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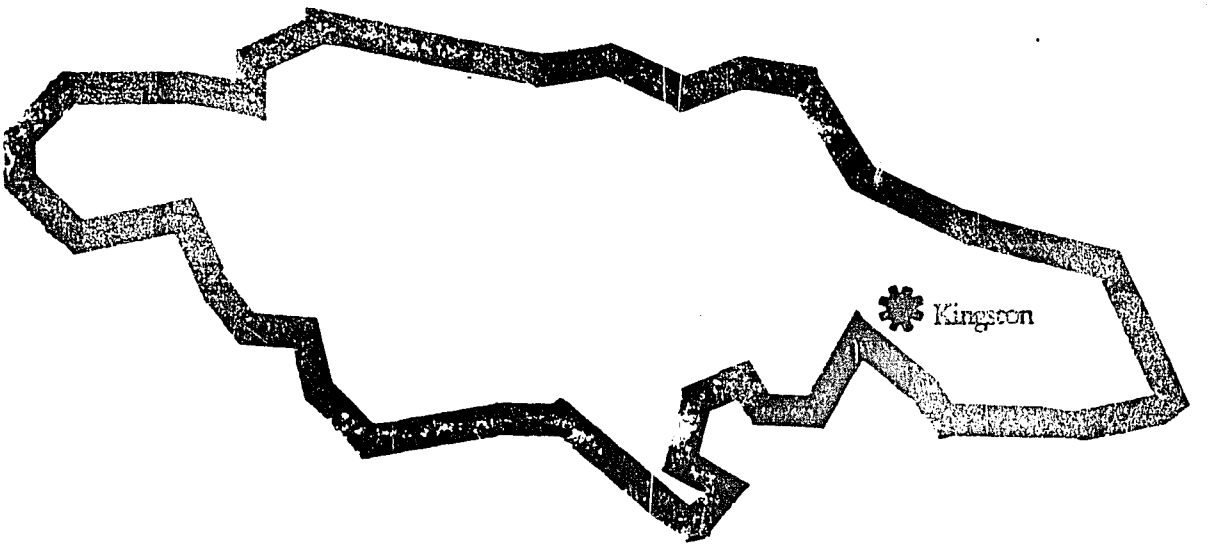
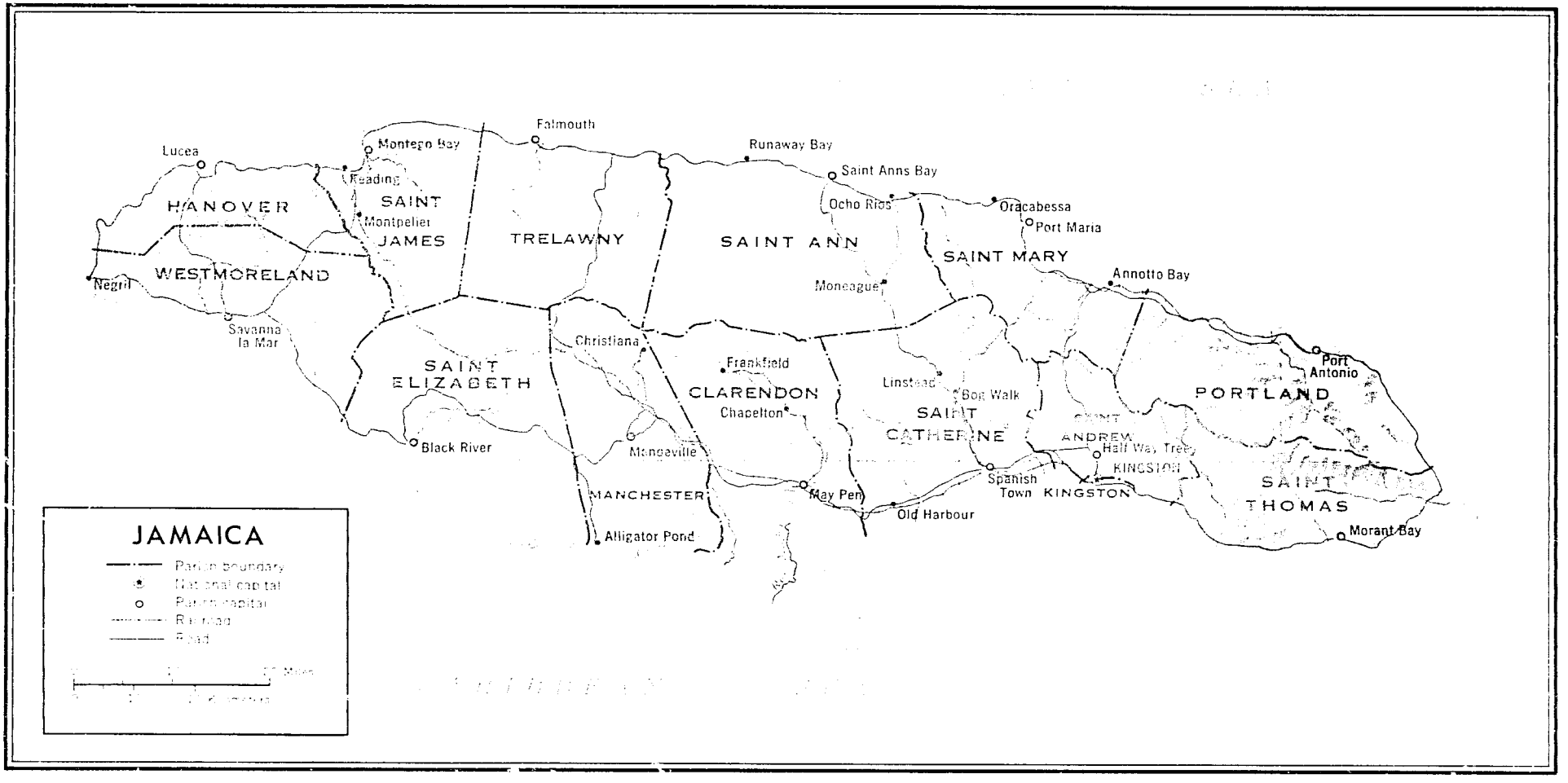
Jamaica

A Country Profile



Office of U.S. Foreign Disaster Assistance
Agency for International Development
Washington, D.C. 20523


JAMAICA
Parish boundary
National capital
Parish capital
Railroad
Road
Lucea
Montego Bay
Reading
Montpelier
Falmouth
Runaway Bay
Saint Anns Bay
Ocho Rios
Oracabessa
Port Maria
Annotto Bay
Moneague
Negril
Savanna la Mar
Christiana
Frankfield
Chapelton
Linstead
Bog Walk
Mandeville
Black River
May Pen
Old Harbour
Spanish Town
Half Way Tree
KINGSTON
Port Antonio
Morant Bay
Alligator Pond
HANOVER
WESTMORELAND
SAINT JAMES
TRELAWNY
SAINT ANN
SAINT MARY
SAINT ELIZABETH
CLARENDON
SAINT CATHERINE
SAINT ANDREW
PORTLAND
SAINT THOMAS
MANCHESTER

JAMAICA: A COUNTRY PROFILE

prepared for

The Office of U.S. Foreign Disaster Assistance
Agency for International Development
Department of State
Washington, D.C. 20523

Updated and Revised by: Holly Brooks
Original Research and Writing: Mary T. McGuire

Evaluation Technologies, Inc.
Arlington, Virginia
under contract AID/SOD/PDC-C-3345

The country profile of Jamaica is part of a series designed to provide baseline country data in support of the planning and relief operations of the Office of U.S. Foreign Disaster Assistance (OFDA). Content, scope, and sources have evolved over the course of the last several years and the relatively narrow focus is intentional.

We hope that the information provided will also be useful to others in the disaster assistance and development communities. Every effort is made to obtain current, reliable data; unfortunately it is not possible to issue updates as fast as changes would warrant.

We invite your comments and corrections. Address these and other queries to OFDA, A.I.D., as given above.

September 1986

ACKNOWLEDGEMENTS

Special thanks for their continuing and invaluable assistance in the preparation of this report are expressed to the staff of Jamaica's Office of Disaster Preparedness and Emergency Relief Coordination, specifically to Mr. Franklin McDonald, Lt. Cdr. John McFarlane, Cmdr. Richard Harvey, Mr. Keith Ford, and Ms. Suzanne Haik, and to Cpl. Willis Hill, Jamaica Defense Force. Other individuals throughout the Jamaican Government Service were also generous with their time and expertise. We hope that this publication will prove to be of assistance to them and others in the international disaster relief community.

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1. General Information

1.1 Geographic Codes

AID Standard	532
State Region	ARA
FIPS	JM

1.2 Time Zones

EST
GMT - 5

1.3 Host Country Mission

Embassy of Jamaica
1850 K Street, N.W.
Suite 355
Washington, D.C. 20006
Tel: 452-0660

For current information on the Jamaica Embassy staff in the United States, refer to U.S. Department of State, Diplomatic List.

1.4 U.S. Mission to Jamaica

Embassy of the United States
Mutual Life Building
2 Oxford Road, 3rd Floor
Kingston 5, Jamaica
Tel: 809-92-94850

U.S. Agency for International Development
6b Oxford Road
Kingston 5, Jamaica
Tel: 809-92-94850

For current information on the U.S. Embassy staff in Jamaica, consult the most recent edition of the Department of State, Key Officers of Foreign Service Posts.

1.5 Currency

$6.86 Jamaican = $1 U.S. (September 9, 1986)

1.6 Travel and Visa Information

Passport and visa not required of U.S. tourists in direct travel from U.S. territory, for stays of up to six months. Tourists must have proof of U.S. citizenship, however, and return ticket. Tourist card issued upon arrival; returned to immigration authorities on departure. A $4 airport exit tax must be paid on departure. Visa required for business or study, at no charge. To obtain a business visa, travellers must present a completed application form (available from the Jamaican Embassy) accompanied by one photograph and a letter from the traveller's organization stating the purpose of the trip.

1.7 Calendar and Holidays

New Year's Day	Jan. 1
Ash Wednesday	*
Good Friday	*
Easter Monday	*
National Labor Day	May 1
Independence Day	First Monday in August
National Heroes' Day	Third Monday in October
Christmas Day	December 25
Boxing Day	December 26

* variable dates

1.8 Treaties and Agreements

Agricultural Commodities
Aviation
Consuls
Defense
Economic and Technical Cooperation
Investment Guaranties
Peace Corps
Telecommunications
Trade and Commerce
Visas
Weather Stations

1.9 International Organization Memberships

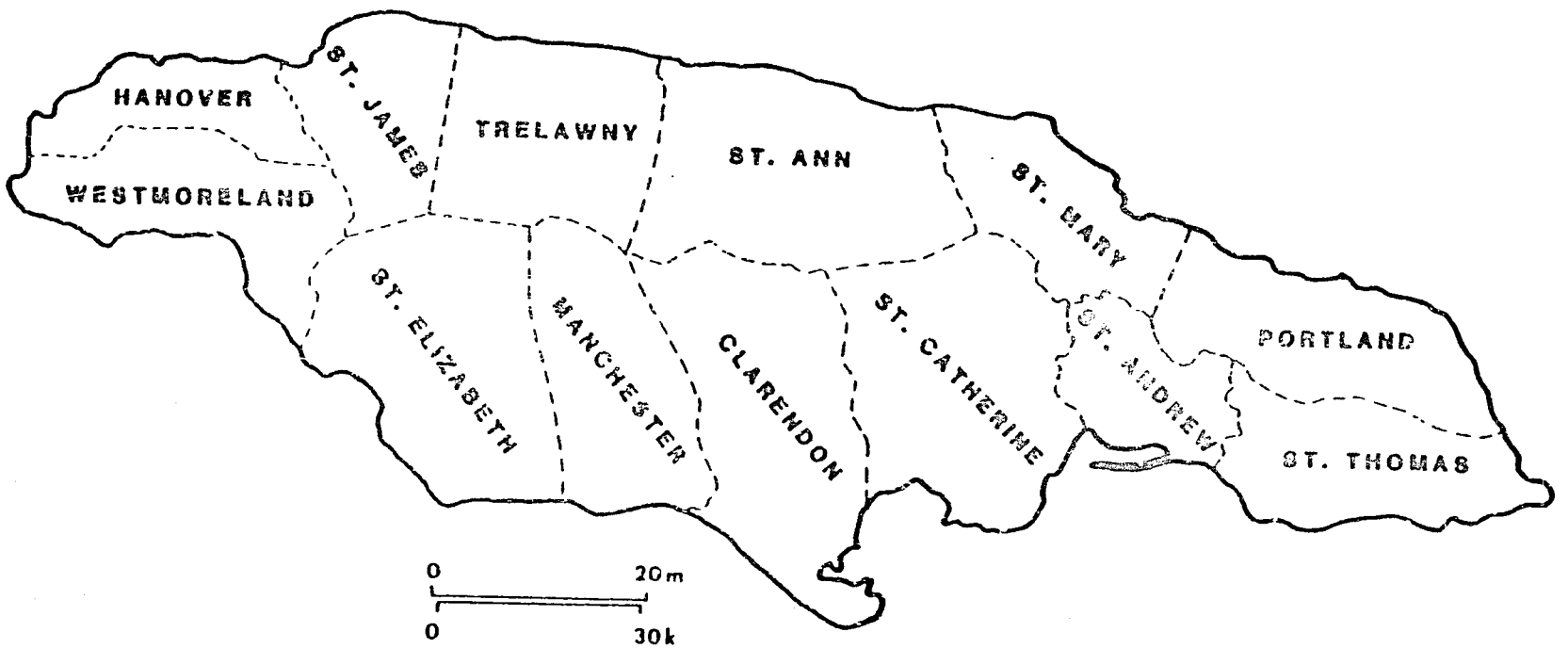
CARICOM, Caribbean Cane Farmers Association, FAO, G-77, GATT, International Bauxite Association, IBRD, ICAO, IDB, IFC, ICO, IMF, OAS, PAHO, SELA, UN, UNESCO, WHO, WMO.

1.10 Government

National: Jamaica became an independent state on August 6, 1962 and is a constitutional monarchy and member of the British Commonwealth. The titular sovereign (Queen) is represented on the island by a Governor-General who appoints the Prime Minister, and, on the latter's recommendation, the members of the Cabinet. The legislative branch consists of a 21-member appointed Senate, and a 60-member popularly elected Parliament.

Regional: Jamaica's three counties, Cornwall, Middlesex, and Surrey, are divided into 14 parishes. Kingston and St. Andrew are jointly administered by the Kingston and St. Andrew Corporation (KSAC). The other 12 Parishes are administered by Parish Councils. Parishes are further divided into 60 electoral constituencies which elect members of Parliament for five year terms.

Parish Boundaries



Source: Climate Impact Assessment for Agriculture and Tourism in Jamaica: A Final Report, 1985

Figure 1

Current Status: The Jamaica Labor Party, led by Prime Minister Edward Seaga, gained control of the Legislature in 1980, following eight years of People's National Party (PNP) control led by Michael Manley. Seaga was re-elected in 1983 in a general election boycotted by the PNP. Seaga is pursuing a national policy of economic conservatism and fiscal control, while actively soliciting and encouraging foreign investment.

In local elections held July 29, 1986, the PNP made impressive gains, winning 57% of the vote to the JLP's 43%. While Prime Minister Seaga is not required by law to hold general elections until 1989, with the weight of these recent results behind the PNP, opposition leader Michael Manley may press for parliamentary elections before then.

Rising violence has marked the Jamaican political scene. Although not politically motivated, the underlying social factors -- serious unemployment, corruption, drug trafficking, and the general problems of urban deprivation in Kingston -- have created a volatile situation, one susceptible to political exploitation.

1.11 Ethnic and Sociocultural Groups

Jamaica's national motto reflects the diversity of her population: "Out of many, one people." The majority of the population is black (76.3%); whites (3.2%), East and Afro-East Indians (3.4%), and Chinese comprise minority populations, all contributing to the country's ethnic, racial, and cultural pluralism.

1.12 Languages

English is the official language. Educated Jamaicans speak Jamaican English which resembles British English, but has an even stress and some idiomatic constructions. Jamaican Patois is spoken by the majority.

1.13 Religions

Many Christian churches are represented; the Protestant Church (mostly Anglican, Baptist, Seventh-Day Adventist) is the largest (70.7%). Revivalism and spiritualism of Afro-Christian cults have wide appeal, particularly among the poor. The Rastafarian Brethren which espouses black awareness and repatriation to Africa is significant. There are several Moslem and Hindu groups and a small Jewish community.

1.14 Geography

Jamaica lies between latitudes 17° 43' and 18° 32' N and longitudes 76° 11' and 78° 21'W, approximately 160 km west of Haiti and 145 km south of Cuba. Total land mass measures 11,300 sq. km. (234 km east to west and about 82 km north to south). Slightly over 1,000 km of irregular coastline feature numerous natural harbors and coves with stretches of white sandy beaches along the northern coast and black sandy beaches along the south.

Jamaica is mountainous. The main mountain range has an east to west trajectory along the center of the island and its highest peak, Blue Mountain, measures 2,256 m. The Santa Cruz and Don Figuereros are two small chains in the southwest, running north to south. Reaching an elevation of 955 m, the Don Figuereros is the higher of the two. Many rivers originate in the mountains. On the north coast these rivers flow south to north and on the south coast they run north to south. There are few plains on the island; the major plain spans the parishes of Clarendon and St. Catherine. A broad plateau is located in the central region. The island has two wetland areas, the major one near Black River in St. Elizabeth and the other on the west coast near Negril, in Hanover and Westmoreland parishes.

Climate:

Jamaica enjoys a subtropical climate moderated by north or northeast trade winds and land-sea breezes. Rainfall and temperatures vary with location and altitude. Average annual rainfall for the entire island is 195.8 cm, with the Blue

Mountains and northeast coast receiving the most rain - over 508 cm, while Kingston and the south coast plains receive less than 75 cm. Coastal temperatures are fairly uniform, averaging 27° C (25-26° C in January-February, and 28-29° C in July and August), but there is a one to two degree (C) drop in temperature per 300 m increase in elevation.

1.15 Population

Approximately one-third of Jamaica's estimated 2.2 million people live in the capital city, Kingston. The national population growth rate has decreased in recent years to 1.4 percent, however, high internal migration to urban centers continues to expand these populations. Other population concentrations are in Montego Bay, Spanish Town, May Pen, and Savanna-la-Mar, while rural populations are dispersed along the coasts and in upland areas.

Population by Parish, 1982

Parish	Total
ALL PARISHES	2,190,400
Kingston	104,000
St. Andrew	482,900
St. Thomas	80,400
Portland	73,700
St. Mary	106,000
St. Ann	137,800
Trelawny	69,500
St. James	136,000
Hanover	62,800
Westmoreland	120,600
St. Elizabeth	136,900
Manchester	144,000
Clarendon	203,100
St. Catherine	332,700

Source: Pocketbook of Statistics, Jamaica, 1984

Population By Parish Capital
1982

Parish and Parish Capital	Population Total
Kingston Metropolitan Area	524,638
St. Thomas - Morant Bay	8,823
Portland - Port Antonio	12,285
St. Mary - Port Maria	7,508
St. Ann - St. Ann's Bay	9,058
Trelawny - Falmouth	6,713
St. James - Montego Bay	70,265
Hanover - Lucea	5,652
Westmoreland - Savanna-la-Mar	14,912
St. Elizabeth - Black River	3,601
Manchester - Mandeville	34,502
Clarendon - May Pen	40,962
St. Catherine - Spanish Town	89,097

Source: Pocketbook of Statistics, Jamaica, 1984

1.16 Health

Vital Statistics:

Births/1,000 population (1984)		23.5
Deaths/1,000 population (1984)		5.4
Infant mortality/1,000 live births (1984)		16.8
Child death rate (ages 1-4)/1,000 (1984)		1.0
Life expectancy at birth (1981)	female	73.3 years
	male	69.2 years

Health Facilities: Most health services are supplied by the Ministry of Health and Environmental Control through 27 general public hospitals, and a number of specialized hospitals in Kingston. A small private health sector administers five private hospitals. 154 health centers and dispensaries provide out-patient and preventive services in Kingston-St. Andrew and in rural parishes. Approximately 2,000 community health aides provide basic health services in rural communities throughout the island. (See also section 3.6, Health Resources).

Diseases: Heart disease and other cardiovascular circulatory diseases have been the major cause of death (49%), followed by cancer (16%),

pneumonia (9%), enteritis and other diarrheal diseases (7%), and diabetes (6.3%). The incidence of communicable diseases has declined dramatically in recent years. However, diseases such as typhoid and leptospirosis maintain fair levels of endemicity and occasionally epidemics are experienced. Nutritional deficiencies, especially among children under five years of age, are cause for serious concern; the death rate attributed to malnutrition is 22.7/1,000 for the total population.

1.17 Agriculture

Approximately 25% of the total land area is cultivated arable land, 27% is forest and woodland, and 20% is pasture. Soil type and relative fertility vary considerably. Hill lands comprise about 70% of the total land area. The majority of these lands are composed of shallow, highly erodable soils; the result is considerable soil loss and accompanying problems.

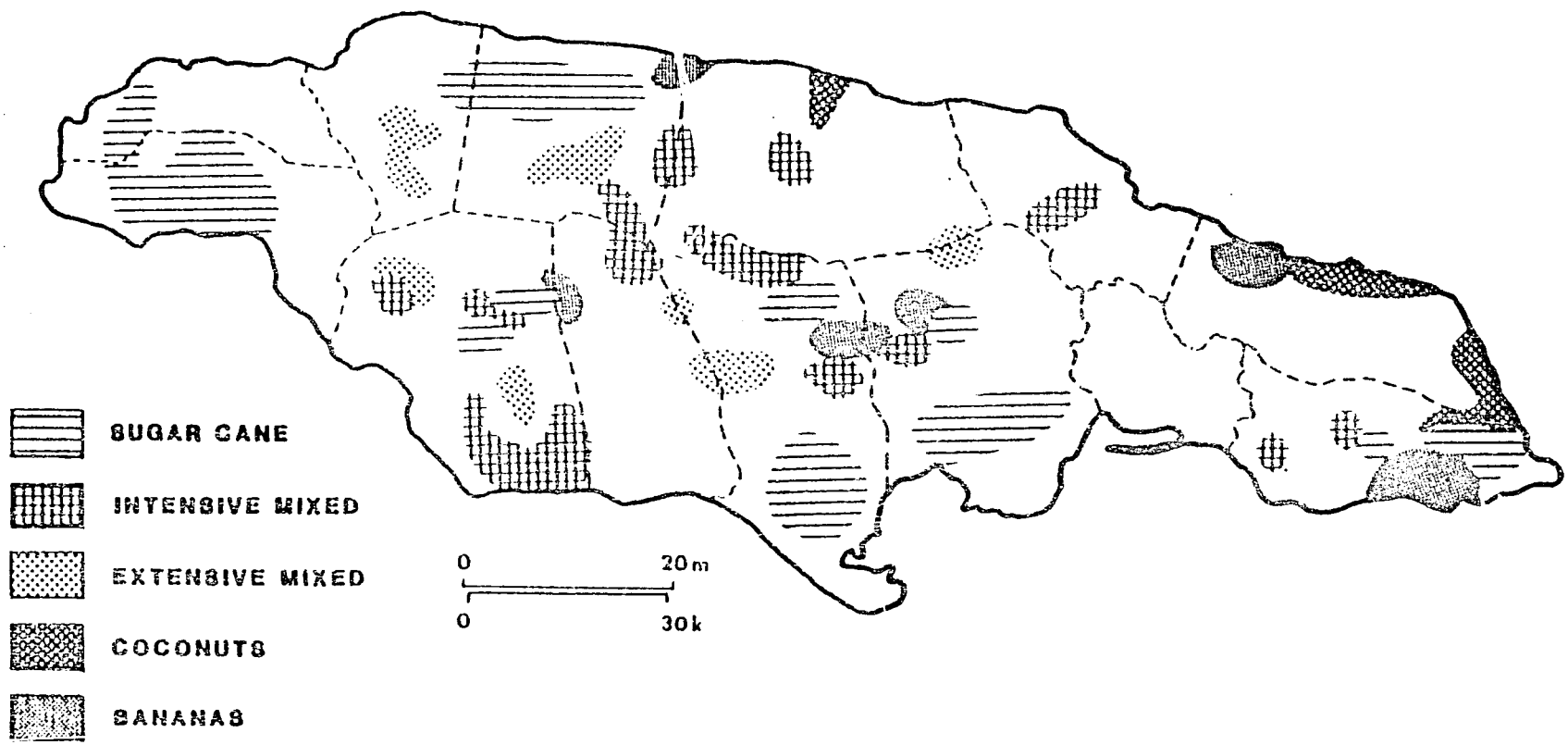
Staple foods are corn and rice, supplemented by cassava, potatoes, and yams. Major crops include sugar cane, bananas, cocoa, coffee, coconut, citrus, and tobacco. (See Appendix II for crop calendars.) For many years, sugar and bananas were the mainstay of the island's economy and their cultivation still provides an important source of employment.

The Jamaican agricultural system employs about 35% of the labor force and is structured in three-tiers:

1. Plantations - occupying the fertile plains and valleys and producing crops for export (e.g., sugar cane and bananas). Plantation systems rely on high levels of mechanization and generally practice monoculture.

2. Peasant Farmers - producing sugar cane for both export and the domestic market. These farmers are the source of 40% of Jamaica's sugar cane.

Major Crops and Areas of Cultivation



Source: Climate Impact Assessment for Agriculture and Tourism in Jamaica: A Final Report, 1985

Figure 2

3. Domestic Market Farmers - cultivating produce exclusively for the domestic market.

Both types of individual farmers generally practice monoculture on sharply inclined slopes and face the major problem of erosion. In addition, these farmers generally practice rainfed agriculture and are therefore vulnerable to weather variability. The level of technology used by small farmers varies considerably, but because most farm steep slopes where access to farm machinery is limited, farmers tend to use the traditional methods of manual preparation of the land, using forks and hoes. While the majority of farmers work on their own, some form cooperatives which regularly apply fertilizer and pesticides. Some farmers participate in GOJ-subsidized tractor pools.

1.18 Economy

Basic Indicators: GNP: $2.0 billion (1984), $890 per capita; real growth rate 1984, -1.0% est.

Overview: The 1970s began as a period of economic growth for Jamaica, but the island's economy faltered abruptly as a result of external shocks and the impact of internal policies. In 1980, the Seaga administration faced considerable economic problems. Mr. Seaga's government committed itself to reforming past economic policies and instituting changes designed to reverse the economic decline of the 1970s. The GOJ viewed the private sector as the main engine of growth. Through deregulation and the divestment of government-owned assets, the GOJ sought to reduce the role of the public sector. The GOJ introduced a market-oriented system and, in an effort to improve the investment climate, restored Jamaica's credit with the International Monetary Fund (IMF).

Sugar, bauxite, and tourism comprise Jamaica's economic base. Both sugar and bauxite are vulnerable to changes in the international market and tourism is sensitive to both seasonal fluctuations and news of political instability. The importance of tourism has grown enormously of late.

Owing to low market prices and poor crops, production of Jamaica's principal agricultural export, sugar, is on the decline. In 1978 Jamaica produced 290,000 MT of raw sugar; in 1982, 197,000 MT; and in 1984 production hit 190,000 MT. The industry's annual capacity is 400,000 MT. The GOJ has shut down all but two of the state-run mills in an attempt to restructure the industry and reduce inefficiency. The banana industry was ravaged by Hurricane Allen in 1980 and has yet to recover; yields continue to be low as a result of poor prices and high production costs. Jamaica formerly produced an average of 70,000 MT of bananas; in 1981 only 19,000 MT of bananas were harvested, and 1983 saw only a slight increase with 23,000 MT. Since 1980 the GOJ has stressed the need for crop diversification, calling for the improvement of farming techniques and the cultivation of under-used land, as a way of reducing Jamaica's growing demand for imported food.

Jamaica is one of the world's largest producers of bauxite and alumina. Previously, exports contributed 75% of total foreign exchange earnings. Recently, however, the slump in the international aluminum market has led to a reduced demand. Total bauxite production has fallen from 12.1 million tons in 1980 to an estimated 7.7 million tons in 1983. A small increase to 8.4 million tons was seen in 1984, but this is attributable to purchases made by both the USA and the USSR to replenish their respective strategic mineral stockpiles.

Tourism has been Jamaica's principal earner of foreign exchange, with gross earnings of $435 million in 1984.

The Jamaican economy's basic external orientation means that growth is heavily dependent on external factors, beyond the control of any government. The slide in the economy can recover through an increase in hard currency earnings, but this is dependent on improved trade resulting from an upswing in the demand for bauxite, a continued increase in tourism, and the increased production of sugar and bananas.

Exports: ($706 million, 1984) alumina, bauxite, raw sugar, bananas, citrus fruits and fruit products, rum, and cocoa

Imports: ($1.1 billion, 1984) fuels, machinery, transportation and electrical equipment, food, and fertilizer

Major Trading Partners:

Exports (1983)		Imports (1983)	
United States	33.4%	United States	39.1%
United Kingdom	20.0%	Venezuela	11.0%
Canada	12.2%	Netherlands Antilles	10.8%
Trinidad and Tobago	9.3%	United Kingdom	6.7%
		Mexico	4.9%

1.19 Communications

Radio Network: The government-owned Jamaica Broadcasting Corporation broadcasts from Kingston, Montego Bay, Mandeville, and Port Maria, Sunday through Saturday from 4:45 a.m. to 12:00 midnight. Radio Jamaica Ltd. operates an island-wide commercial and public-service station 24-hours a day, seven days a week. At least three quarters of the island's population listens to the radio daily. Radio West, Radio Northeast, and Radio Central are community radio stations, also operated by the Jamaica Broadcasting Corp.

Television: Jamaica Broadcasting Corporation broadcasts from nine transmitters operating 67.5 hr./wk. In 1984, Jamaica had 200,500 television sets (1 per 12 persons).

Telecommunications: Telephone service throughout the island is operated by automatic exchange by the Jamaica Telephone Company. Domestic and international telegraph and telex services are also available. (See also section 3.5, Communications.)

1.20 Transportation

Roads: The main road network (all paved, over 4,700 km) parallels the coast and crosses the island via three main north-south roads, Kingston to Annotto Bay, via Stony Hill; Kingston-Spanish Town to St. Ann's Bay, via Mount Diablo; and Savanna-la-Mar to Montego Bay, via Mackfield. Secondary (totalling 11,688 km) and tertiary roads fan out from the principal roads to connect more than 1,150 villages and towns.

Ports: Kingston is the principal of Jamaica's 15 ports, with equipment and facilities to handle all types of cargo and vessels. Kingston handles the bulk of imports and is the seventh largest transshipment port in the world. Montego Bay and Montego Freeport are also increasingly important ports. Most of the remaining ports are designed to handle specialized cargoes, such as bauxite and aluminum and agricultural exports. (For details on accommodations and facilities of Jamaica's ports, see Lloyds of London's Ports of the World.)

Shipping: The Jamaica Merchant Marine is Jamaica's national shipping line; it is 75% government-owned and includes charter vessels and one vessel owned jointly with private interests. Jamaica also participates in Naviera Multinacional del Caribe (NAMUCAR), a shipping company set up by seven Caribbean countries, and the West Indies Shipping Company, an inter-regional company owned and operated by CARICOM member governments.

Rail: Jamaica Railway Corporation operates two railway lines connecting Kingston with Montego Bay and Port Antonio to Spanish Town. These lines total 294 km and are

standard-gauge. Total rolling stock included 31 locomotives, 34 passenger vehicles, and an unspecified number of freight vehicles in 1978. The bauxite companies own several short lines which operate between their plants and the ports. Bauxite, aluminum and related processing materials make up 99% of the freight traffic.

Airports: Jamaica has two international airports, Norman Manley at Kingston, and Donald Sangster at Montego Bay, four airfields for domestic traffic, and about thirty privately owned airstrips (principally used by sugar and bauxite company personnel). (See section 3.7, Airports, for characteristics of some of these airstrips.)

Airlines: Air Jamaica, the government-owned international airline, provides air service between Jamaica and New York, Miami, Chicago, Toronto, and the Bahamas, while Trans-Jamaican Airlines, also government-owned, provides internal air service between Montego Bay, Kingston, Mandeville, Ocho Rios, and Port Antonio.

Foreign airlines serving Jamaica include Aeroflot, Air Canada, American Airlines, British Airways, British West Indies Airways, Cayman Airways, Cubana, Eastern Airlines, Lufthansa, KLM, Pan Am, and TACA (El Salvador).

2. Disaster Vulnerability

2.1 Overview of Physical Environment

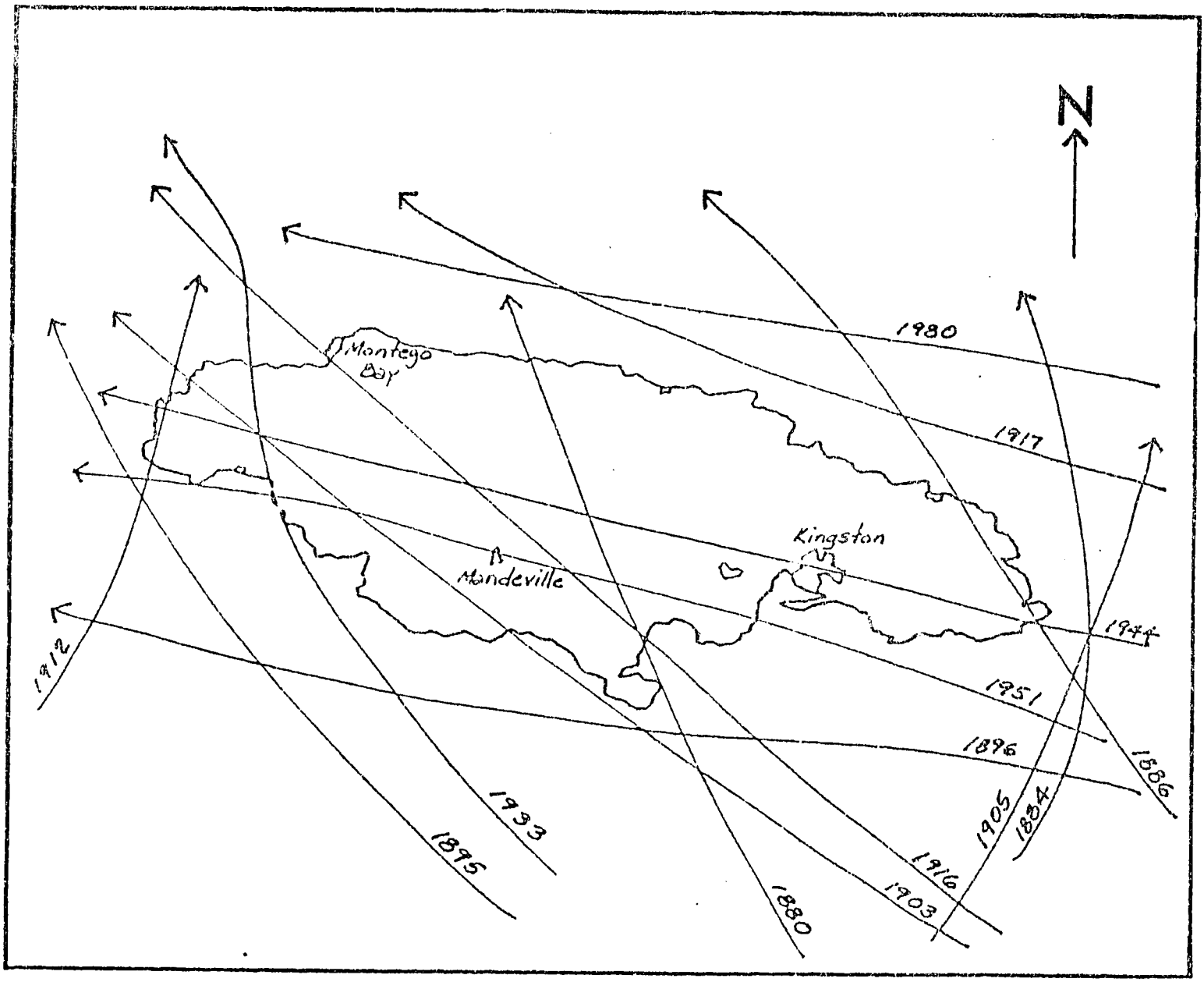
Jamaica, the third largest island in the Caribbean, measures approximately 234 km east to west and 82 km north to south. It is divided naturally into three regions consisting of flat coastal plains, especially broad in the southwest and southeast, rugged, steep-sided mountains, and interior valleys and plateaus. The mountain ranges run northwest to southeast with long spurs extending to the coastal plains, while more than two-thirds of the country's land area is made up of limestone hills and plateaus in the central and western interior. The coastal plains measure less than three km wide along most of the north and parts of the south coast, but expand into broad embayments and agricultural plains in the south, southwest, and eastern zones. The coastal lowlands and interior valleys are the sites of major agricultural activity. They are also highly flood-prone.

Most weather patterns move over Jamaica from a northeasterly direction, depositing heavy rains in the north and east. The major northwest-southeast mountain ranges prevent the rains from travelling on to the south coast, and, as a result, the densely populated area in the south can suffer periods of extended drought. When heavy precipitation actually reaches the area, flooding sometimes results.

Elevation varies from sea level in the coastal marsh areas in the southwest to 2,260 m in the Blue Mountain range in the east. Massive run-off from the higher elevations contributes to flooding problems along the coasts. In areas such as Kingston, which is built on unconsolidated alluvial soil, the infusion of mountain run-off overloads the absorptive capacity of the soil, further exacerbating flood conditions. Approximately one third of the country's 2.2 million people live in the Kingston-St. Andrews Corporate area. Pressure for housing has led to extensive settlement in marginal areas and development of reclaimed landfill areas - all prone to flooding.

The largest of the island's many rivers is the Black River in St. Elizabeth. From its mouth at the southern coast it is navigable for approximately 40 km and formerly served as a principal transportation route for area farmers and fishermen. Black River winds southward from the central mountains a total of 70 km, although it flows underground in the limestone hills for part of this distance. Other major rivers include the Yallahs River in St. Thomas, the Rio Grande and Swift rivers in Portland, Rio Minho in Clarendon, Martha Brae in Trelawny, and the Great River in St. James. Most of the rivers rise in the mountains and flow either north or south to the sea. The flow of most rivers is irregular, appearing and disappearing as they travel through the limestone hills to the coast.

Figure 3 Hurricane Tracks 1880-1980



Source: NOAA, 1977

INTERTECT — Dallas, Texas

Jamaica's coastal areas are varied and offer large potential for development of fish and tourist industries. Mangrove stands in the west and southwest, and coral reefs in the west and along the north coast provide natural buffers to the sea.

2.2 Hazard Analysis

Hurricanes

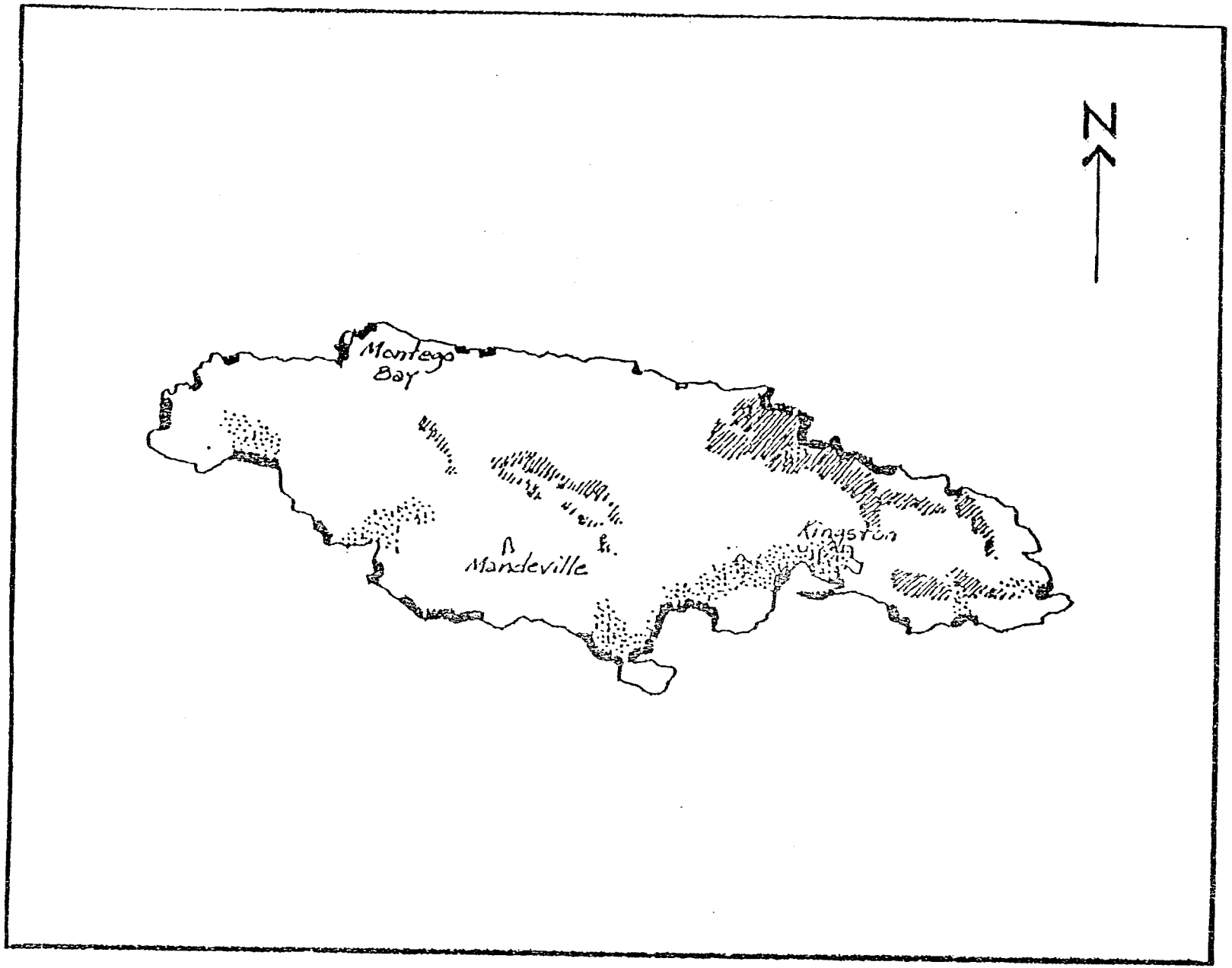
Jamaica is situated in one of the most active hurricane regions in the world. The hurricane season runs from June through November, but most storms form in August, September, and October. Since 1880 at least 14 major hurricanes have hit the island, and numerous tropical storms have also caused damage. Hurricanes affecting Jamaica are usually of Atlantic or eastern Caribbean origin and traverse the island while moving in a westerly direction. A notable exception is the Great Hurricane of 1780 which slammed into the south coast while moving in a north-easterly direction.

The damage caused by hurricanes and tropical storms is most severe in the housing and agriculture sectors. High winds in excess of 118 kph (74 mph) tear roofs from homes, buildings from their foundations, and agricultural crops from the ground. The accompanying rains can cause widespread flooding, washing out roads, bridges, and communication lines, and carrying away survivors' homes and household possessions. The excess water saturates the soil creating landslides and mudslides. In coastal areas, the high winds generate huge tidal waves which can reach far onto the shore, beating down and carrying away everything in their paths.

Some of the destruction associated with hurricanes is a result of poor siting and weak construction. Development in areas in the historical path of major hurricanes requires that special measures be taken to protect structures and crops from hurricanes' effects. In the Kingston Harbour area, construction of residential and commercial buildings extends to the edge of the sea. Maps delineating the reach of a typical 10 or 25 foot tidal wave clearly show that the areas which will be inundated and damaged include major new developments in downtown Kingston. A storm surge or tidal wave of such destructive potential could hit the Jamaican coast even if the accompanying hurricane did not.

Some natural features may help to offset the destructive potential of hurricane-generated flooding. Coastal barrier reefs shelter parts of the coast by providing a buffer to break the force of tidal waves. However, recent and proposed development projects threaten to reduce the effectiveness of these natural mitigators.

Hurricane Hazards in Jamaica



Storm Surge Hazard
Flood Hazard
Mudslide Hazard

Source: ODIPERC, 1981
Intertect - Dallas, Texas, 1981

Figure 4

Floods

Most of the island is prone to flooding, however, this is most severe in the plains and low-lying areas in the east, the south coast, and the capital. The extensive marshlands in the west in Westmoreland and St. Elizabeth, the agricultural plains in Clarendon, and the eastern perimeter of Portland and St. Thomas are all low-lying flood-prone areas. Because they are also the sites of some of the best farm land, much agricultural activity is centered in these regions, including sugar cane, rice, coconut, banana, and pineapple cultivation.

The densely populated Kingston-St. Andrew Corporate (KSAC) area is highly flood-prone. Surface run-off is the principal problem as drainage gullies and sewer systems are inadequate to handle the volume of water generated during a serious deluge. The run-off from the surrounding mountain ranges rushes down to the low-lying city and is dispersed over land throughout the city.

In some areas of the city, the problem of flooding is particularly acute primarily as a result of poor construction and inadequate design specifications implemented during construction. Several housing developments constructed on marginal low-lying or land-filled areas expose large concentrations of people to a high degree of vulnerability from flooding.

Low-lying areas of Westmoreland, St. Elizabeth, and Hanover in the west have been subject to extensive flooding as well. In 1979, some of the worst flooding in memory necessitated the evacuation of the entire town of New Market. The area was under water for more than six months and, as a result, the population's agricultural crops, livestock, and household possessions were either extensively damaged or completely lost. New Market is now being rebuilt on higher ground. The same June 1979 floods washed out roads, eroded bridges, and forced the evacuation by boat and makeshift rafts of isolated populations throughout the Savanna-la-Mar coastal area. (See June 1979 Western Floods Case Report, at OFDA, Washington, DC.)

Fire

The threat of fire is most serious in the southern and western regions of the country where periodic droughts create an ideal environment for fire. During drought conditions, low water pressure throughout the municipal KSAC water system increases the risk of fire and drastically reduces the Fire Brigade's ability to respond effectively. In the southwestern area, including the Black River and Savanna-la-Mar environs, spontaneous fires erupt on the marshlands. Wildfires may also occur in the forests. Such fires are difficult to reach and are usually left to burn themselves out.

Erosion

Coastal dredging, deforestation, and poor farming practices contribute to the growing problem of erosion in Jamaica. A recent FAO study projected that Jamaica will look like Haiti within twenty years if present land use practices are continued. Dredging of the coastal areas to expand and enhance tourist areas has contributed to the erosion of the coast and alteration of the currents. Gradual urban encroachment on the mangrove forests is reducing the size of these areas to the detriment of the dependent marine life, but also to the breakwind function these forests serve.

Environmental Hazards

Oil Spills - The large volume of petroleum products shipped through the Caribbean is a constant threat to fishing and beach resources.

Red Mud Waste - Each year tons of red mud slurry, the waste product of alumina processing, are generated; for each ton of bauxite refined into alumina, one ton of red mud waste is generated. The caustic slurry, composed of aluminum and sodium compounds with some iron impurities, is stored in abandoned mine pits or natural hollows measuring five to 100 acres, until recently there were almost no precautions against infiltration. Infiltration and contamination of the nearby aquifers has endangered the water available for domestic and agricultural applications in some areas.

Increasing concern has been expressed at the use of hazardous materials in industry and agriculture. Pesticide related poisoning has been on the increase and is being closely monitored.

Seismicity

Jamaica is located on the northern perimeter of the tectonically active Caribbean plate, and borders the Cayman trough, a major fault zone. The release of pent-up energy results in tremors frequently registering six and upwards on the Richter scale. Jamaica has experienced serious earthquakes in the past, most notably the 1692 and 1907 events in which over 3,000 people perished.

Faulting occurs primarily in two major directions. Along the north coast a complex zone of east-west faulting occurs. This zone spans the area from the coastal land surface to the depths of the Cayman trough. The second group of faults tend to run north-northwest/south-southeast dividing the island into blocks.

Kingston, an area of high population density, and the site of major economic activities, is built on alluvium. This is cause for concern because unconsolidated matter often amplifies seismic waves thereby intensifying the effects of an earthquake. Earthquakes can also trigger massive submarine landslides and tsunamis. The 1692 earthquake which submerged nine-tenths of the city of Port Royal typifies this danger.

Water

The Kingston metropolitan water catchment area experienced dry conditions between 1981-84. This necessitated water shutoffs in major areas of Kingston to conserve water and the construction of a new pipeline to convey water from Yallahs River to Kingston. This scheme was commissioned early in 1986 and increases the supply by 15 mgd per day.

2.3 Disaster History

Jamaica has a history of disasters caused by hurricanes, earthquakes, and floods. Hurricanes, the most recurrent disaster type, cause extensive and repeated damage to the agricultural sector. The following lists only some of the most devastating disasters which have occurred since 1692 (when an earthquake caused part of Port Royal, then the major port, to slip into the sea).

Selected Major Disasters

Date	Disaster Type	Location	Number Killed	Number Affected	Damage ($000)
1692	Earthquake & Tsunami	Islandwide St. Ann's Bay	2,000	n.a.	n.a.
1722	Hurricane & Tidal Surge	Port Royal, Queenstown	400	n.a.	n.a.
1780	Hurricane & Sea Wave	Savanna-la-Mar & West Coast	300	n.a.	n.a.
1850	Cholera Epidemic	Urban areas	32,000	n.a.	n.a.
01/14/07	Earthquake	Kingston & Port Maria	1,200	90,000	n.a.
11/18/12	Hurricane Tidal wave	Western Parishes Savanna-la-Mar Montego Bay	142	n.a.	n.a.
1933	Floods	Kingston-St. Andrew	53	n.a.	n.a.
10/29/33	Hurricane	Western parishes	10	n.a.	n.a.
11/23/37	Floods	Northern areas	111	n.a.	n.a.

Date	Disaster Type	Location	Number Killed	Number Affected	Damage ($000)
11/18/40	Floods	St. Mary, Portland, & St. Thomas	125	n.a.	n.a.
08/20/44	Hurricane	Northern parishes	32	n.a.	n.a.
1951	Hurricane	South coast	154	20,000	$56,000
1957	Earthquake	St. James & Western parishes	3	n.a.	n.a.
1968	Drought	Nationwide	n.a.	100,000	$500
10/17/73	Tropical Storm	Kingston & entire island	6	2,500	$1,700
1976	Civil Strife	Kingston	n.a.	60,000	n.a.
1977	Dengue Fever	Widespread	n.a.	n.a.	n.a.
04/25/79	Floods	Western areas	4	40,000	n.a.
06/00/79	Floods	Widespread	40	160,000	n.a.
08/05/80	Hurricane	North coast	6	30,000	$64,000
05/20/80	Fire/Accident	Kingston	187	n.a.	n.a.
01/00/81	Fire	Esso Plant, Montego Bay	n.a.	n.a.	$14,000
05/25/86	Floods	Entire island	49	40,000	$25,500

Source: Office of Disaster Preparedness and Emergency Relief Coordination, and Office of U.S. Foreign Disaster Assistance Disaster History.

2.4 Vulnerability of Infrastructure

Principal Highways, Airports, Ports

The road network is extensive, however, the principal roads connecting the north and south coasts are limited to narrow two-lane highways, with little or no shoulders. The two principal north-south routes cross through the mountains carrying all the commercial traffic between Kingston and the northern population centers of Ocho Rios, Port Antonio, and Montego Bay. Twisting along an interior fault line, the

roads wind their way through small towns to the coast. The potential for traffic accidents including those involving tanker trucks carrying volatile materials is great. Similarly, the ability of fire and other emergency vehicles to reach the scene of an accident is hindered by the congestion and limited passing area.

The main roads are overall well-maintained, being asphalt-surfaced the entire perimeter and on the three north-south routes. Secondary roads are all asphalt-surfaced. Tertiary and parochial roads are surfaced around the larger towns, but are primarily marl (a local stone) in other areas. During the dry season most roads are quite passable. However, rain can cause large potholes to form on the unpaved interior roads. During very heavy rains, some hard-surfaced roads may become dangerous as they may be blocked by landslides or flood waters.

The road along the north coast is built close to the sea at many points and may therefore be vulnerable to flooding and tidal surges. The southern coast road from Kingston to Negril runs through the agricultural plain until it returns to the coast at Black River. From Black River to Negril the road parallels the coast; it was this area that experienced substantial damage in June of 1979 by flood waters. Several parts of the road were completely washed away and the force of the water carried away the foundations of several small bridges. The roads here have been repaired and some of the worst hit were elevated and rerouted several feet inland.

The road system is maintained by the Public Works Department (PWD) through an island-wide system of Works Offices and a decentralized system for emergency action. The PWD operates a VHF radio for ensuring effective road clearing operations.

Airports

Jamaica's two principal airports are Norman Manley International in Kingston and Sir Donald Sangster in Montego Bay. Numerous smaller and private airstrips serve specialized communities (e.g., bauxite company personnel). The Kingston Airport is situated on a narrow peninsula that parallels the shore to form one of the best natural harbors in the world. However, because the strip of land is so narrow, the road to the airport is at sea level its entire length, making it vulnerable to flooding and possible liquefaction.

Airport accidents are a concern. Both airports maintain their own fire brigade, with some specialized equipment and can call on the municipal fire services for support.

Hospitals

Hospitals and health centers serve vital functions at all times, but especially during disaster relief operations. (See section 3.6, Health Resources, Medical Facilities, for a list of hospitals and health centers.) A serious problem facing the hospitals throughout the island is that of electricity supply. Very few hospitals have the standby generators required to enable them to operate when the electricity fails. Power outages of short duration are not uncommon during non-emergency periods. Heavy rains or high winds may knock out power and communications lines, most of which are above ground. The hospitals are equipped with VHF radios to address the communication problem and support Emergency Medical Service activities. The ODP, Fire Service, and other emergency agencies can access the hospital radio system in emergency situations.

Communications

The communications network is highly vulnerable to almost any kind of natural disaster in Jamaica. Most telephone lines are laid above ground thus exposing the system to disruption from hurricane winds, rains, and earthquakes. Because the telephone system would almost surely be inoperable following a major storm or other disaster, other communication systems would be required.

The VHF systems operated by government and the private sector are effective and reliable as long as the strategic repeater stations remain in operation. During Hurricane Allen in 1980 four repeaters were put out of commission in the eastern third of the island by the high winds. As a result, stricken communities were isolated. CB radios have limited applicability for maintaining nationwide communications because of their very short range, especially in poor weather conditions; however, there are enough CB radios in operation at short distances from each other to serve as a valuable communications link within a disaster-stricken parish.

In the event of disaster, it is the commercial radio network which is relied upon to broadcast early warnings, hurricane alerts and watches, and to communicate all guidelines and messages from the central relief coordinators. The commercial stations are also dependent upon repeater stations and so are vulnerable to disruption.

Utilities

Electricity, gas, water, sewerage systems - all will be locally affected by a serious emergency. In heavy downpours, electricity lines are among the first to be disrupted. Overloading of existing drainage gullies (sometimes additionally burdened by accumulated trash), combined with substandard drainage systems in many concentrated urban areas, can lead to serious flooding in some areas after a moderate to heavy rain. In some instances, flooding can cause sewerage systems to back up producing a potential health hazard. Another result is intrusion or contamination

of the potable water system by sewage. Since mid-1985, a program of clearing all blocked drains has been underway and has led to a reduction of this risk. During the heavy rains of late May and early June 1986, more serious flooding was averted due to the timely clearing of the main gully courses in Kingston.

Water systems vary throughout the island. The Kingston-St. Andrews Corporate area is served by a series of five discrete reservoir systems, interconnected by narrow couplings at a few points. During the periodic droughts to which Kingston is prone, the water authorities have introduced rationing schemes or "lock-outs," rotating periods during which water is cut off to certain parts of the system for a few hours at a time. As administered, there is no regularity to the scheduling or duration of the lock-outs. However, once water is reintroduced to the locked-out area, the accumulated pressure within the system produces burst pipes in many parts of the city. In addition, the variations in water pressure expose the entire municipal system to possible intrusion of contaminants.

In the western third of the island following the June 1979 floods, health officials were fearful that the major disruption of the sewerage and water systems would result in a large-scale health problem with possible epidemic levels of typhoid. However, despite the severity of the flooding, no health problems related to water contamination developed, principally because the force of the rains carried the sewage straight out to sea in most areas. In New Market, however, the entire population was forced to evacuate when the flood waters failed to recede, even as much as six months after the storm.

Housing

The majority of Jamaicans live in non-engineered buildings, i.e., buildings constructed by the owners or by local building tradesmen without extensive architectural or engineering input and without using disaster-resistant construction techniques. In 1981 almost 70% of the 380,000 people in Kingston and 90% of the 1.5 million Jamaicans in rural areas lived in non-engineered structures.

Contemporary non-engineered housing has three classifications: 1) rural, 2) urban yard, and 3) urban single-family housing. Housing types and construction methods are similar, yet distinct characteristics exist and are important to note. A selection of these follow.

Rural Housing

1. The majority of rural housing is single-family.

2. The majority of people still using traditional construction methods, as well as the majority of older traditional buildings, are found in rural areas.

3. Wood is still the primary structural component used in new housing. Nog and wood frame houses still account for a substantial amount of new construction in rural areas, although these methods are rapidly being replaced by reinforced concrete block construction (known locally as "block and steel").

4. The most popular roofing material in the rural areas is zinc sheeting.

5. The size of new rural houses is usually very small. This is due in part to lack of resources, the cost of land, and uncertainty concerning land tenure.

6. In rural areas, the owner-contractor relationship is still strong. The skills of the contractors, however, are not as good as those of urban contractors.

Urban Construction

1. Almost all new construction is of block and steel.

2. The majority of non-engineered buildings are occupied by more than one family.

3. Houses in the urban areas tend to be slightly larger than their rural counterparts, especially the older buildings.

4. The majority of people residing in non-engineered housing are renters. Repairs, maintenance, and upgrading will therefore be more difficult.

5. The most prevalent style of older buildings is that of the post-earthquake Kingston period. The majority of buildings in the older parts of the city are made of brick nog. The newer houses have no distinct style and are expanded and adapted to whatever land is available.

6. Almost all new construction in urban areas is on the periphery of the cities. Few new houses are erected in the older sections (although additions are made to older buildings).

In Kingston, many of the urban poor live in two distinct patterns of settlement: urban tenement "yards" and squatter settlements.

Yards

Urban tenement yards make up a large portion of the slum housing in the urban sector. There are two types of tenement yards: tenant yards owned by individual, usually absentee, landlords, and government yards where the government is landlord. The older tenement areas are usually

located in the central city. These areas are physically deteriorated, overcrowded, and lack community facilities, although water and electricity are usually available. The areas are characterized by a large number of families living in an enclosed yard in close proximity and sharing basic services such as standpipe, kitchen, and toilet facilities. Almost all yard dwellers are renters.

There are no standard features of yard buildings. Rarely more than semi-permanent, the majority of structures are poorly built. Construction materials are usually salvaged or available at little or no cost from construction sites.

The proximity of buildings may provide some degree of protection from high winds in a hurricane, but the flimsy construction will precipitate widespread losses. In an earthquake a high percentage of failure in yard buildings is likely, even in those made of cement block because little reinforcement was used in their construction. Lightweight buildings of wood or zinc sheets are unlikely to cause major injuries.

Squatter Settlements

Squatter settlements surround all the major cities in Jamaica. Settlements tend to be less dense than yards, with one family per house and one house per site. Facilities and infrastructure are not communal (except for standpipes). Buildings usually are upgraded to more permanent housing; block and steel are used most often in those structures which evolve into permanence.

Settlement structures are highly vulnerable to both earthquakes and hurricanes; this is due to the poor quality of construction. Even block and steel structures are susceptible to damage.

Hurricane and Earthquake Risk

Hurricanes threaten housing in four basic ways:

1. Damage or collapse resulting from the force of high winds.

2. Inundation caused by high levels of rainfall accompanying the storm.

3. Inundation from storm surges affecting low-lying coastal areas.

4. Damage from landslides, mudslides, or other displacements caused by super saturation of the soil by heavy rainfall.

Earthquakes can threaten housing in three basic ways:

1. Forces generated by ground shaking can damage a building.

2. Liquefaction of the soils, a condition where loosely packed soils separate and behave like liquid when shaken by an earthquake, can cause buildings on the surface to partially sink or settle and damage them in the process.

3. Secondary effects such as landslides or tsunamis.

Damage from liquefaction and secondary effects is of major concern in Jamaica due to the types of soil. Major damages from liquefaction occurred in the 1692 earthquake, and the extensive damage to port facilities in Kingston in 1907 are attributed to this phenomenon.

According to a 1984 report published by the Jamaican Institute of Architects, a survey of buildings in Jamaica reveals the following breakdown of structures and construction materials:

-- industrial complexes and factories: 90% steel frame construction
-- public buildings (e.g., markets): 80%-90% steel frame construction
-- commercial buildings (banks, insurance companies, etc.): reinforced concrete
-- schools and churches: a combination of steel frames and reinforced concrete
-- hospitals: 90% reinforced concrete and sheer walls
-- residential (apartment buildings): 100% reinforced concrete and reinforced hollow blocks
-- resorts: 99% reinforced concrete and reinforced hollow blocks

Much of this section was taken from Improvement of Vernacular Housing in Jamaica to Withstand Hurricanes and Earthquakes, INTERTECT, 1981. For an in-depth vulnerability analysis and discussion of construction methods in Jamaica, please refer to this document.

3. Disaster Preparedness and Assistance

3.1 Host Country Disaster Organization

When major floods swept the island in 1979, Jamaican response systems proved inadequate. As a result, a GOJ advisory committee - assisted by experts from OFDA, the Office of the U.N. Disaster Relief Coordinator (UNDRO), and the Red Cross - undertook a review of the emergency management system. Based on the committee's recommendations, technical assistance was requested of OFDA and UNDRO in designing a permanent organization for national disaster planning, preparedness, and emergency relief operations. In July 1980 the GOJ established the Office of Disaster Preparedness and Emergency Relief Coordination (ODP) within the Office of the Prime Minister to carry out these functions. The ODP currently operates as a part of the Ministry of Construction and interacts extensively with the Planning Departments, Ministry of Agriculture, and others engaged in development and relief. In the event of a declared emergency, the ODP reverts to the control of the Prime Minister for the emergency period.

Office of Disaster Preparedness and
Emergency Relief Coordination (ODP)
2a Devon Road
Kingston 10
Tel: 809/929-4400 to 04

Franklin McDonald
Director

Lt. Cdr. John McFarlane
Deputy Director

Keith Ford
Head
Research and Planning

D. Green
Senior Administrator

Mrs. B. Roache
Coordinator of Relief

ODP is the coordinating office for all disaster preparedness and relief operations in Jamaica. In this capacity, its most critical function is not that of directly providing relief, but in developing and mobilizing existing resources at the national and parish levels to anticipate and plan for disasters. ODP is therefore organized into three divisions: Planning and Research; Preparedness and Emergency Operations; and Public Education, Information and Training. The Planning and Research

Branch is engaged in developing a comprehensive picture of Jamaica's disaster vulnerability - pinpointing those areas judged to be most vulnerable to various types of disasters, and identifying mitigation measures which can be implemented to reduce the identified risks. This branch is gathering data from the parishes on the extent of damage, cost of repair, and availability of local resources during past major disasters. This information will be pooled with current figures received from the ministries on the distribution and availability of reconstruction equipment and materials likely to be needed following a large-scale disaster. Planning and Research also works to promote disaster awareness, and consequent mitigation among the ministries involved in planning and effecting Jamaican development projects as well as among the professional societies, Bureau of Standards, land-use and other development planners.

The Preparedness and Emergency Operations Branch works directly with the national ministries, Parish Disaster Committees, and voluntary organizations to develop and maintain assessments of risk and vulnerability, resources available for relief, and communications systems to ensure continuous contact before, during, and after an emergency. Preparedness and Operations staff travel throughout the island to work with the local Parish Disaster Committees in developing a comprehensive coordinated plan for providing local relief. This decentralized approach is designed to ensure that the local community will be able to meet their immediate needs during the first 72 hours of a major disaster, the period during which national relief agencies may be unable to reach the area.

The Public Education and Training Branch is embarked on an ongoing program to educate the national population about the dangers and risks associated with the various disasters to which Jamaica is prone, and to inform the public of preparedness and mitigation measures it can take to reduce these risks. Programs in the local schools, civic associations, and voluntary agencies use films, speeches, and training materials to promote awareness of the hazards, the need for preparedness, the meaning of early warnings, and practical measures to improve the safety of the population.

ODP maintains detailed inventories of the resources available throughout the country for disaster relief operations.

3.2 Ministry Plans

The emergency relief operations of the various ministries would be coordinated through the National Disaster Committee during a national disaster. However, individual operational ministries have been encouraged to develop emergency command centers and procedures for activating the centers during the critical phases of emergencies. The Ministry of Health has developed such a plan (see section 3.6 Health Resources). Other ministries with a potential role during emergency

situations, i.e., Construction (Housing & Public Works), Public Utilities, National Security, and Local Government, have developed ad hoc methods of addressing these situations. The Directorate of Housing in the Ministry of Construction maintains a store of prefabricated housing construction supplies which could be dispersed if necessary. The Directorate of Maintenance produces a monthly report on the national distribution and condition of all its equipment (trucks, front-end loaders, rollers, graders, pick-ups, etc.).

3.3 Parish Plans

Each parish in Jamaica has established a Parish Disaster Committee which is composed of: the Custos; the Mayor; Deputy Mayor; Parish Councillors; Secretary; Senior Police; Fire Brigade; Medical, and Poor Relief Officers; the Superintendent of Roads & Works; the Parish Managers of Central Government Ministries; and representatives of voluntary agencies active in the parish; the private sector, ham-radio and CB radio clubs or operators, and the Jamaican Information Service. Each parish is developing a Parish Disaster Plan which details all arrangements necessary to cope with the effects of a natural or man-made disaster within the parish. At this writing, all 12 parishes and the Kingston-St. Andrews Corporation have submitted initial parish plans and contact lists to ODP. The contact lists are updated periodically and submitted to ODP.

The Parish Disaster Plan calls for the establishment of an Emergency Operations Center in an accessible, relatively disaster-proof structure to serve as the headquarters for all relief operations. The parishes are now identifying sites for potential shelters, estimating numbers of people likely to require assistance, and establishing alternate communication networks for use following a disaster. Copies of the initial plans are on file at ODP.

3.4 Warning Systems

Storm Warnings: Through the Meteorological Office located in the Norman Manley Airport, the Meteorological Division of the Ministry of Public Utilities and Transport issues bulletins whenever a tropical depression, storm, or hurricane threatens Jamaica. These bulletins, numbered sequentially, specify threatened areas and wind direction and are geared toward issuing preliminary warnings 24 hours in advance of a hurricane and the accompanying dangers such as heavy rain, hurricane force winds, rough seas, and abnormally high tides. The bulletins are made available to the Prime Minister's Office, the ODP, the Jamaica Telephone Company, the Police Force, and other organizations who have primary concern for distribution.

Integrated into the Worldwide Severe Storm Threat Warning System, the U.S. Mission in Kingston receives warning messages quantifying the risk associated with tropical cyclones. The U.S. Navy's Fleet Numerical Oceanographic Center (FNOC) transmits these messages to the State Department Diplomatic Telecommunications System network for routing to appropriate U.S. Embassies and Consulates.

Using computer-based probability models (i.e., strike, wind, and storm surge), the warning system generates color-coded threat indices which correspond to increasing levels of threat (higher probability) and decreasing lead time available for responding to the threat. Computed on a real-time basis, these threat indices are incorporated in warning messages issued at six hour intervals only when the threat becomes significant.

These messages are intended primarily for host government meteorological and disaster preparedness officials and also serve to assist the U.S. Mission in monitoring potential disaster situations to ensure readiness for responding to a request for disaster assistance. Responsibility for sharing this information with host country meteorological and disaster preparedness officials falls to the U.S. Embassy and AID Mission in Kingston.

Earthquakes - The Seismic Research Unit was established at the University of the West Indies, Mona, Jamaica, in 1979. Nine seismographs are installed island-wide but have yielded little strong-motion information due to a dearth of recent earthquake activity. Five strong-motion accelerographs are placed in high rise buildings in Kingston. While no precise technique for predicting earthquakes exists at this time, collection of data yields important information on the location of earthquake activity and areas of potential seismic recurrence.

3.5 Office Of Disaster Preparedness (ODP) Resources

The Office of Disaster Preparedness (ODP) is the principal coordinating office for all disaster preparedness and relief activities. This office maintains detailed inventories of the resources required and available during a disaster.

In addition to the specific resource listings below, ODP maintains lists of commercial suppliers of communications equipment (printing, public address systems, mobile and hand-held radios), pharmaceutical and shelter supplies, household utensils, portable lighting units, generators, water storage units, water treatment equipment, bandages, bedding, medical supplies, food, transportation and evacuation equipment, fire stations, salvage and recovery services.

The briefing room at ODP displays a large map of the island indicating the location of critical services. Included are locations of hospitals (with number of beds), location of repeater stations, military installations, fire and police stations, and electric generating plants.

3.6 Health Resources

The GOJ, through the Ministry of Health (MOH), is the main provider of health care. The MOH is divided along technical and administrative lines: 1) A technical unit is charged with the promotion and organization of field technical programs and the supervision of their staff to ensure that health care delivery conforms to the standards and policies set forth by the central ministerial levels and also makes best use of the available technology; 2) A second technical unit is responsible for resource coordination for primary, secondary, and tertiary care services; and 3) A third unit performs managerial and administrative functions in support of the delivery of health services.

Jamaica is divided into 47 health districts served by 152 health centers and dispensaries. Nine hospital boards administer 27 public hospitals. Tertiary care is provided by two regional general hospitals and several specialized tertiary institutions. A medical officer is responsible for health matters in each of the parishes. In a move toward decentralization, the parishes are to be grouped into four health regions administered by a senior medical officer: south, north-east, south-east, and west. The latter two are fully functional. The devolution of program planning and budget management to the regions and parishes further reflects decentralization.

The MOH's Primary Care Unit provides central management and supervision of primary care services. In the field, the parish is the basic administrative unit for primary health care. Each health district boasts an interlocking, tiered network of services, the least complex unit being the Type I Health Center staffed by one midwife and one or two community health aides. Types II and III Health Centers offer a progressively more intricate range of services. Types IV and V Health Centers (comprehensive clinics) are only available in a few urban areas.

In Time of Disaster

In time of disaster, the MOH, in concert with the Ministry of Social Security, collaborates with the ODP in disaster relief endeavors. The Disaster Preparedness and Relief Plan for Health, April 1980 names two committees responsible for disaster preparedness and relief in the context of health: the Standing Disaster Preparedness Committee for Health and the Health Action Committee for Disaster Relief. The Preparedness Committee is charged with maintaining a state of readiness for disaster

in the health sector. To effect this the Preparedness Committee: 1) appoints Health Action Committee members and defines and publicizes their duties; 2) ensures that parish health and hospital disaster committees have well-defined plans with which they are fully familiar; and 3) ascertains that health personnel are apprised of the Guidelines for Disaster Preparedness and Relief and that these individuals are ready to assume their assigned roles at short notice. The Health Action Committee becomes active once a disaster is imminent (i.e., upon the issuance of a hurricane watch) or has occurred. This committee is responsible for activating the emergency preparedness plans, ensuring that necessary actions are taken, and directing immediate plans for the emergency as well as post-disaster operations in the health arena.

The Disaster Preparedness and Relief Plan for Health provides for a coordinated relief effort and designates the roles and functions of key personnel. The plan also contains a series of guidelines -- such as for the immediate assessment of priority health needs, the control of communicable disease, and management of mass casualties -- for health sector personnel to follow in disasters.

Medical Facilities

Public Hospitals (March 1986)

Parish	Hospital & Location	Beds	Telephone
Clarendon	Chapelton Hospital Chapelton	121	987-2215
	Lionel Town Hospital Lionel Town	70	986-3226 986-3213
	May Pen Hospital May Pen	71	986-2528 986-2494
	Percy Junior Hospital Spalding	163	964-2322 964-2222
Hanover	Lucea Hospital Lucea	171	956-2233
Manchester	Mandeville Hospital Mandeville	128	962-2067 962-2744 962-3370

Parish	Hospital & Location	Beds	Telephone
Portland	Port Antonio Hospital Port Antonio	112	993-2646
St. Ann	Alexandria Hospital Brown's Town	35	975-2372
	St. Ann's Bay Hospital St. Ann's Bay	130	972-2272 972-2026 972-2273
St. Catherine	Linstead Hospital Linstead	135	985-2241 985-2359
	Spanish Town Hospital Spanish Town	144	984-3035
St. James	Cornwall Regional Hospital Montego Bay	262	952-5100 952-5105 952-5799
St. Elizabeth	Black River Hospital Black River	128	965-2212 965-2224
St. Mary	Annotto Bay Hospital Annotto Bay	117	996-2222
	Buff Bay Hospital Annotto Bay	n/a	996-2232
	Port Maria Hospital Port Maria	120	994-2228 994-2277
St. Thomas	Isaacs Barrant Hospital Golden Grove, Morant Bay	64	982-2366
	Princess Margaret Hospital 54 Lyssons Road, Morant Bay	165	982-2304
Trelawny	Falmouth Hospital Falmouth	102	954-2250 954-2255
Kingston	Bellevue Hospital 16 1/2 Windward Road Kingston 2	1,600	928-1380-1
	Bustamante Children's Hospital Arthur Wint Drive Kingston 5	260	926-5721

Parish	Hospital & Location	Beds	Telephone
Kingston (cont'd.)	Kingston Public Hospital North Street Kingston	453	922-0210
	Mona Rehabilitation Centre Mona Kingston 7	120	927-7209
	National Chest Hospital Liguanea Kingston 6	232	927-7121 927-6421
	University of the West Indies* Mona Kingston 7	135	927-6621
	Victoria Jubilee Hospital North Street Kingston	185	922-1700
Westmoreland	Savanna-la-Mar Hospital Savanna-la-Mar	197	955-2533 955-2610 955-2678

Total.....5,420

* A four-bed Burn Unit was to have begun operation in the spring of 1986.

Private Hospitals

Hospital & Location	Beds	Telephone
1. Andrews Memorial Hospital 27 Hope Road Kingston 10	45	926-7401-2 929-3820-1
2. Community Medical Associates 18 Tangerine Place Kingston 10	44	926-1400 926-2221
3. Nuttall Memorial Hospital 6 Caledonia Avenue Kingston 5	65	926-2139
4. St. Joseph's Hospital Deanery Road Kingston 3	87	928-4955 928-1197
5. Hargreaves Memorial Hospital	36	n/a

6. ALCAN Partners of Jamaica operates a primary care facility with two doctors, several nurses, and three ambulances.
7. Three private clinics in Clarendon include: Alcoa (986-2561) - nurses, doctors available by request; Monymons (986-2231) - full time doctor, nurses, pharmacist; New Yarmouth 986-2521 - no full time medical staff.

ODP maintains a current list of local health departments and health centers, organized by parish, with phone numbers.

Health Centers

Parish	Type I	Type II	Type III	Type IV	Type V
St. Thomas	12	4	4		
KSAC	22	8	17	1 (U.W.I.)	1
Portland	10	4	2		
St. James	15	9	5		
Clarendon	25	10	9		
Manchester	19	7	6		1
St. Catherine	15	10	7		
St. Elizabeth	15	8	7		
St. Mary	22	7	5		
Westmoreland	12	5	6		
St. Ann	18	7	5		
Trelawny	10	6	2	1	
Hanover	13	7	2	1	

Health Personnel 1981, 1982, and 1983

Type	1981	1982	1983
Doctors	292	416	414
Dentists	58	67	63
Nurses	1,566	1,918	1,957
Assistant Nurses	904	998	986
Midwives	n.a.	497	410
Pharmacists	106	124	123
Nutritionists	11	10	12
Dieticians	13	6	8
Medical Technologists	40	132	131
Radiographers	-	59	49
Public Health Inspectors	380	396	417

Source: Pocketbook of Statistics, Jamaica 1984

Ratio of Health Personnel to Population

1981, 1982, and 1983

Category	Ratio of Population* 1981	1982	1983	Ratio Recommended by P.A.H.O.
Doctors	1:7,546	1:7,033	1:5,159	1:910
Dentists	1:37,993	1:33,485	1:33,902	1:2,857
Registered Nurses	1:1,407	1:1,739	1:1,091	1:769
Assistant Nurses	1:2,438	1:1,268	1:2,166	1:385

Source: Pocketbook of Statistics, Jamaica 1984

* Mean Population

3.7 Airports

The illicit drug trade has spawned many clandestine airstrips throughout the island. Many airports have been closed or are closely controlled; therefore, prior arrangements to use an airport must be made with the proper authorities. An abbreviated list of airports listed with the Civil Aviation Department follows; additional specifications are available at ODP.

Name	Parish	Elev. Ft.	Runway Length Ft.	Surface	Status
Boscobel	St. Mary	90	3,000	Asphalt	Minor Public Open
Ken Jones	Portland	6	3,000	Asphalt	Minor Public
Negril	Hanover	4	2,164	Asphalt	Minor Public Restricted
Norman Manley Intl.	Kingston	10	8,565	Asphalt	Major Public Open
Sangster Intl.	St. James	3	8,700	Asphalt	Major Public Open
Tinson Pen	St. Andrew	15	3,000	Asphalt	Minor Public Open
Vernamfield	Clarendon	100	4,000	Concrete	Minor Public Open

Military Installations

Up Park Camp, Kingston - main JDF Base has 1,200 ft. airstrip.

Other installations at: New Castle, Port Antonio, Port Maria, Moneague (has airstrip 1,200 ft.), Mandeville, Montpelier (has 1,200 ft. strip), Montego Bay (located at old airport).

3.8 Communications

Local citizen's band (CB) clubs, mobile radio units of the Ministry of Public Works, Transportation, and the Fire Brigade, and the Jamaican Defense Force radio network will be the principal alternate communications media if normal telephone communication fails. CB clubs are organized throughout the island and have been integrated into the individual Parish disaster plans. The following is a list of clubs and the parishes in which they operate. Phone numbers and addresses of contact persons for each club are on file at ODP.

Western Star CB Association - Westmoreland, Hanover
Citizen Band Operators of Portmore - Portmore, W. Kingston
POTCOM - Portland, St. Thomas
Western Citizens Band Association - St. James, Trelawny, Hanover
Eastern Citizens Band Association - St. Thomas
St. Elizabeth Citizens Band Association - St. Elizabeth
Spanish Town CB Radio Association - St. Catherine
SECOM - St. Mary & St. Ann
Linstead CB Association - St. Catherine
Central Citizens Band Club - Manchester, St. Elizabeth, Clarendon
Clarendon CB Club - Clarendon
Citizens Band Radio Association (CIBRA) - Westmoreland
North East St. Elizabeth CB Association - St. Elizabeth
Mountain Range CB Association - E. Kingston, Harbor View, St. Thomas

The Public Works Division maintains an island-wide communications system to track their equipment in the field. A complete list of stations, repeaters, and call numbers is on file at ODP. The Fire Brigade operates on a frequency of 158.775 mhz (VHF) from its base station in York Park, and through nine substations, as well as a number of mobile units in the Brigade's vehicles. The Traffic Department in Kingston also has a comprehensive system which operates on frequency 169.255 (T) and 173.725 (R) and connects the Mayor with the principal corporate offices through substations and mobile units.

Jamaica Telephone Company has developed a set of procedures for emergencies (a copy is on file at ODP), and Jamintel Company Ltd., the international telephone company, has prepared Guidelines for Disaster Emergency Contingency Planning. The plans focus on restoring the network following a disaster.

ODP Communications System - ODP presently operates both a CB system and a VHF system from its base at Devon Road. Staff vehicles are equipped with a VHF through which they maintain communication with headquarters while in the field. ODP has placed CB radios in the major Fire Stations in order to be able to communicate with emergency personnel 24 hours a day.

ODP hopes to acquire several HF single-side band (SSB) radios, self-contained portable units which will be distributed around the island to establish a nationwide emergency communications net. SSB radios are the most reliable communications medium during emergency situations when repeater dependent systems can fail.

Parish Disaster Communications Systems

As a part of each Parish Disaster Plan, the local CB radio club is encouraged to test the emergency communications system at a set time one day each week. The CB net has a range of between five and 15 miles depending upon the terrain, weather, and time of day.

The parishes are also exploring the creation of other alternate communications systems. Working through local youth groups, several parishes are recruiting owners of motorcycles and mopeds to serve as emergency couriers during disaster situations. These small vehicles can traverse blocked roads more easily than larger cars or trucks, and can therefore carry messages between a disaster site and the parish relief center.

3.9 Road Clearing and Construction

The Directorate of Maintenance in the Ministry of Construction (Works) is responsible for maintaining the roads throughout the island. The Directorate operates 67 stations or substations with seven regional headquarters: Savanna-la-Mar, Montego Bay, Mandeville, Richmond, Spanish Town, and two in the Kingston-St. Andrews Corporate area. Equipment is concentrated in the areas of greatest traffic density and use, but is less than adequate in all stations.

3.10 Search & Rescue Services

Jamaica Defense Force
HQ Up Park Camp
Kingston 5
926-8121-8

Fire Dept.
York Park HQ
Kingston

Coast Guard HMJS Cagway
Port Royal
Kingston 1
928-7873, 7874, 7626

Marine Police Division
New Port East
922-3176

Police Canine Division
Harmon Barracks
928-1095, 96

Recompression Chamber
U.W.I. Marine Biology Laboratory
Discovery Bay
Dr. Woodley 973-2241

U.S. Coast Guard
7th District Miami
(305) 350-5611

3.11 Fire Services

The fire service in Jamaica is decentralized; each parish maintains its own fire brigade, equipment, facilities, and staff. Training is conducted on-the-job by the station fire chief. There is little or no compatibility of equipment between parishes because the equipment at the respective fire stations has been acquired from different foreign suppliers. As a result, when a large-scale fire requires a coordinated collective response, the hose fittings, couplings, and engines of the various responding fire companies are often incompatible.

Until recently the lack of a single national fire service has caused delays in the local release of equipment needed during a major fire. Because there is no single chain of command or authority, individual fire brigades are under no obligation to provide support to fires outside their jurisdiction. In 1985, the GOJ announced its intention to consolidate the existing parish fire units into a national fire service supported by an emergency training facility. A program to rehabilitate and regroup the service is now underway and will be executed through 1988.

3.12 U.S. Mission Disaster Relief Plan

The Mission Disaster Relief Plan (MDRP), updated in March 1986, provides action guidelines for the U.S. Mission in the event of a U.S. Government (USG) disaster relief response in Jamaica. The plan details the organization of a USG relief response -- both in the Kingston Mission and

in AID/OFDA/Washington --- delineating the responsibilities of the Chief of Mission, the Mission Disaster Relief Officer, and the Mission Disaster Relief Team. The MDRP also describes the GOJ's disaster response structure and identifies key personnel likely to be involved in a relief operation. A.I.D. Handbook 8: Foreign Disaster Assistance and a copy of this country profile provide USG policy and background information, respectively, and form part of the MDRP. The plan is available at the U.S. Mission in Kingston and at OFDA in Washington, D.C.

Other Resources

USAID Program: A.I.D.'s FY 86 program was estimated at $94 million ($70 million in Economic Support Funds and $24 in Development Assistance). The agency's development strategy entails assisting the GOJ establish the basic economic foundation necessary for sustained growth, increased employment, and improving the efficiency and effectiveness of social services. A.I.D. supports GOJ efforts to adopt policy and institutional reforms essential to increase production through Economic Support Fund assistance, project assistance, P.L. 480 and Section 416 food aid, and housing guaranty resources. Development Assistance supports increased private sector production and employment, and institution building in the critical sectors of agriculture, education, family planning, and urban development.

Peace Corps: Currently counting with 165 volunteers, Peace Corps/Jamaica is actively participating in disaster preparedness and awareness training. In addition to receiving orientation and training for their personal safety, Peace Corps volunteers also learn how they might assist their communities in time of disaster. Moreover, in July of 1986, Peace Corps/Jamaica - in collaboration with OFDA, Partners of the Americas, and the Office of Disaster Preparedness (ODP) - conducted a series of disaster preparedness training workshops for both host country nationals and volunteers.

In March of 1986, two volunteers had assignments at ODP - one working with the Public Education, Information, and Training Branch, the other, periodically seconded to other GOJ ministries, assisting in hazard mitigation construction techniques. Working at Red Cross Headquarters, another volunteer was providing emergency first aid training. Other Peace Corps volunteers distributed throughout the island work in areas such as education, agriculture, health, small business development, and technical services, forming an important nationwide network of resource personnel.

3.13 U.S. Disaster Relief and Preparedness Activities

Emergency Assistance

Since 1969 the USG has provided assistance to the GOJ in seven emergency situations ranging from drought to civil strife to hurricane and floods. Assistance has included the provision of food and temporary shelter for disaster victims, construction materials for repairing damaged housing, and assessment teams and an air photo reconnaissance mission to aid the GOJ in post-disaster surveys. A list of commodities and services donated by the USG to the GOJ for disaster relief follows.

U.S. Disaster Relief to Jamaica 1964-1986

Year	Disaster	Commodity/ Service	Provided Through	Cost
1969	Drought	600 MT Title II cornmeal	WFP	$67,000
		TOTAL		$67,000
1974	Tropical Storm Gilda	Ambassador's Authority	GOJ	$5,000
		1 MT Title II food	GOJ	$350
		TOTAL		$5,350
1976	Civil Strife	Airlift	DOD	$7,956
		488 cots		$14,712
		120 tents		$23,897
		TOTAL		$46,565
1979	Floods	Airlift of P.L. 480 food from Haiti	CARE	$1,484
		350 air mattresses		$8,152
		Transport of blankets and detergent	ADRA	$17,519
		TOTAL		$27,155
1979	Floods	Ambassador's Authority		$25,000
		Helicopter airlifts	U.S. Coast Guard	$200,000
		Airlift		$26,450
		Airlift of 52,600 lbs. of CWS clothing	Trans Air	$37,607
		Assessment Team	DOD	$21,756
		Disaster Experts	OFDA	$1,175
		20 MT Title II food		$108,300
		Medicines	Lederle	$70,716
		Personnel Support	Peace Corps	$0
		TOTAL		$491,004

1980	Hurricane Allen	Assessment Team, air reconnaissance mission	DOD	$100,000
		Grant for zinc sheets and nails	GOJ	$75,000
		TOTAL		$175,000
1986	Floods*	Ambassador's Authority	ODP	$25,000
		Airlift	DOD	$25,000
		2,057 cots		$90,508
		31 rolls plastic sheeting		$8,587
		Disaster Expert	OFDA	$1,500
		TOTAL		$150,595
		GRAND TOTAL		$962,669

* Preliminary figures (see also Appendix A, Jamaica Floods May-June 1986 Case Report)

3.14 Private Voluntary Organizations

Voluntary agencies in Jamaica can be an effective resource for disaster preparedness and relief. The idea of one entity coordinating voluntary agency preparedness and relief activities has long been regarded as essential and at one time the Council on Voluntary Social Services (CVSS) served this function. Recently reorganized into the CVSS/United Way of Jamaica, this organization is primarily a social welfare agency still in the incipient stages of its development and therefore hesitant to assume the role of coordinating agency. However, the ODP is attempting to resurrect the idea of the CVSS/United Way as the galvanizing organization for voluntary agencies.

A list of voluntary agencies with contact persons, telephone numbers, and brief descriptions of disaster-related programs, where available, follows.

CVSS/United Way of Jamaica
13 Barbados
Kingston 5
President-elect: Avis Henriquez

Jamaica Red Cross
76 Arnold Road
Kingston 5
Telephone: 926-7861
Contact: Franklin Smith

Represented in most parishes by chapters of registered volunteers, the Jamaica Red Cross's strongest representation can be found in the Kingston area due to the presence of the national headquarters; the Red Cross has lesser representation in the parishes of Trelawny, Hanover, Westmoreland, St. Elizabeth, and St. Mary.

In terms of disaster relief work, the Red Cross would be effective in distributing emergency food and clothing and administering first aid. Cooperative efforts among parish chapters have yielded a well-organized system capable of carrying out these tasks.

The Red Cross does not maintain large stores of goods. Clothing and tents, not food, are the main stockpiled items. Red Cross headquarters urges its parish chapters to enter into arrangements with local food suppliers for emergency food stocks, with headquarters providing matching funds. Although headquarters attempts to keep up-to-date records of what each chapter has at its disposal, this is not always possible.

The Red Cross has no reliable communications system in place and, due to a lack of funds, does not envision establishing one in the near future. This significantly reduces Red Cross headquarters' ability to contact its branches in times of emergency.

With its emergency first aid training, the Red Cross is trying to build a significant cadre of personnel capable of administering first aid.

Project Hope
53 Old Hope Road
Kingston 5
Telephone: 927-8283
Contact: Dave Edwards, Program Director

While Project HOPE has no staff member assigned to disaster preparedness, the Program Director is keen on integrating a preparedness component into the program. HOPE has been involved in three important disaster preparedness-related endeavors:

1. Burn Unit Program - implementation has lead to the creation of a four-bed Burn Unit at the University of the West Indies Hospital. Additionally, Cornwall Regional Hospital will soon open a Reconstructive Unit for burn victims.

2. Emergency Medical Services Program - the project focuses on ambulance drivers and other first responder personnel to upgrade the quality of emergency care.

3. CPR Program - Project HOPE was instrumental in establishing a national protocol on CPR instruction, thereby standardizing procedures throughout the island. Through this program HOPE trained personnel from the Heart Fund of Jamaica who, in turn, trained others.

Except for a stock of medicaments and supplies on hand for use by its staff and their dependents, Project HOPE does not keep large stores of medical supplies in Jamaica. It does, however, maintain 15,000 sq. ft. of one of its warehouses at Dulles International Airport in Washington, D.C. stocked with items such as bandages, swabs, and crutches, which can be released immediately in time of disaster. No pharmaceuticals are stored.

Jamaica-Western New York Partners of the Americas
2a Ruthven Road
Kingston 10
Telephone: 926-8726 to 7
Contact: Eleanor Jones

Jamaica Partners is actively involved in disaster preparedness activities and their 1986 program contains a series of preparedness and mitigation efforts. Partners' biggest push in this area is to raise the national consciousness on matters of safety - fire safety, traffic safety, and so on. The group is engaged in a revitalization of the National Safety Council as a viable coordinating and lobbying organization. With funding from the local Exxon subsidiary Esso, Partners is participating in a one-year safety education campaign. Partners' chemical and pesticide risk assessment project being carried out by Partners in collaboration with ODP and others is another important activity that endeavors to quantify risk and identify populations at risk, and subsequently to identify a risk minimization strategy and train response teams.

Partners sees its role as one involved in mitigation efforts as opposed to relief. However, in a relief effort Partners could prove a valuable resource.

Jamaica-American Medical Assistance Committee (JAMAC)
14 Hope Road
Kingston 10
Telephone: 926-4044
Contact: Mrs. Paula Bow, Coordinator

A private sector entity channeling donated medical supplies, equipment, and health services to the Ministry of Health (MOH), JAMAC works nationwide. JAMAC has dispatched dentists and opthamologists who have donated their time to various parts of the island to hold free clinics. JAMAC does not maintain in-country stocks, but rather collects them from its sources and donates them to the MOH.

Disaster Emergency Relief and Welfare of Jamaica Council of Churches
All Saint's Church
West Street
Kingston
Telephone: 922-4734
Contact: Father Powell

This group maintains no stocks, but, in the event of disaster, would coordinate an appeal through the Caribbean Council of Churches and the World Council of Churches for cash and relief materials. In 1979 the group ran a six-month emergency food and clothing program for 60,000 people. The machinery exists to effect distribution of relief supplies.

Salvation Army
3 Waterloo Road
Kingston 10
Telephone: 929-6190 to 2; 926-6914
Contact: Major Burrowes

The Salvation Army responds to the needs of victims in the wake of a hurricane, fire, flood, or earthquake. Depending on the nature of the disaster, the Salvation Army issues an international appeal and coordinates the response. No food or relief supplies are maintained, only stores of clothing.

While no call for assistance was issued during the November 1985 floods, the Salvation Army fed over 200 people in the Kingston area affected by the floods.

Canada Save the Children
26 Camp Road
Kingston 5
Telephone: 926-8696, 926-0565
Contact: Faith Jumpp

Caribbean Council of Churches
P.O. Box 527
Kingston 10
Telephone: 926-7007

YMCA of Jamaica
2h Camp Road
Kingston 5
Telephone: 928-3023
Contact: Minnie McCloud, National General Secretary

Jamaica Scouts Association
2d Camp Road
Kingston 5
Telephone: 926-7209, 926-6292

Jamaica 4-H Clubs
95 Old Hope Road
Kingston 6

Hyacinthe Lightbourne Society
47 Lady Musgrave Road
Kingston 10
Telephone: 927-9575, 927-0558

Girl Guides Association of Jamaica
2 Waterloo Road
Kingston 10
Telephone: 926-6277, 926-6507

3.15 International Organizations

United Nations Development Program (UNDP)
1-3 Lady Musgrave Road
Kingston
Telephone: 926-5507 to 9, 926-5500
Resident Representative: Dr. Brenda G. Sweeney

Pan American Health Organization (PAHO)
Pan Jamaican Building
60 Knutsford Boulevard, 3rd floor
Kingston 5
Telephone: 926-2365
Representative: Dr. Norma Andrews

Delegation of the Commission of the European Committee
Mutual Life Centre
2 Oxford Road, 2nd Floor
Kingston 10
Telephone: 929-3030 to 2
Delegate: Mr. Klaus Billerbeck

Organization of American States (OAS)
21 Braemar Avenue
Kingston 10
Telephone: 927-8240, 927-4882, 927-7623
Director: Mr. E. Patrick Healy

UNICEF
Pan Jamaican Building
60 Knutsford Boulevard, 6th Floor
Kingston 5
Telephone: 926-7584 to 5

Canada, Great Britain, the United States, and other countries in the region have traditionally lent support to Jamaica.

The British High Commission
Trafalgar Road
Kingston 10
Telephone: 926-9050
High Commissioner: His Excellency Martin Reid, CMG

Canadian High Commission
Royal Bank Building
30-36 Knutsford Boulevard
Kingston 10
Telephone: 926-1500 to 7
High Commissioner: His Excellency Robert G. Woolham

3.16 Mitigation Efforts

The Government of Jamaica has undertaken a major study of the nation's resources and another of its natural hazards. The Ministry of Agriculture's Rural Physical Planning Division is making rapid progress in its program to inventory and analyze the entire island, identifying each hectare of land by soil composition, and current use, the amount of rainfall, and temperature fluctuations.

The aim of this multi-year project is to provide policy makers with the information they need to make informed choices between various development alternatives. Models which indicate what crops will grow best in which part of the country, can be matched to national policy objectives (reduced unemployment and increased foreign exchange) to select optimum development alternatives.

The Office of Disaster Preparedness is conducting a nationwide study to identify and manage Jamaica's natural hazards. As a part of this effort, ODP asked each Parish Council to identify areas within their parish which have historically been damaged during storms, hurricanes, floods and areas which are likely to suffer in the future from such events. From the lists submitted, ODP selected high priority areas for further in-depth study. These were identified as follows:

a. areas of high population concentration were given priority over other areas;

b. areas supporting activities important to the regional and national economies were evaluated with priority given to safeguarding the national economy; and

c. areas slated for future development by the J.I.D.C. were given priority over areas not scheduled for development.

To date, the following priority areas have been targeted for detailed disaster vulnerability analysis:

KINGSTON & ST. ANDREW
Kingston Water Front
Main Gully Courses
Rockfort - Paradise Street

ST. ELIZABETH
Maggotty
New Market
Middle Quarters
Lacovia

PORTLAND
Manchioneal
Long Bay
Windsor
Buff Bay
The Rio Grande Valley

ST. MARY
Annotto Bay
Baileys Vale - Port Maria (along the Pagee River)

TRELAWNY
Falmouth
Wakefield
Wait-a-bit

ST. JAMES
Montego Bay
Anchovy
Reading

HANOVER
Hopewell
Sandy Bay
Lucea/West River
Chigwell

WESTMORELAND
Savanna-la-Mar
Petersfield
Whithorn
Whitehouse
Santa Cruz
Black River

CLARENDON
Alston
Kellits
Hayes
Four Paths
Race Course
Milk River
Lionel Town

ST. CATHERINE
Ewarton
Old Harbour Bay
Portmore

ST. THOMAS
Seaforth
Poorman's Corner
Morant Bay
Port Morant
Golden Grove
Bath

APPENDIX A

JAMAICA - Floods

Date: May 23 - June 6, 1986

Location: Islandwide; southern areas most severely affected

No. Dead: 49

No. Affected: at least 40,000

Damage: Extensive damage to housing, agriculture, and road infrastructure; flooding had an adverse effect on numerous community water supply systems. Preliminary estimates of damage: agriculture, $30.4 million; public utilities (telephone, electrical, railroad, and water systems), $1.6 million.

The Disaster

For months before the May-June deluge, high levels of rainfall had drenched Jamaica. Hurricane Kate had caused island-wide flooding in November 1985 and unusually heavy precipitation had continued throughout the winter months. Beginning in mid-May, however, Jamaica came under the influence of a complex concentration of disturbed weather systems. Prolonged moderate to heavy rain showers and isolated thunderstorms affected the entire island, especially the parishes of Westmoreland (Savanna-la-Mar area), Clarendon (plains south of May Pen), and St. Catherine (Rio Cobre Valley around Spanish Town). Other affected areas included St. Elizabeth, Manchester, St. Andrew, Portland, and St. Ann. From May 15 to June 1, 1,549 mm of rain fell; 1,067 mm soaked the island between June 1 and 5. An analysis of the rainfall data demonstrates that May-June rainfall levels were at least three times the normal levels for most stations. The already saturated condition of the soil and the uninterrupted heavy downpours combined to produce a disastrous aftermath.

The continuous rains precipitated severe flooding along all river banks in the southern part of Jamaica. The flood waters forced people from their homes and also marooned thousands of victims during peak flooding. Heavy rains washed out road segments while landslides obstructed roads. Flood waters eroded bridge supports and approaches, rendering at least seven essential bridges impassable to vehicular traffic. In all, 341 roads were blocked and/or damaged, including 15 bridges with a restoration price estimated at $34 million. The Rio Minho, which at the height of its current flowed at an estimated 2,800 cubic meters per second, caused the most devastating damage, inundating towns, roads, crop lands, and factories as well as damaging bridges and power lines. The Jamaica Railway Corporation temporarily suspended service to selected areas where railway lines had been washed away or tracks blocked by landslides.

Jamaica's agricultural sector suffered extreme damage, with a total of 8,320 ha destroyed. Produce for domestic consumption such as red peas, onions, and corn experienced heavy losses. The most devastated areas were Clarendon, where 2,430 ha of crops were damaged, St. Elizabeth with 1,900 ha damaged, and Manchester with 640 ha damaged. Downpours uprooted plantings on slopes, while crops on level land were spoiled by pooling rainwater. In addition to farm equipment and buildings, 1,197 km of farm roads were damaged. Total livestock losses reached $1.5 million; the Jamaica Livestock Association reported the loss of thousands of chickens in several parishes. Flooding of aquaculture ponds resulted in a significant loss of fish.

Damage to local water supply systems was widespread; about 219,500 people were affected by a lack of potable water. Water contamination and sewer disruption in eight parishes necessitated repair and decontamination efforts. The possibility of water borne diseases further threatened the flood victims. Other utilities (power supply, transport, telecommunications) were affected to varying degrees. With the exception of some inaccessible areas of upper Clarendon, electrical power was restored in all locations by June 14.

Fourteen hospitals, twelve health centers, and four parish health offices were severely affected. Damage to their physical structures, facilities, and equipment was estimated at $3.5 million.

From May 25 to June 5, the Norman Manley Airport in Kingston recorded approximately 764 mm of rain. The Metropolitan Park and Markets had recently cleaned the main gully courses within the Kingston - St. Andrew Corporate area; this effort played a vital role in preventing more serious flooding in Kingston. The Hope River bridge -- the main artery feeding into Kingston from the eastern end of the island -- experienced critical structural damage when the footing of a pier supporting a section of the 76-m bridge eroded. The bridge decking collapsed, impeding vehicular traffic. The bridge will require eventual reconstruction.

Action Taken by the Government of Jamaica

Prime Minister Edward Seaga convened the National Disaster Committee to manage and coordinate relief and rehabilitation efforts. The Office of Disaster Preparedness and Relief Coordination (ODP) handled the mechanics of the GOJ relief response, in cooperation with local disaster committees. The ODP convened daily meetings of pertinent GOJ officials and local voluntary agency representatives to report situation updates, establish priorities, validate needs, and adjust response plans accordingly.

In a unified effort, the various entities of the GOJ responded to the situation. The Ministry of Construction and Public Works supplied vehicles and heavy equipment for road and bridge clearance and repairs; 1,100 of its employees were engaged in rehabilitation activities. Disaster victims received food, clothing, and bedding distributed by the Ministry of Social Security, assisted by Poor Relief officials. At the

height of the disaster, more than 6,390 persons were lodged in 20 temporary shelters throughout the island; many of these people received food provided by the Ministry of Education. A feeding program for more than 40,000 people was a major GOJ relief undertaking.

The Jamaica Constabulary Force maintained security and the Jamaican Defence Force (JDF) provided air and ground support to the relief effort. The JDF established an operational headquarters in the hardest hit area of Clarendon and assisted in coordinating local relief endeavors. The Jamaican Red Cross (JRC) and the Salvation Army distributed food to those in need. The JRC received local donations in cash and food from the GOJ, the National Commercial Bank, and private sector sources.

Prime Minister Seaga visited the most severely affected areas, offering encouragement and support to the flood victims. The Prime Minister also designated June 18 as a day of national rehabilitation. On this day, Jamaican citizens voluntarily contributed their time and effort to assist in cooperative rehabilitation endeavors. The day was heralded as a grand success, with extensive popular participation.

Assistance Provided by the United States Government

In response to a request from Prime Minister Edward Seaga, U.S. Ambassador Michael Sotirhos determined on June 6, 1986 that the floods were of a magnitude to warrant USG assistance. Ambassador Sotirhos granted his $25,000 Ambassador's Authority to the ODP; these funds paid for emergency food supplies. In addition, OFDA dispatched its logistician, Walter Keesecker, to conduct an on-site assessment, provide support to the USAID Mission in Kingston, and help determine any prospective USG response.

OFDA released 2,057 folding cots from its Panama stockpile for use by at least 2,000 people in temporary shelters. A series of five California Air National Guard C-130 flights ferried the cots, valued at $90,508, to the Norman Manley Airport in Kingston; transport costs totaled $25,000. The Jamaican Defence Force provided local transport of the cots to distribution points in Westmoreland and southern Clarendon. OFDA also provided 31 rolls of plastic sheeting to be used in constructing temporary protection for damaged GOJ facilities. The plastic sheeting arrived on the last C130 flight and cost $8,587.

Logistician Keesecker surveyed some of the hardest hit areas and participated in relief coordination sessions at the ODP. Short-term emergency needs were identified and met. Long-term reconstruction constituted Jamaica's greatest need; USAID/Kingston reprogrammed $500,000 from its crop diversification and irrigation project grant funds to purchase seeds and planting materials (excluding chemicals and fertilizer) for use by small farmers.

Summary of USG Assistance

Ambassador's Authority	$25,000
2,057 folding aluminum cots	90,508
31 rolls of plastic sheeting	8,587
C130 transport costs	25,000
Travel and expenses of OFDA logistician	1,500
Total OFDA Assistance	$150,595
USAID Reprogrammed funds	$500,000
Total	$650,595

Assistance Provided by the International Community

International Organizations

EEC - granted $376,300 to be distributed in cash to the most affected families.

FAO - contributed $200,000 worth of agricultural implements; 468 MT of food and technical assistance for 6-10 months, value not reported.

IDB - cash grant of $100,000 to help small farmers recover from personal losses

UNDP - $50,000 cash

UNDRO - dispatched a delegate to assist in damage assessment and relief coordination; also donated $5,000 cash for local purchase of chemicals. Contributed $1,200,000 for integrated rural development, including soil conservation, agricultural inputs, and appropriate technology for rebuilding houses.

WHO/PAHO - sent a six-member team to evaluate health situation and medical needs; contributed water supply equipment; total value $10,000.

Governments

Barbados - supplied five swing fogging sprayers for vector control, valued at $5,000.

Canada - donated food and blankets valued at $109,490, including external transport. Gave $32,846 to PAHO for the repair and decontamination of water systems.

France - gave a cash grant of $13,700 for food aid. Also gave 400 MT of wheat flour and 1.5 MT of medical supplies; value not reported.

Germany, Fed. Rep. - disbursed $21,740 cash for local purchase of relief supplies.

Guyana - provided lumber, utility poles, and 100 MT each of rice and sugar.

Korea, Rep. of - donated $30,000 for food aid.

India - gave an undetermined amount of medical supplies.

Israel - contributed assorted medical supplies.

Spain - sent medical supplies valued at $13,800.

United Kingdom - provided three Puma helicopters for local transport; a Royal Air Force Hercules aircraft brought in 6 MT of medical supplies and other relief equipment; total value $299,850. The HMS Ariadne berthed at Rocky Point and provided 27.3 MT of freshwater a day for local distribution. Also, a 1985 program loan was increased by $375,150 to cover the cost of a Bailey Bridge.

Voluntary Agencies

U.K. Red Cross - gave $2,998 cash to Jamaica Red Cross.

TOTAL $2,845,874

Appendix B

Crop Calendar For Jamaica

By Parish

P - Planting H - Harvesting

Parish	Crops	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Approx. No. of Weeks	Yield Range Ton/ha
Portland	Kidney Bean	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP				
		HHH			HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	8-12	0.7-1.1
	Irish Potato	PPP									PPP	PPP	PPP		
		HHH	HHH	HHH										10-12	4.6-11.4
	Yellow Yam	PPP	PPP	PPP									PPP		
								HHH	HHH	HHH	HHH			30-48	8.0-13.7
St. Mary	Kidney Bean	PPP	PPP	PPP						PPP	PPP	PPP	PPP		
		HHH	HHH	HHH	HHH								HHH	8-10	0.7-1.1
	Irish Potato	PPP										PPP	PPP		
		HHH	HHH	HHH	HHH									10-12	4.6-11.4
	Banana			PPP	PPP	PPP	PPP	PPP							
		HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	40-52	3.7-20.5
	Coffee										PPP	PPP	PPP		
										HHH	HHH	HHH	HHH	96-144	25-38 box
	Cocoa										PPP	PPP	PPP		
					HHH	HHH	HHH	HHH	HHH	HHH				96-192	40-60 box
St. Ann	Kidney Bean		PPP	PPP											
							HHH	HHH						10-12	0.9-1.4
	Irish Potato	PPP	PPP	PPP									PPP		
				HHH	HHH	HHH	HHH	HHH						12-16	9.1-11.4
	Banana	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP		
		HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	36-48	9.1-18.2

Appendix B

Crop Calendar for Jamaica

By Parish

P – Planting H – Harvesting

Parish	Crops	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Approx. No. of Weeks	Yield Range Ton/ha
Trelawny	Kidney Bean	PPP	PPP	PPP											
					HHH	HHH	HHH							10–12	0.7–1.1
	Irish Potato		PPP	PPP							PPP	PPP			
			HHH	HHH			HHH	HHH						16	6.8–9.1
	Yellow Yam				PPP	PPP	PPP								
		HHH	HHH	HHH	HHH	HHH							HHH	32–48	11.4–15.9
St. James	Kidney Bean	PPP	PPP					PPP	PPP	PPP					
				HHH	HHH					HHH	HHH	HHH		10–12	0.6–1.1
	Banana	PPP	PPP	PPP	PPP										
		HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	40–52	6.8–13.6
	Yellow Yam			PPP	PPP										
		HHH	HHH	HHH	HHH	HHH							HHH	36–48	9.1–15.9
Hanover	Kidney Bean	PPP	PPP	PPP							PPP	PPP	PPP		
		HHH	HHH	HHH	HHH	HHH	HHH						HHH	10–12	0.5–0.9
	Rice			PPP	PPP										
									HHH	HHH				20–24	2.3–3.6
	Yellow Yam	PPP										PPP	PPP		
					HHH	HHH		HHH	HHH	HHH				32–48	9.1–13.7
Westmoreland	Kidney Bean	PPP	PPP	PPP	PPP	PPP	PPP	PPP				PPP	PPP		
			HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH				10–12	0.7–1.1
	Rice				PPP	PPP	PPP	PPP							
		HHH									HHH	HHH	HHH	24	1.4–2.7
	Irish Potato	PPP						PPP	PPP				PPP		
				HHH	HHH							HHH	HHH	14–16	9.1–13.7
	Yellow Yam			PPP	PPP	PPP									
										HHH	HHH			32	6.8–11.4

Appendix B

Crop Calender for Jamaica

By Parish

P - Planting H - Harvesting

Parish	Crops	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Approx. No. of Weeks	Yield Range Ton/ha
St. Elizabeth	Kidney Bean	PPP	PPP	PPP	PPP			PPP	PPP			PPP	PPP		
		HHH	HHH	HHH	HHH	HHH	HHH			HHH	HHH			10-12	0.7-1.4
	Rice		PPP	PPP											
								HHH	HHH					20-24	1.6-3.4
	Irish Potato	PPP											PPP		
				HHH	HHH									14-16	9.1-15.9
Manchester	Kidney Bean			PPP			PPP					PPP			
			HHH			HHH				HHH				10-12	0.7-1.1
	Irish Potato	PPP	PPP	PPP			PPP	PPP	PPP						
						HHH	HHH	HHH			HHH	HHH	HHH	14-16	6.8-18.2
	Yellow Yam			PPP	PPP	PPP	PPP								
		HHH	HHH	HHH	HHH	HHH							HHH	32-48	9.1-18.2
Clarendon	Kidney Bean		PPP	PPP						PPP	PPP				
		HHH					HHH	HHH					HHH	10-12	0.7-1.1
	Banana	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP		
		HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	52	9.1-11.4
	Coffee	PPP	PPP	PPP	PPP	PPP									
											HHH	HHH	HHH	156	50-110 box
	Cocoa				PPP	PPP					PPP				
		HHH	HHH	HHH	HHH	HHH							HHH	156	63-125 box
	Sugarcane	PPP	PPP	PPP	PPP	PPP	PPP	PPP	PPP				PPP		
		HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH				48	35-70

Appendix B

Crop Calendar for Jamaica

By Parish

P - Planting H - Harvesting

Parish	Crops	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Approx. No. of Weeks	Yield Range Ton/ha
St. Catherine	Kidney Bean	HHH	PPP	PPP		HHH	HHH			PPP	PPP		HHH	10-12	0.7-1.1
	Citrus	HHH	HHH		PPP HHH	PPP HHH	PPP	PPP	PPP	PPP	PPP	HHH	HHH	156	1,150-1,500
	Irish Potato	PPP		HHH	HHH								PPP	12	9.1-11.4
	Yellow Yam	PPP HHH	PPP HHH	PPP HHH	PPP HHH	PPP HHH					HHH	HHH	PPP HHH	40-52	9.1-13.7
	Coffee				PPP	PPP	PPP	PPP	PPP	PPP HHH	PPP HHH	HHH	HHH	156	63-125 box
	Cocoa			HHH	PPP HHH	PPP HHH	PPP	PPP	PPP	PPP HHH	PPP HHH	HHH	HHH	156	40-75 box
	Banana	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	PPP HHH	PPP HHH	HHH	36	9.1-13.7
St. Andrew	Kidney Bean	PPP	HHH	PPP HHH	PPP	HHH	HHH						PPP	10-12	0.9-1.1
	Banana	PPP HHH	PPP HHH	PPP HHH	PPP HHH	PPP HHH	PPP HHH	PPP HHH	PPP HHH	PPP HHH	PPP HHH	PPP HHH	PPP HHH	36-52	9.1-18.2
	Coffee	HHH			PPP	PPP			HHH	PPP HHH	PPP HHH	HHH	HHH	104-156	90-125 box
	Cocoa									HHH	PPP HHH	PPP HHH	PPP	156	55-125 box

Appendix B

Crop Calendar for Jamaica

By Parish

P - Planting H - Harvesting

Parish	Crops	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Approx. No. of Weeks	Yield Range Ton/ha
St. Thomas	Kidney Bean	PPP	PPP							PPP	PPP				
		HHH			HHH	HHH							HHH	10-12	0.9-1.4
	Banana						PPP	PPP	PPP						
		HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	HHH	36-48	11.4-20.5
	Coffee									PPP	PPP				
		HHH	HHH	HHH	HHH	HHH	HHH			HHH	HHH	HHH	HHH	96	75-100 box
	Cocoa					PPP	PPP			PPP	PPP				
		HHH								HHH	HHH	HHH	HHH	144	65-125 box

Source: Climatic Impact Assessment for Agriculture and Tourism in Jamaica: A Final Report, 1985

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