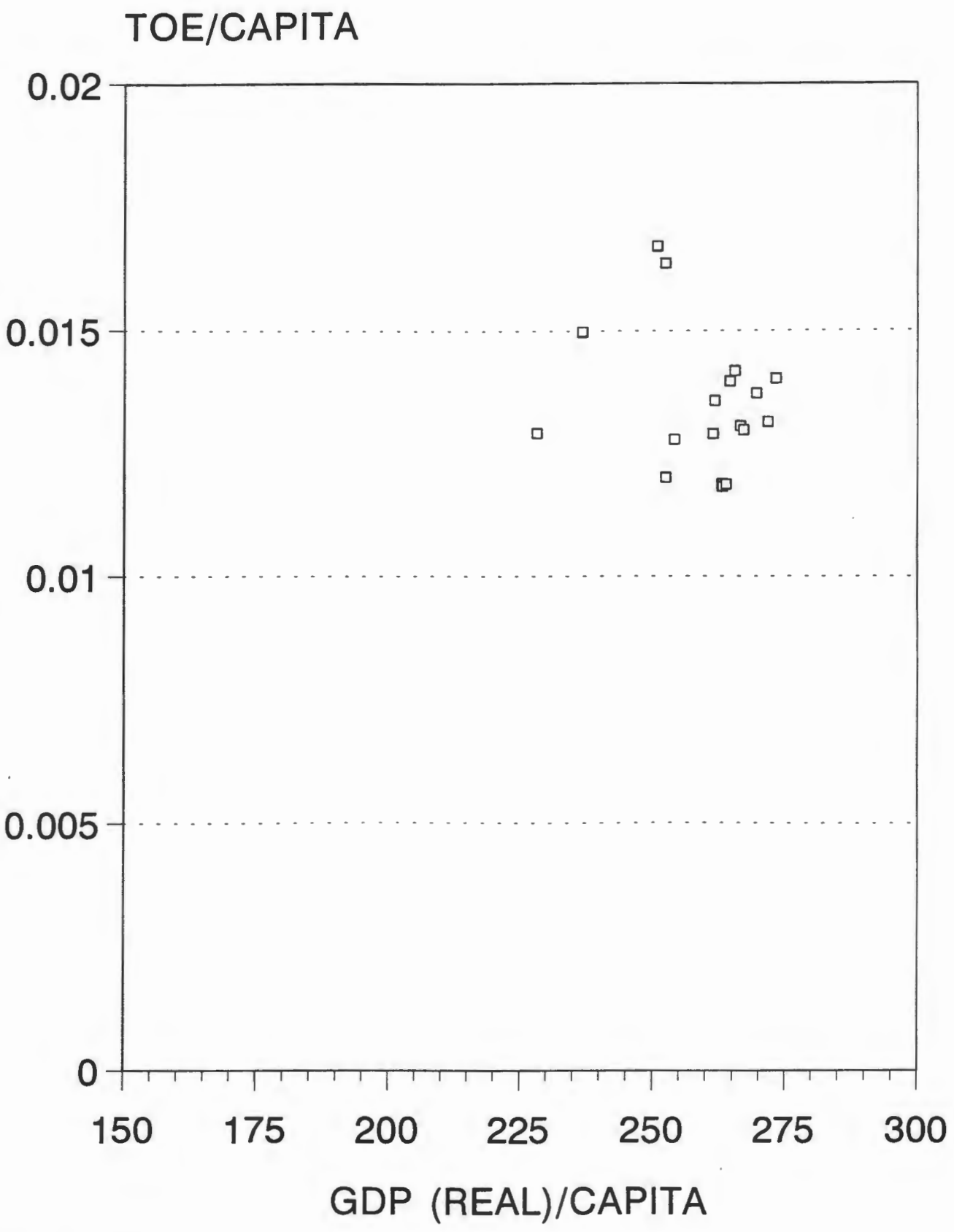
TFC - TOTAL FINAL CONSUMPTION
* COMMERCIAL
ETHIOPIA/GROWTH2

FIGURE 12 ENERGY INTENSITY
TFC(COMMERCIAL)/GDP(real 1985)



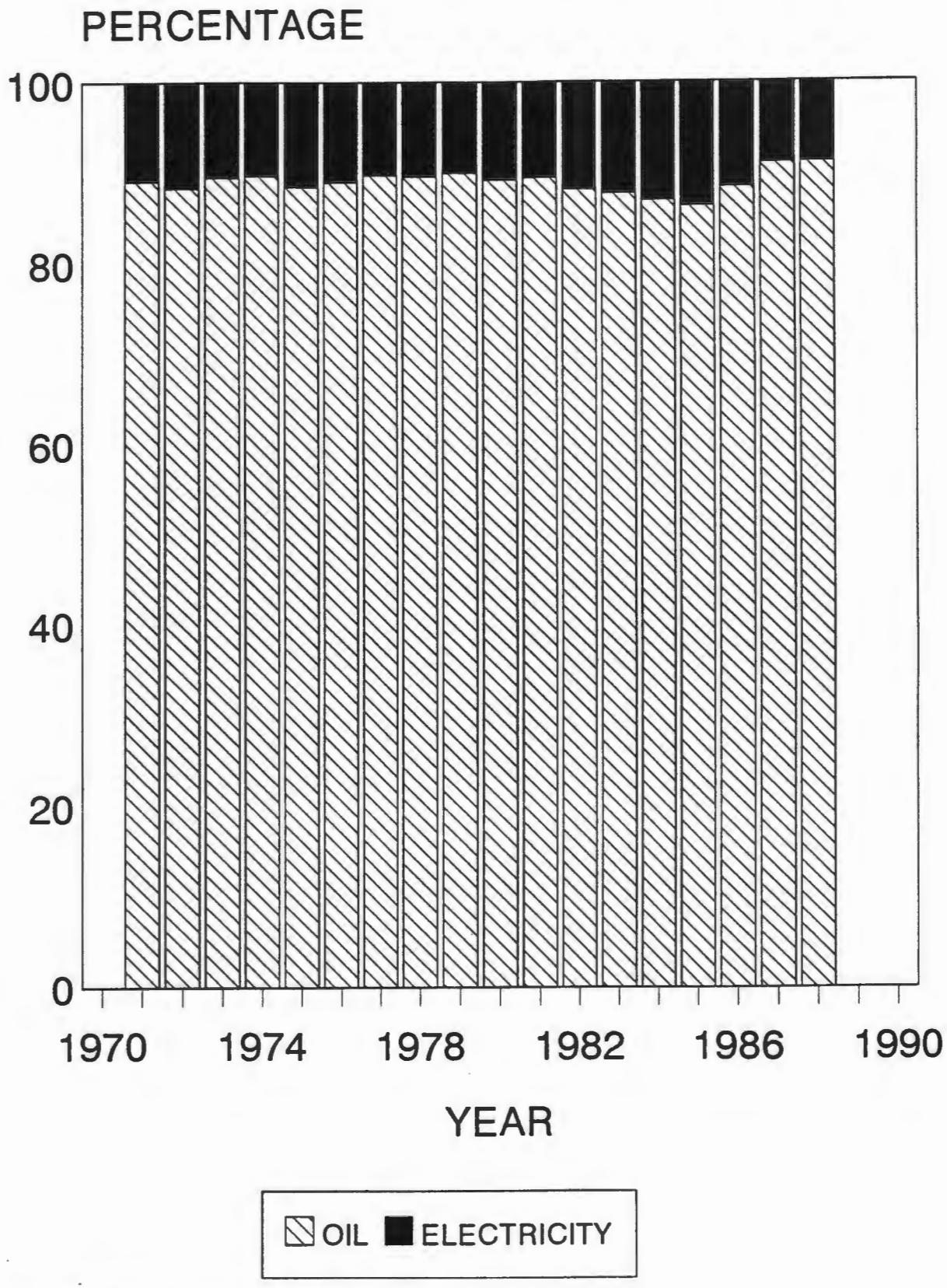
TFC - TOTAL FINAL CONSUMPTION
ETHIOPIA/TFC21

FIGURE 13 GDP PER CAPITA VS TFC OF COMMERCIAL ENERGY PER CAPITA



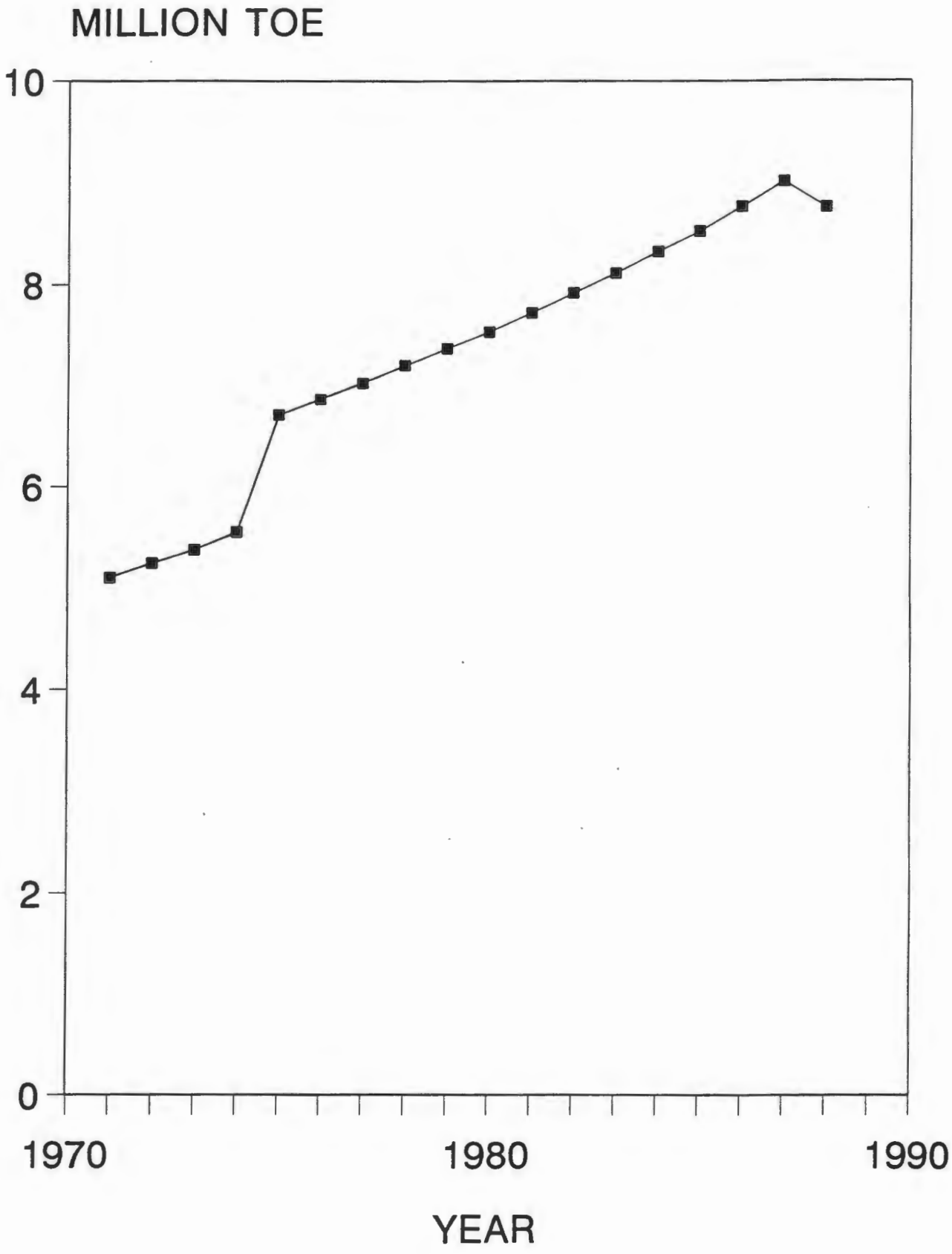
TFC - TOTAL FINAL CONSUMPTION
ETH_13

FIGURE 14 TFC OF COMMERCIAL ENERGY CARRIERS AS A PERCENTAGE OF TOTAL



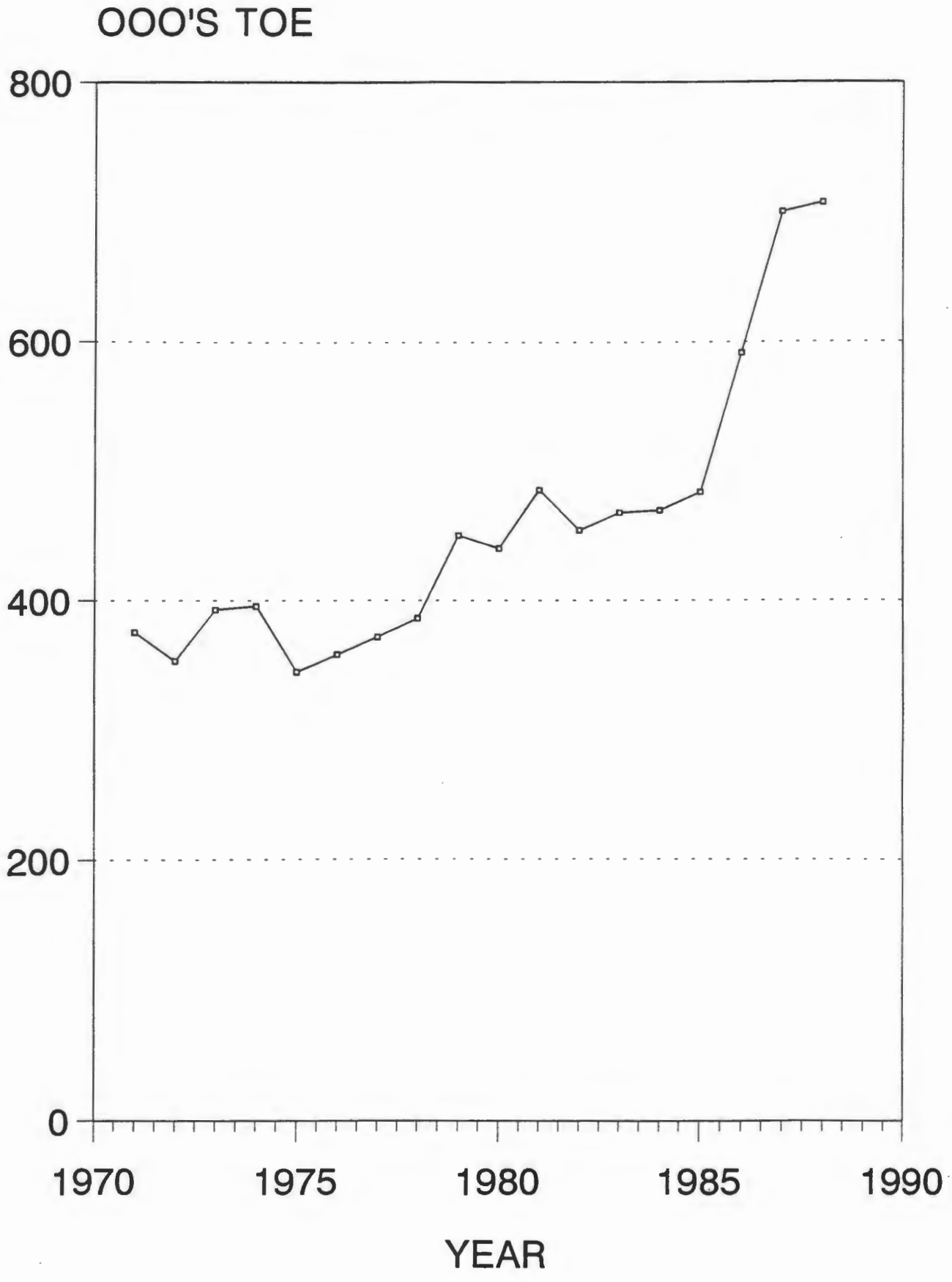
TFC - TOTAL FINAL CONSUMPTION
ETHIOPIA/TFC20

FIGURE 15 CONSUMPTION OF TRADITIONAL ENERGY



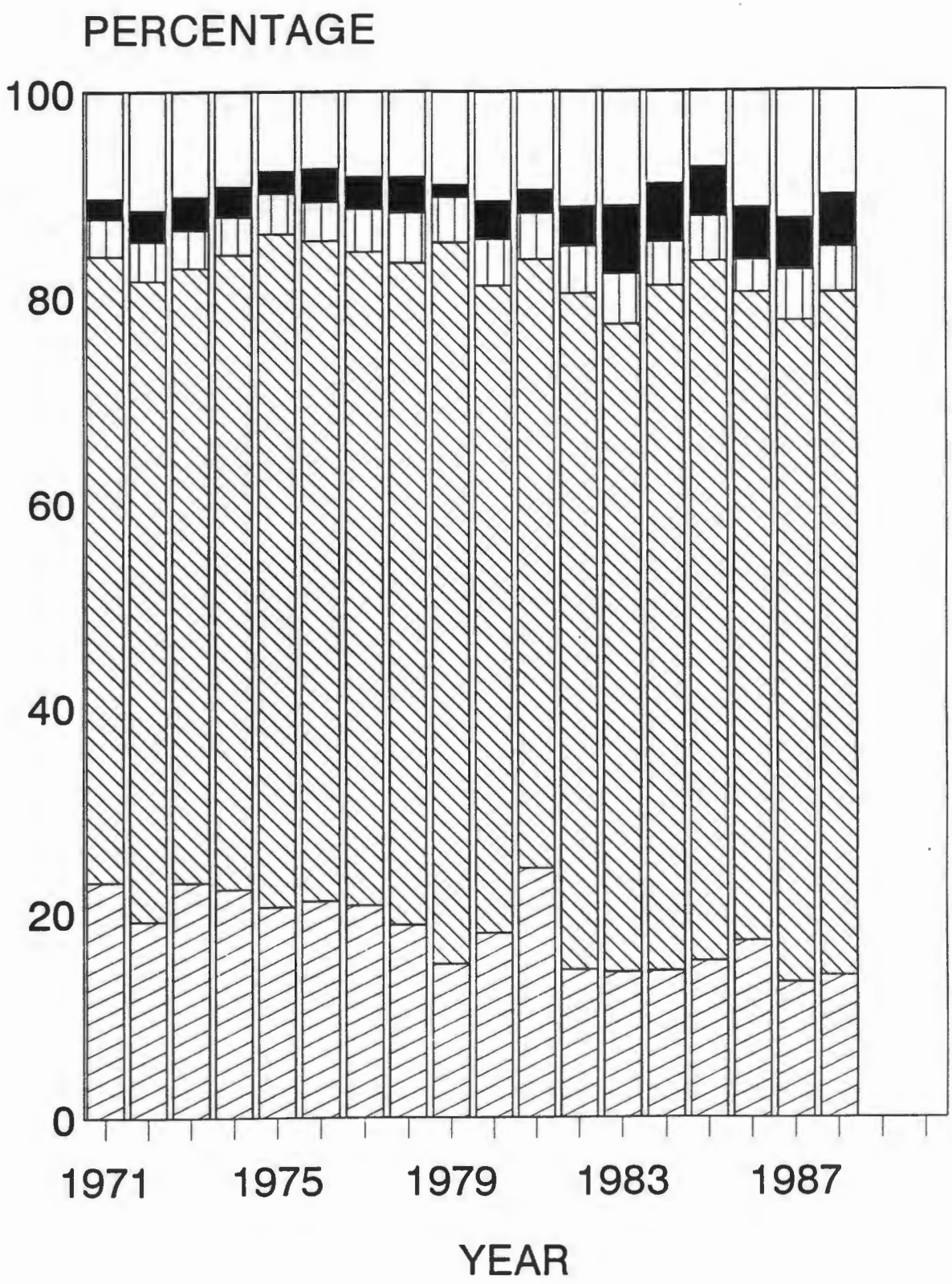
ETHIOPIA/WOOD1

FIGURE 16 OIL TOTAL FINAL CONSUMPTION



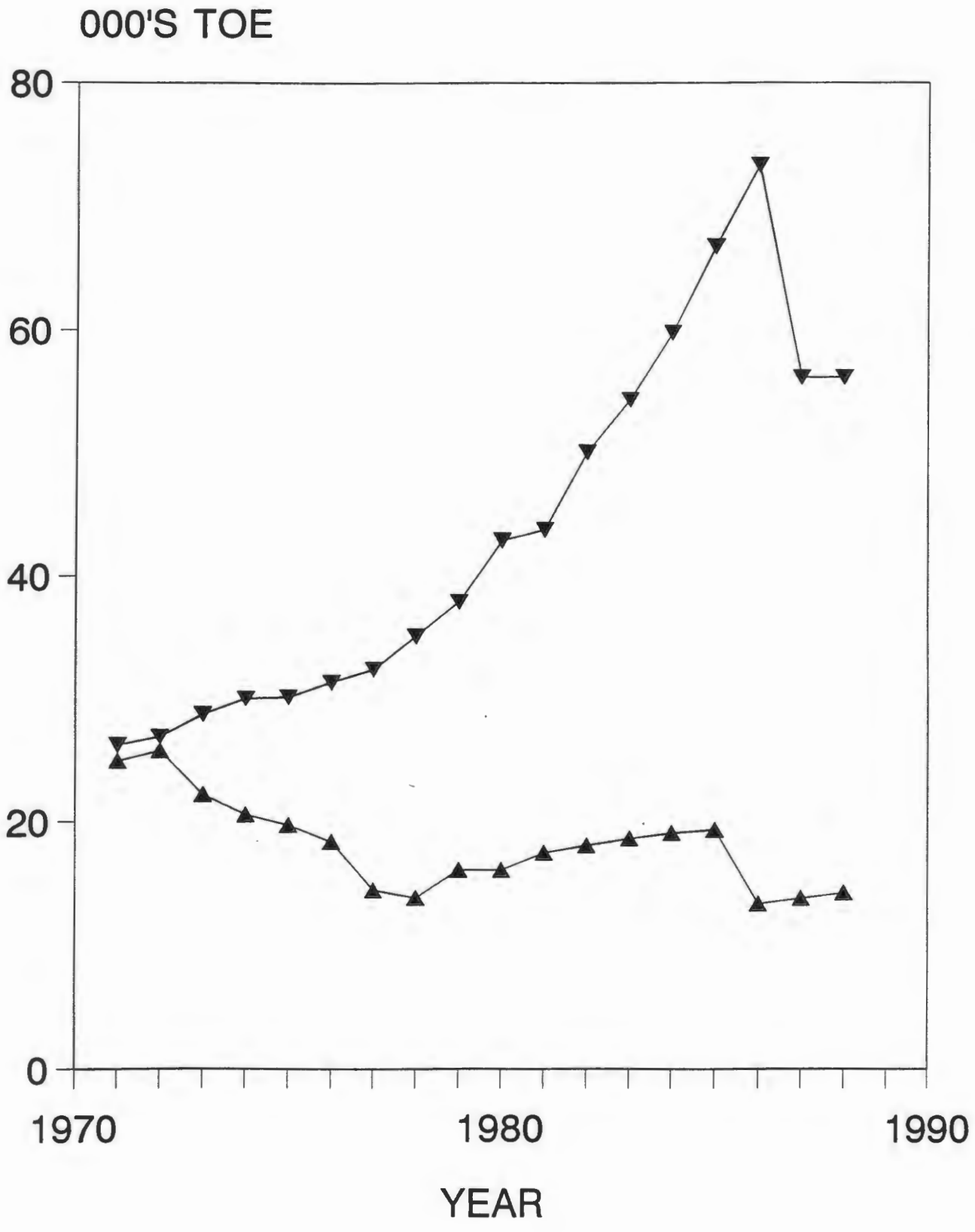
ETHIOPIA/OILTFC

FIGURE 17 TFC OF OIL: SECTORIAL BREAKDOWN



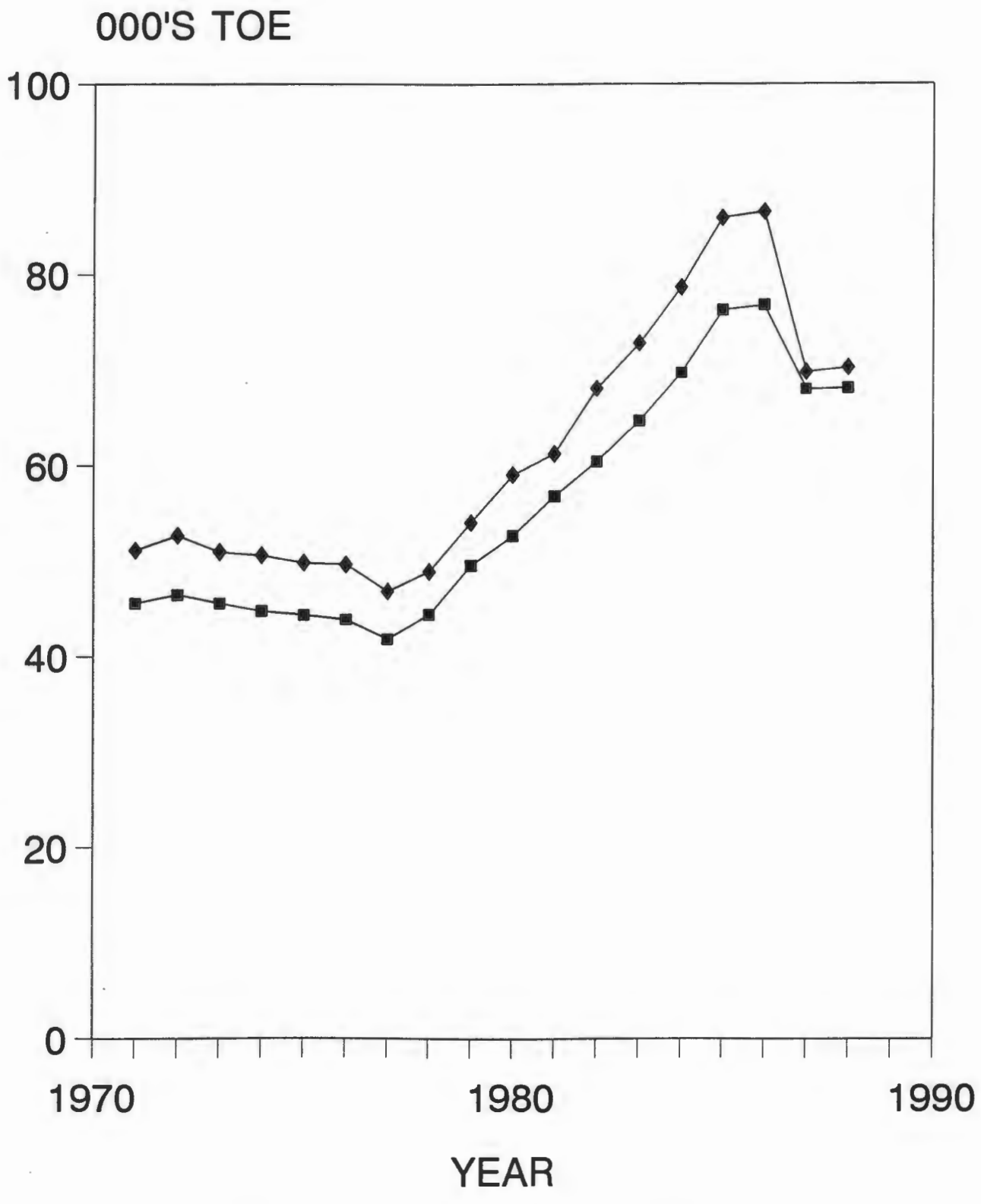
TFC - TOTAL FINAL CONSUMPTION
ETHIOPIA/SECTOR1

FIGURE 18a ELECTRICITY PRODUCTION BY TYPE



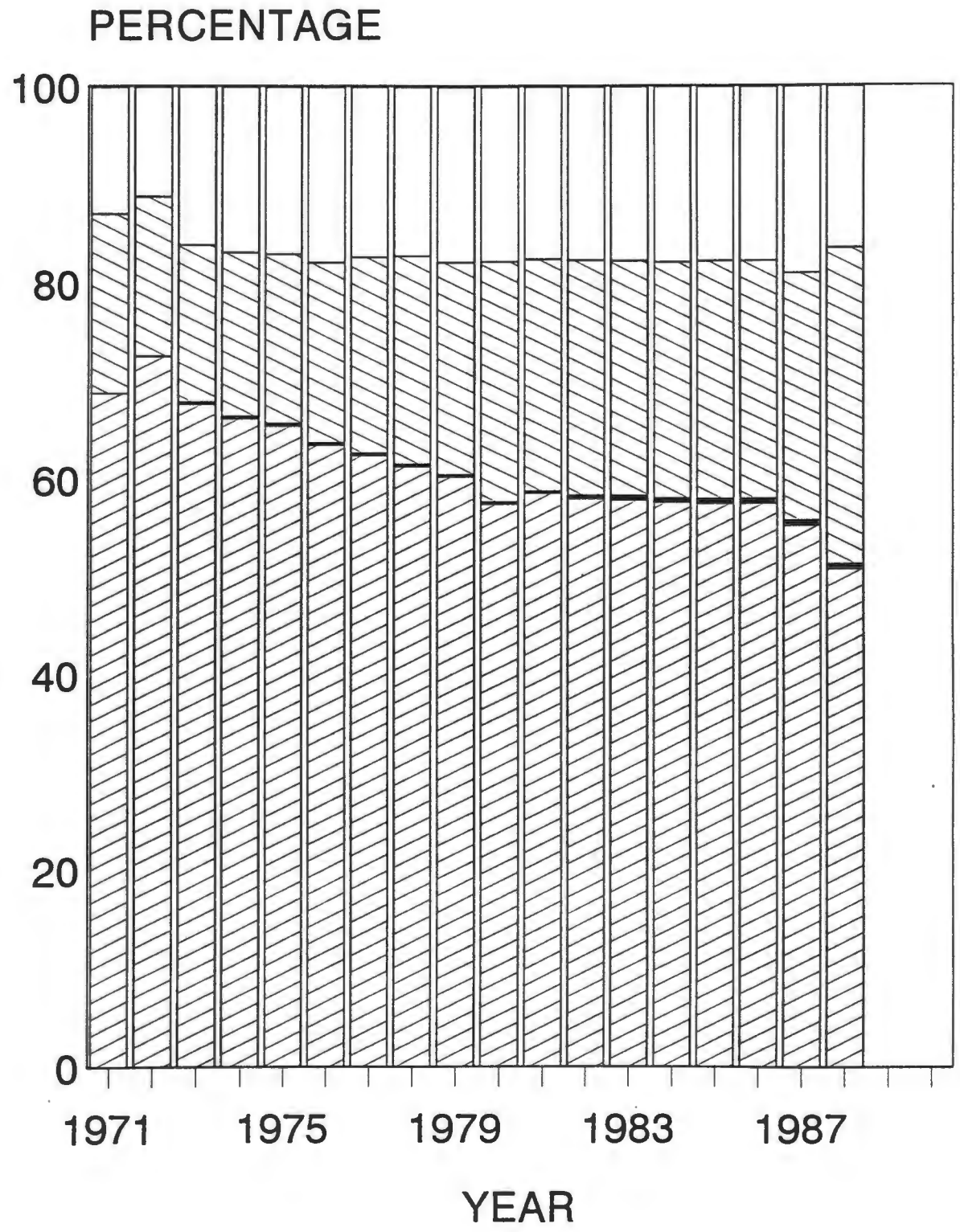
ETHIOPIA/ELECCA

FIGURE 18b ELECTRICITY TOTAL PRODUCTION AND CONSUMPTION



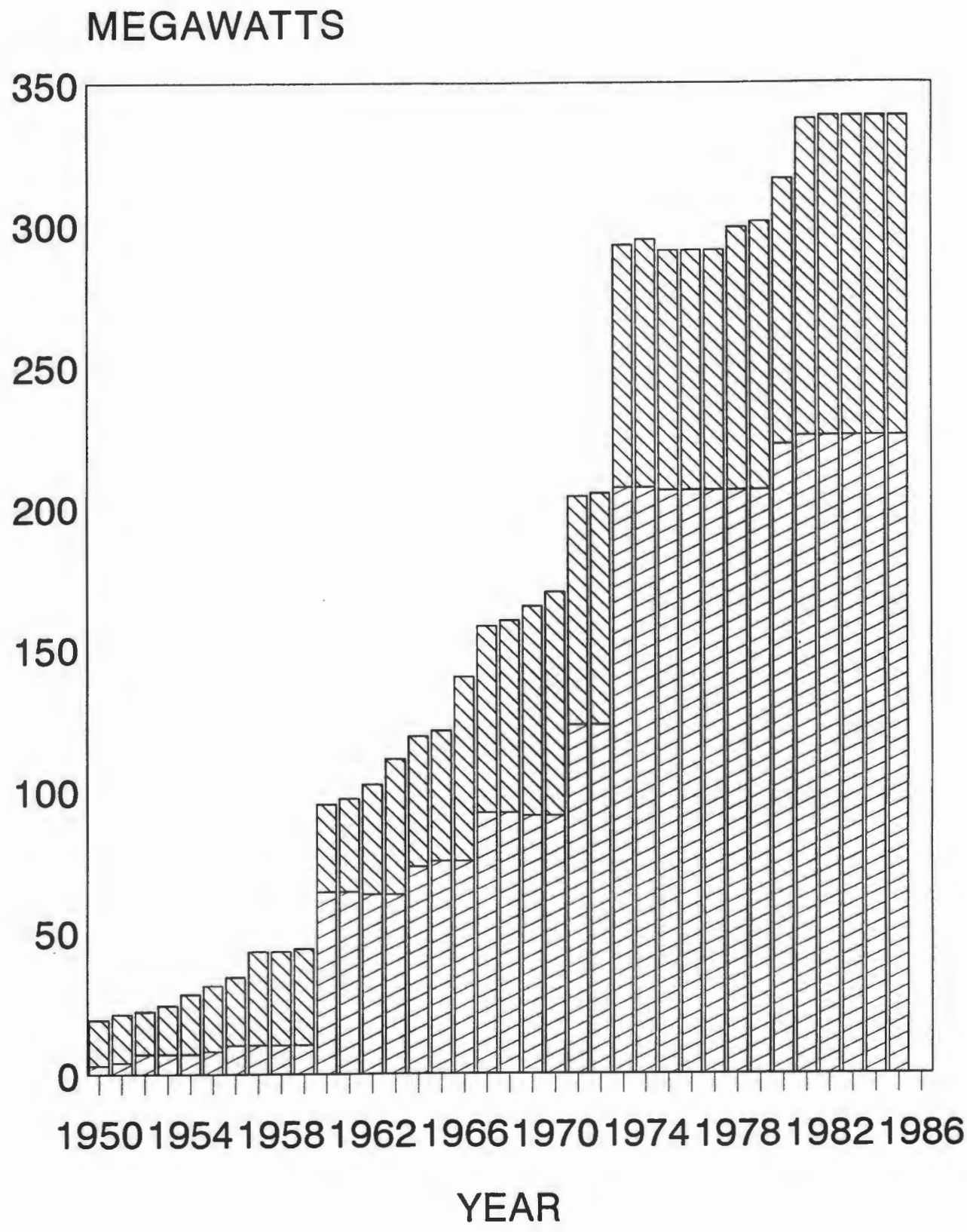
ETHIOPIA/ELECCA

FIGURE 19 TFC OF ELECTRICITY: SECTORIAL BREAKDOWN



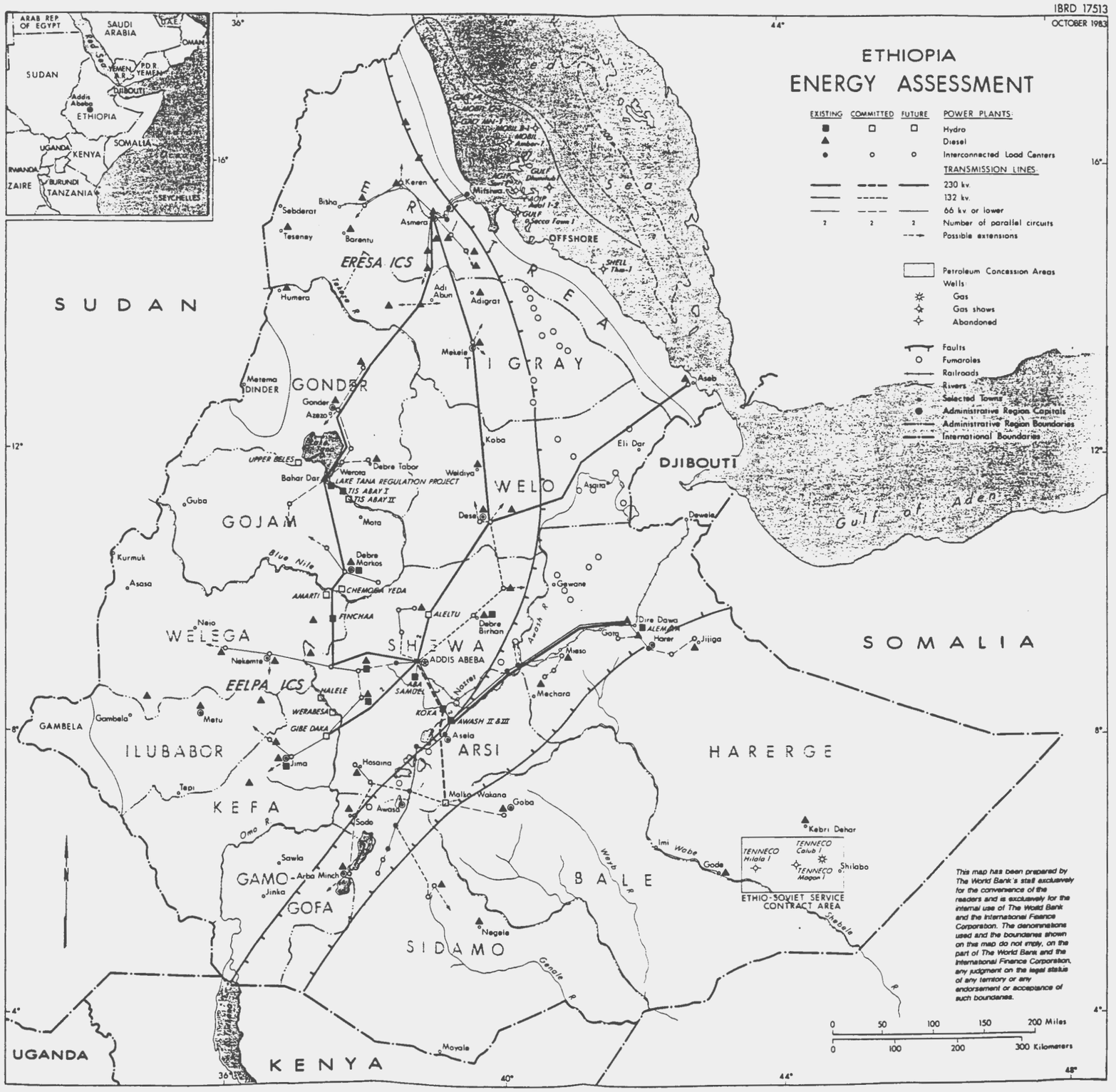
TFC - TOTAL FINAL CONSUMPTION
ETHIOPIA/SECTOR2

FIGURE 20 TOTAL INSTALLED CAPACITY



ETHIOPIA/ELEC1

MAP


IBRD 17513
OCTOBER 1983
ETHIOPIA
ENERGY ASSESSMENT
EXISTING COMMITTED FUTURE
POWER PLANTS:
Hydro
Diesel
Interconnected Load Centers
TRANSMISSION LINES:
230 kv.
132 kv.
66 kv or lower
Number of parallel circuits
Possible extensions
Petroleum Concession Areas
Wells:
Gas
Gas shows
Abandoned
Faults
Fumaroles
Railroads
Rivers
Selected Towns
Administrative Region Capitals
Administrative Region Boundaries
International Boundaries
SUDAN
ERITREA
TIGRAY
GONDER
GOJAM
WELLO
WELEGA
SHEWA
ILUBABOR
KEFA
GAMO-GOFA
SIDAMO
BALE
HARERGE
DJIBOUTI
SOMALIA
KENYA
UGANDA
GAMBELA
OFFSHORE
ERESA ICS
EELPA ICS
Red Sea
Gulf of Aden
Blue Nile
Omo R.
Awash R.
Wabe R.
Ganale R.
Shebele R.
LAKE TANA REGULATION PROJECT
TIS ABAY I
TIS ABAY II
CHEMOGA YEDA
FINCHAA
ALELTU
HALELE
WERABESA
GIBE DAKA
AWASH II & III
ADDIS ABEBA
ETHIO-SOVIET SERVICE CONTRACT AREA
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0 50 100 150 200 Miles
0 100 200 300 Kilometers

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