



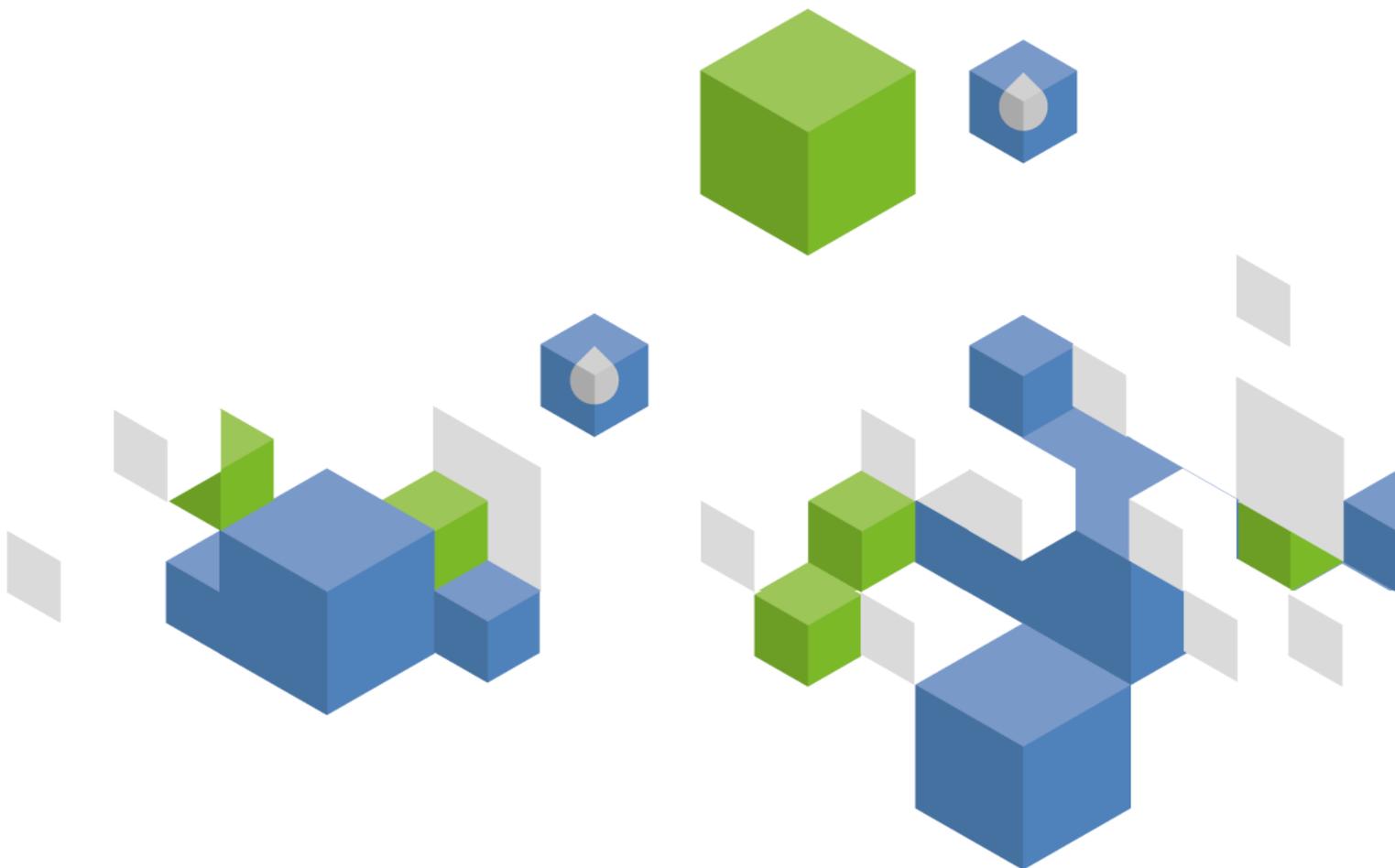
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Reports

# Country profile – Jamaica

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# Jamaica

## GEOGRAPHY, CLIMATE AND POPULATION

### Geography

Jamaica is located to the south of Cuba and forms part of the Greater Antilles, at latitude 18°15'N, longitude 77°30'W. It is the largest island of the English-speaking Caribbean with a total area of 10 990 km<sup>2</sup>. In 2012, the total physical cultivated area was estimated at 220 000 ha, of which 55 percent (120 000 ha) consisted of temporary crops and 45 percent (100 000 ha) of permanent crops (Table 1). Permanent meadows and pasture cover 229 000 ha, which brings to total agricultural area to 449 000 ha. The country is divided into fourteen administrative districts, called Parishes. The capital is Kingston.

The country has three landform regions: the eastern mountains, the central valleys and plateaus, and the coastal plains. There are a series of mountain ranges along the major WNW-ESE axis of the island. In the eastern third, these mountains generally exceed elevations of 1 000 m with Blue Mountain Peak, the highest point, rising to a height of 2 256 m. North of the Blue Mountains lie the John Crow Mountains. Major alluvial lowlands occur in the southern half of the island, where they are often associated with coastal swamps. The other main topographical feature is a narrow and discontinuous coastal plain. Karst formations dominate the island.

### Climate

The island's climate can be classified as tropical maritime, hot and humid with a temperate interior. Mean daily temperatures range from 26°C in February to 30°C in August in the lowlands, and from 15°C to 22°C at higher elevations. Daily sunshine hours are fairly constant throughout the year, averaging about 8.2 hours in the southern plains.

Long-term mean annual rainfall over the island is about 2 051 mm. Much of the rainfall results from the northeasterly trade winds, which deposit most of their moisture on the northern slopes of the axial mountain ranges, while the southern half of the island is in rain shadow. Annual rainfall on the northeastern slopes of the Blue Mountain Range is generally 3 000 to 5 000 mm, whereas in the south coastal plains of Saint Catherine and Clarendon it is generally less than 1 500 mm. Annual rainfall exhibits a characteristic pattern, with a primary maximum in October and another in May. The main dry season lasts from December to April.

Jamaica regularly comes under the influence of tropical storms and hurricanes during the period of July to November, characterized by flood-producing rainfall of high intensity and magnitude.



TABLE 1

**Basic statistics and population**

<b>Physical areas:</b>			
Area of the country	2012	1 099 000	ha
Agricultural land (permanent meadows and pasture + cultivated land)	2012	449 000	ha
• As % of the total area of the country	2012	41	%
• Permanent meadows and pasture	2012	229 000	ha
• Cultivated area (arable land + area under permanent crops)	2012	220 000	ha
- As % of the total area of the country	2012	20	%
- Arable land (temp. crops + temp. fallow + temp. meadows)	2012	120 000	ha
- Area under permanent crops	2012	100 000	ha
<b>Population:</b>			
Total population	2013	2 784 000	inhabitants
- Of which rural	2013	48	%
Population density	2013	253	inhabitants/km <sup>2</sup>
Population economically active	2013	1 258 000	inhabitants
• As % of total population	2013	45	%
• Female	2013	44	%
• Male	2013	56	%
Population economically active in agriculture	2013	208 000	inhabitants
• As % of total economically active population	2013	17	%
• Female	2013	27	%
• Male	2013	73	%
<b>Economy and development:</b>			
Gross Domestic Product (GDP) (current US\$)	2013	14 362	million US\$/year
• Value added in agriculture (% of GDP)	2012	7	%
• GDP per capita	2013	5 159	US\$/year
Human Development Index (highest = 1)	2013	0.715	-
Gender Inequality Index (equality = 0, inequality = 1)	2013	0.457	-
<b>Access to improved drinking water sources:</b>			
Total population	2012	93	%
Urban population	2012	97	%
Rural population	2012	89	%

**Population**

In 2013, the total population was about 2 784 000, of which around 48 percent was rural (Table 1). Population density is 253 inhabitants/km<sup>2</sup> but is unevenly distributed. In 2003, the total population was estimated at 2 647 000 reflecting an average annual demographic growth rate over this period of 0.5 percent.

In 2012, 93 percent of the total population had access to improved water sources (97 and 89 percent in urban and rural areas respectively) and 88 percent of the total population had access to improved sanitation (78 and 82 percent in urban and rural areas respectively).

**ECONOMY, AGRICULTURE AND FOOD SECURITY**

In 2013, the Gross Domestic Product (GDP) was US\$ 14 362 million and agriculture accounted for 7 percent of GDP. In 2013, total population economically active in agriculture is estimated at 208 000 inhabitants (17 percent of economically active population), of which 27 percent is female and 73 percent is male.

The agricultural sector has experienced numerous challenges resulting in a decline in output and direct contribution to GDP largely due to increased trade liberalization, competition and low productivity. But it represents a critical component of Jamaica's national development as an important contributor to GDP, employment, foreign exchange earnings and rural livelihoods. Due to an overall decline in public sector

activity, funding for agriculture is projected to be limited to those areas of public good, such as research for smallholder crops, regulatory controls, etc.

Most of the foreign exchange in Jamaica is from tourism, remittances, and bauxite/alumina mining.

Jamaica has greater resilience and potential for food security than most other Caribbean Small Island Developing States (SIDS) as local substitutes for imported staples are widely produced and farmers have implemented successful coping and adaptation mechanisms at the farm-level through damage reducing strategies.

The top imported foods in 2011 by quantity include maize, wheat, soybeans cake, non-alcoholic beverages, and raw sugar. The top exports from Jamaica include raw sugar, barley beer, alcoholic beverages, and non-alcoholic beverages. The main traditional export crops include sugar, bananas, coffee, citrus, cocoa and pimento.

The major trade agreements impacting agriculture include the European Partnership Agreement (EPA), the Caribbean-Canada Trade Agreement (CARIBCAN), the Caribbean Basin Initiative (CBI), and the Caribbean Single Market Economy (CSME).

Large farms are generally located on the plains while small farmers occupy the hillsides.

## WATER RESOURCES

### Surface water and groundwater resources

About 52 percent of the average annual rainfall is lost to evapotranspiration. The internal renewable water resources (IRWR) are 10 823 million m<sup>3</sup>/year with 9 111 and 5 472 million m<sup>3</sup>/year for surface water and groundwater respectively and the overlap between surface water and groundwater (baseflow) being 3 760 million m<sup>3</sup>/year (Table 2).

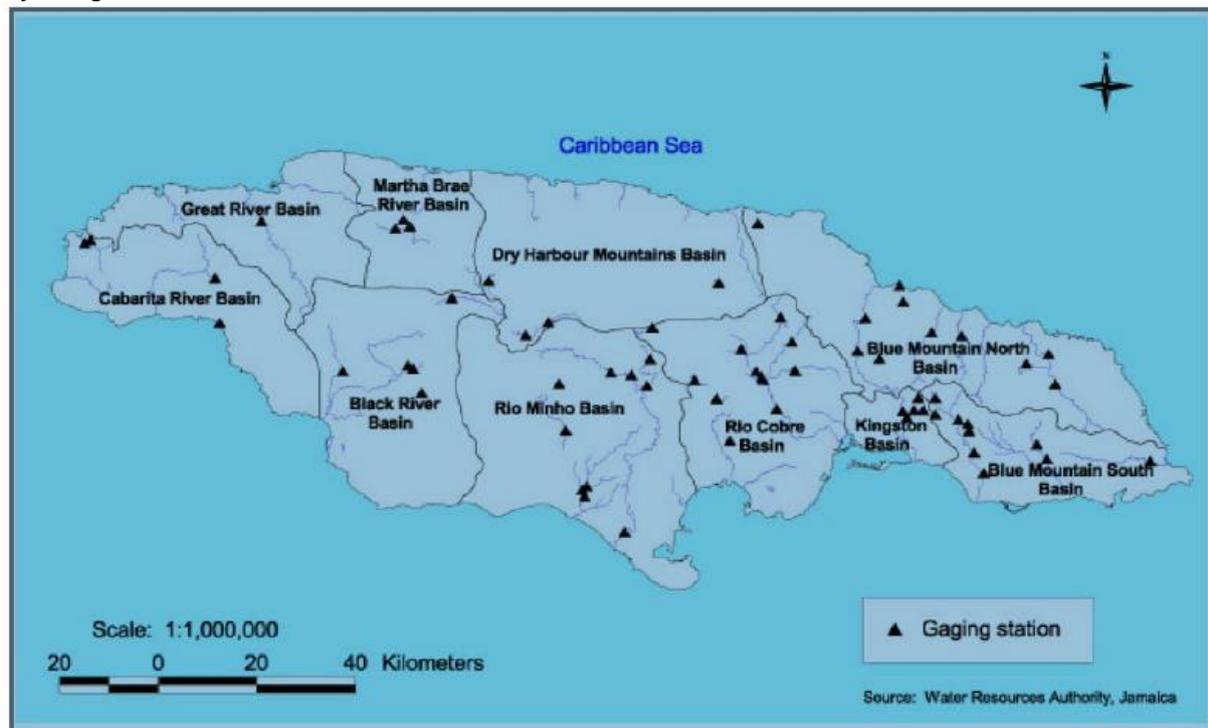
TABLE 2  
Renewable water resources

Renewable freshwater resources:			
Precipitation (long-term average)	-	2 051	mm/year
	-	22 540	million m <sup>3</sup> /year
Internal renewable water resources (long-term average)	-	10 823	million m <sup>3</sup> /year
Total actual renewable water resources	-	10 823	million m <sup>3</sup> /year
Dependency ratio	-	0	%
Total actual renewable water resources per inhabitant	2013	3 888	m <sup>3</sup> /year
Total dam capacity	2014	5.5	million m <sup>3</sup>

The central mountain ranges divide the catchment areas for rivers which drain either to the north or to the south coasts. Surface runoff predominates on outcrops of basement rocks and interior valley alluviums, whereas groundwater is the dominant water resource associated with the karstic limestone and coastal alluviums. The surface water resources are characterized by a marked seasonal variability in flow. Streams flowing northward originate mainly in the tertiary limestone. These are mostly perennial rivers, like the Martha Brae and White rivers, with significant baseflow components and low seasonal flow variability. Exceptions are the Great river and several rivers in the Blue Mountains basin which, like many of the south draining rivers, are characterized by widely varying seasonal flows and comparatively low baseflow. Some of the catchments consist of cretaceous volcanoclastic of low permeability.

Jamaica is subdivided into ten major hydrological basins. The basins are further subdivided into 26 watershed management units (WMU). The WMUs and basins are presented in Figure 2.

FIGURE 2  
Hydrological basins



Almost 40 percent of the IRWR are considered exploitable or reliable, defined as daily flow exceeded during 90 percent of the time for surface water and quantity of water which can be withdrawn over a long period without impairing the limestone and alluvial aquifers as a water source or causing contamination by seawater intrusion for groundwater. About 20 percent from the limestone aquifer are developed through wells, mainly in the Río Cobre and Río Minho. However, in other basins, the water is generally available as base flow and is exploitable through run-of-river developments.

In 2000, desalinated water produced was estimated at 0.5 million m<sup>3</sup>.

The National Water Commission (NWC) collects wastewater and sewage from over 600 000 customers across the country. Wastewater is treated and used for irrigation, but this data is not currently being collected.

Approximately 23 percent of the rural population relies on rainwater harvesting via roof collection. The NWC and Local Parish Councils manage 353 public rainwater harvesting catchment tanks. In 2003, 15.3 percent of the population used rainwater harvesting as a water source.

#### Lakes, dams and wetlands

There are two major raw water storage facilities, both located in Saint Andrew. The Mona reservoir, with intakes at the Hope and Yallahs rivers, has a storage capacity of 3.67 million m<sup>3</sup>. The Hermitage Reservoir, with intakes at Ginger river and Wag/Morsham river, has a storage capacity of 1.78 million m<sup>3</sup>.

Jamaica is party to the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention). Three sites in Jamaica have been designated as Ramsar sites: Black River Lower Morass, Palisadoes Port Royal, and Portland Bight Wetlands and Cays.

## WATER USE

In 2007 total water withdrawal was estimated at 812 million m<sup>3</sup> of which 448 million m<sup>3</sup> (55 percent) for agriculture, 288 million m<sup>3</sup> (35 percent) for municipalities and 76 million m<sup>3</sup> (10 percent) for industries (Figure 3 and Table 3). In addition, it is said that around 903 million m<sup>3</sup>/year needs to be reserved for the environment.

FIGURE 3  
**Water withdrawal by sector**  
 Total 812 million m<sup>3</sup> in 2007

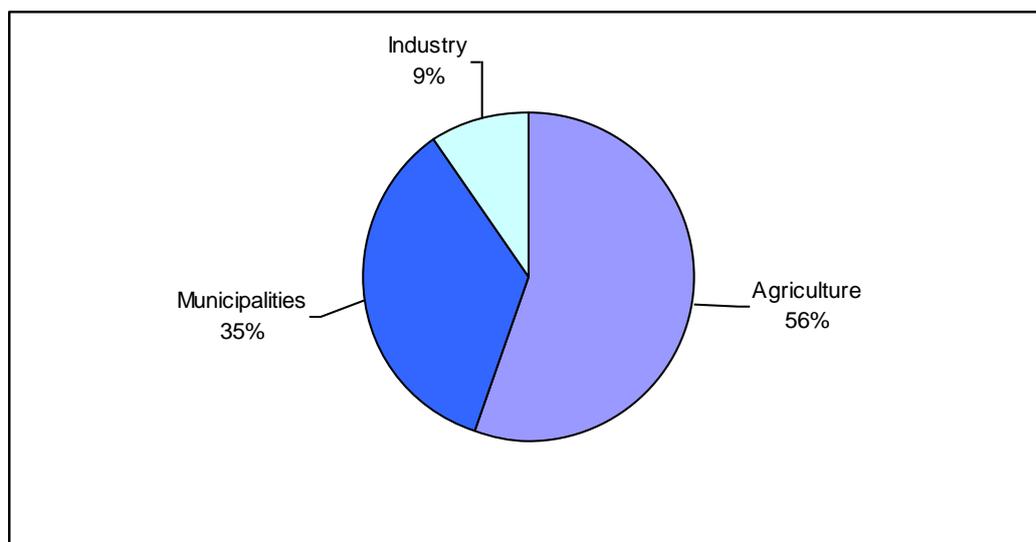


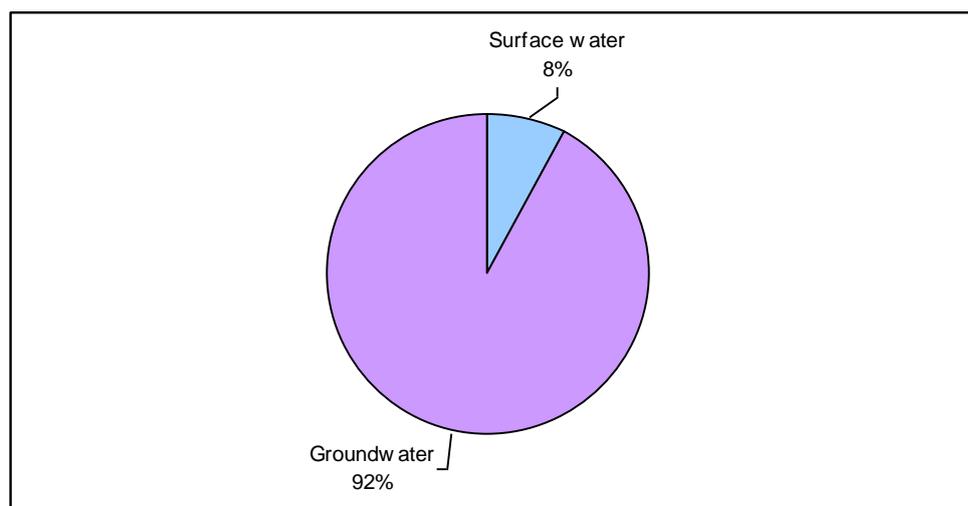
TABLE 3  
**Water use**

<b>Water withdrawal:</b>			
Total water withdrawal	2007	812	million m <sup>3</sup> /year
- Agriculture (Irrigation + Livestock + Aquaculture)	2007	448	million m <sup>3</sup> /year
- Municipalities	2005	288	million m <sup>3</sup> /year
- Industry	2005	76	million m <sup>3</sup> /year
• Per inhabitant	2007	300	m <sup>3</sup> /year
Surface water and groundwater withdrawal (primary and secondary)	2007	811.5	million m <sup>3</sup> /year
• As % of total renewable water resources	2007	8	%
<b>Non-conventional sources of water:</b>			
Produced municipal wastewater	-	-	million m <sup>3</sup> /year
Treated municipal wastewater	-	-	million m <sup>3</sup> /year
Direct use of treated municipal wastewater	-	-	million m <sup>3</sup> /year
Direct use of agricultural drainage water	-	-	million m <sup>3</sup> /year
Desalinated water produced	2000	0.5	million m <sup>3</sup> /year

In 1993, about 92 percent of the water was withdrawn from groundwater sources and the remainder from surface water (Figure 4). However, use of groundwater for irrigation has high operation costs, and many irrigation well fields on the south coast have high salinity issues. Surface water is therefore imported from the Yallahs river of the Blue Mountain South basin to meet the domestic demands of the Kingston Metropolitan Area. The alluvial and limestone aquifers are widely tapped for irrigation supply.

The maximum agricultural water demands are in the Rio Cobre and Rio Minho basins, which account for about 71 percent and 89 percent of the total demand in these basins.

FIGURE 4  
Water withdrawal by source  
Total 928 million m<sup>3</sup> in 1993



## IRRIGATION AND DRAINAGE

### Evolution of irrigation development

According to the National Irrigation Development Plan (NIDP), areas suitable for irrigation have been classified into three land categories: (1) lands which may be irrigated with all common irrigation techniques; (2) lands suited only to sprinkler and localized irrigation techniques; (3), lands with generally steep slopes (>10 percent) and thin soils, which are productive with careful management of the limitations and responsive to manual irrigation. This third category applies mainly to small hillside farmers. From this analysis 90 811 ha were classified as Category 1 and 2, while 97 095 ha were classified as Category 3. These categories do not take water resources into account.

Irrigation has always played a significant role in the island's agriculture, and the need to continuously improve irrigation practices has long been recognized. Over the years some of the improvements which have been made have included channel lining and utilization of closed pipes in order to improve conveyance efficiencies, the use of water measuring techniques to encourage improved management, and the use of overnight storage facilities. In 1997, about 25 220 ha were irrigated.

In 2010, the area equipped for irrigation is estimated at 30 682 ha. Surface irrigation accounts for 23 012 or 75 percent, sprinkler irrigation for 5 216 ha or 17 percent and drip irrigation for 2 454 ha or 8 percent (Table 4 and Figure 5).

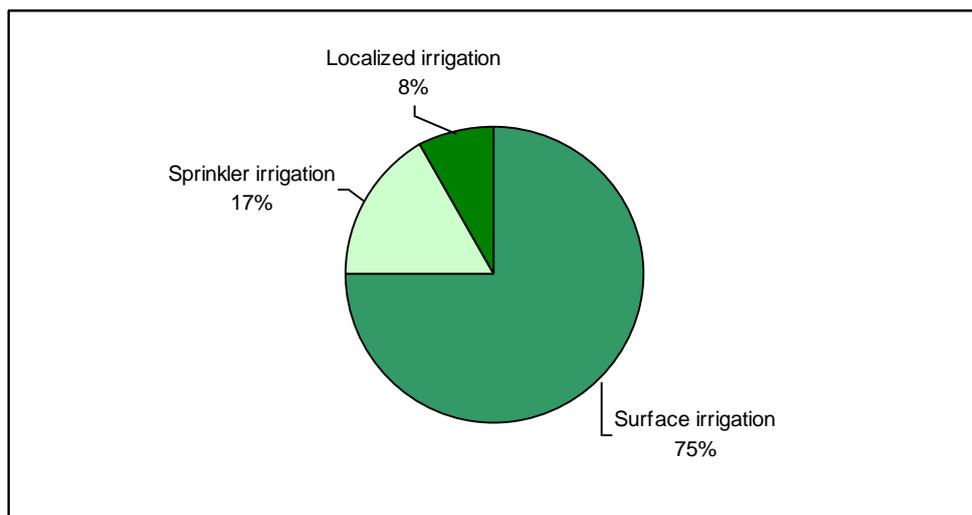
Public irrigation systems managed by the National Irrigation Commission (NIC) cover approximately 50 percent of the total area equipped for irrigation, commercial estates and private individual systems the other 50 percent.

The NIC is responsible for operating and maintaining delivery systems for six public districts: Rio Cobre, Saint Dorothy, Mid-Clarendon, Hounslow, Braco and Yallahs. The networks consist of open canals and pressurized pipelines. Water is abstracted from river diversions, small storage reservoirs and deep wells. In the private sector, in addition to sugar estates in Saint Catherine which receive much of their irrigation water from NIC, there are several commercial estates which have implemented their own irrigation systems. Many farmers with small holdings in most parishes irrigate vegetables or fruit trees using their domestic water supply or from local surface sources or springs or stored precipitation. In general, irrigation in Jamaica is characterized by low efficiencies and significant wastage of water.

TABLE 4  
Irrigation and drainage

<b>Irrigation potential</b>	-	188 000	ha
<b>Irrigation:</b>			
1. Full control irrigation: equipped area	2010	30 682	ha
- Surface irrigation	2010	23 012	ha
- Sprinkler irrigation	2010	5 216	ha
- Localized irrigation	2010	2 454	ha
• Area equipped for full control irrigation actually irrigated	2010	30 682	ha
- As % of area equipped for full control irrigation	2010	100	%
2. Equipped lowlands (wetland, ivb, flood plains, mangroves)	-	0	ha
3. Spate irrigation	-	0	ha
<b>Total area equipped for irrigation (1+2+3)</b>	<b>2010</b>	<b>30 682</b>	<b>ha</b>
• As % of cultivated area	2010	14	%
• % of area irrigated from surface water	-	-	%
• % of area irrigated from groundwater	-	-	%
• % of area irrigated from mixed surface water and groundwater	-	-	%
• % of area irrigated from non-conventional sources of water	-	-	%
• Area equipped for irrigation actually irrigated	2010	30 682	ha
- As % of total area equipped for irrigation	2010	100	%
• Average increase per year	1997-2010	2	%
• Power irrigated area as % of total area equipped for irrigation	-	-	%
4. Non-equipped cultivated wetlands and inland valley bottoms	-	0	ha
5. Non-equipped flood recession cropping area	-	0	ha
<b>Total agricultural water-managed area (1+2+3+4+5)</b>	<b>2010</b>	<b>30 682</b>	<b>ha</b>
• As % of cultivated area	2010	14	%
<b>Size of full control irrigation schemes: Criteria:</b>			
Small schemes	< - ha	-	ha
Medium schemes	> - ha and < - ha	-	ha
Large schemes	> - ha	-	ha
Total number of households in irrigation	-	-	
<b>Irrigated crops in full control irrigation schemes:</b>			
Total irrigated grain production	-	-	metric tons
• As % of total grain production	-	-	%
<b>Harvested crops:</b>			
Total harvested irrigated cropped area	2010	30 682	ha
• Temporary crops: total	2010	20 682	ha
- Vegetables	2010	8 682	ha
- Sugarcane	2010	12 000	ha
• Permanent crops: total	2010	10 000	ha
- Bananas	2010	2 000	ha
- Citrus	2010	8 000	ha
Irrigated cropping intensity (on full control area actually irrigated)	2010	100	%
<b>Drainage - Environment:</b>			
Total cultivated area drained	-	-	ha
• Non-irrigated cultivated area drained	-	-	ha
• Area equipped for irrigation drained	-	-	ha
- As % of total area equipped for irrigation	-	-	%
Area salinized by irrigation	-	-	ha
Area waterlogged by irrigation	-	-	ha

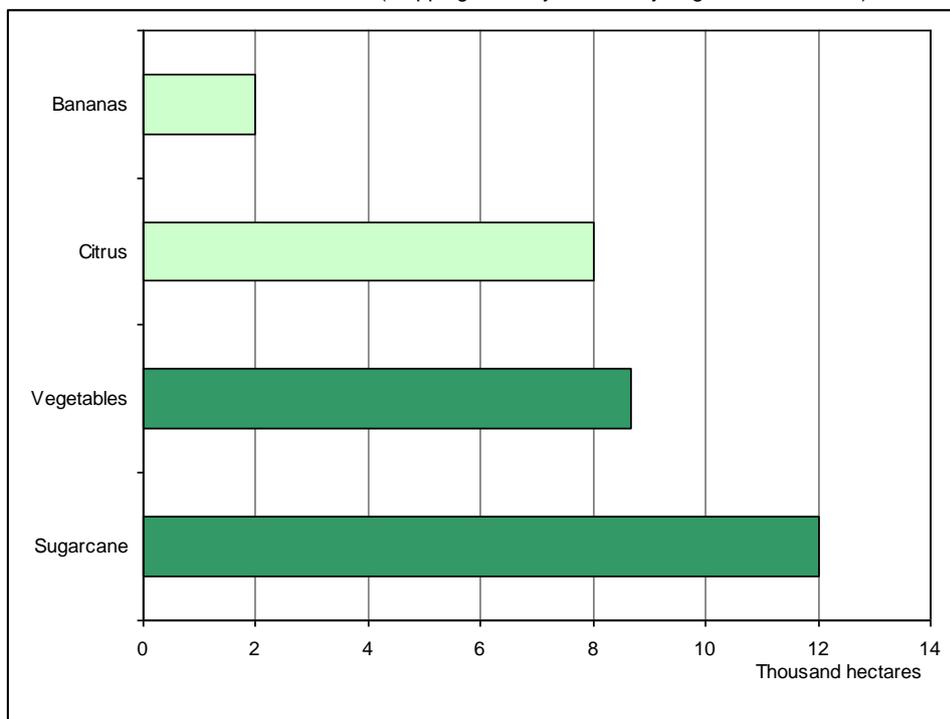
**FIGURE 5**  
**Irrigation techniques on area equipped for full control irrigation**  
 Total: 30 682 ha in 2010



**Role of irrigation in agricultural production, economy and society**

In 2010, the harvested irrigated crop area covered 30 682 ha, giving an irrigated cropping intensity of 100 percent. Of the total harvested irrigated crop area, 12 000 ha or 39 percent were sugarcane, 8 682 ha or 28 percent vegetables, 8 000 ha or 26 percent citrus and 2 000 ha or 7 percent bananas (Table 4 and Figure 6).

**FIGURE 6**  
**Irrigated crops on area equipped for full control irrigation**  
 Total harvested area 30 682 ha in 2010 (cropping intensity on actually irrigated area: 100%)



Irrigated sugarcane is mainly on public schemes using surface irrigation, whereas private schemes favour more high valued crops (e.g. banana and vegetables) and systems with higher efficiencies such as localized and sprinkler irrigation. It should be noted that non-irrigated crops such as coffee, cocoa, and pimento are also important to the economy.

Based on an analysis of 51 projects undertaken under the NIDP, the average construction cost of irrigation schemes was estimated to be US\$4 785/ha, with a range from US\$943/ha to US\$20 450/ha. The average operations and maintenance cost was estimated to be US\$740/ha, with a range from US\$13/ha to US\$1 714/ha.

### Women and irrigation

Women remain in secondary farming roles in Jamaica. However, some efforts have been done to improve the participation of women in agriculture including the irrigation sector.

The Caribbean Policy Development Centre (CPDC), with the support of UN Women, has led a project focused on women agricultural producers' role in sustainable development in Jamaica that aims to reduce women's lack of access to resources. The project includes training for women in the use of technologies to improve irrigation and other water-management strategies (UN Women, 2014).

The National Irrigation Commission has undertaken projects in 6 irrigation communities including gender issues (NIC, 2009).

The National Irrigation Development Program (NIDP), that started in 2005, has many positive social benefits that increases the economic and social welfare of women. They benefit from leadership training, cropping and increased production knowledge and marketing skills, resulting in increased income equality and independence.

## WATER MANAGEMENT, POLICIES AND LEGISLATION RELATED TO WATER USE IN AGRICULTURE

### Institutions

The main agencies responsible for water resources management, especially relating to the agricultural sector, are:

- National Irrigation Commission (NIC): Responsible for the planning, management, operation, and maintenance of irrigation systems.
- Water Resources Authority (WRA): Responsible for the management, protection, and controlled allocation and use of water resources. The WRA provides water abstraction licenses and maintains a surface water and groundwater monitoring database.
- Ministry of Agriculture and Fisheries (MOAF): Responsible for advancing the development of a modern, efficient, and internationally competitive agricultural sector, sustainable management of fisheries, and promotion of food security and food safety.
- National Environment and Planning Agency (NEPA): Responsible for monitoring water quality under its Watershed Branch.
- Ministry of Water, Land, Environment and Climate Change (MWLECC): Formed in 2012, this ministry is responsible for the formulation and implementation of policy relating to water, land, environment and climate change.
- Office of Utilities Regulation (OUR): Established in 1995 to regulate the operations of utility companies. They set the tariffs of irrigation and drainage systems.
- National Water Commission (NWC): Responsible for providing high quality potable water and wastewater services. The provision of rural water is shared between NWC and Parish Councils.
- Water Users Associations (WUAs): Organize private farmers into self - governing units which manage an irrigation system through democratic processes. The NIC develops the WUAs until they are operational and self - sufficient.
- Rural Agricultural Development Authority (RADA): A Memorandum of Understanding between NIC and RADA was established to provide technical assistance to farmers under the NIDP.

## Water management

Integrated water resources management is being incorporated into the national Water Sector Policy as a part of the GOJ's Vision 2030 National Development Plan.

The MOAF's Production and Productivity Programme aims to improve best management practices among groups of farmers, including incorporating drip irrigation systems integrated with the use of black tanks.

## Finances

Agricultural financing can be accessed through the Development Bank of Jamaica via the Peoples Cooperative Banks and other financial intermediaries. The Government of Jamaica (GOJ), Caribbean Development Bank (CDB), and Inter - American Development Bank (IDB) have embarked on funding for several irrigation projects under the National Irrigation Development Plan. The plan includes increasing access for loans and grant funding to farmers to upgrade farms inclusive of small - scale irrigation systems, as well as to expand irrigation services in major agricultural production areas.

FAO has provided funding to establish a rainwater harvesting project in Jamaica, consisting of 11 pilot projects in South Saint Elizabeth and Manchester.

## Policies and legislation

The following laws and policies are key in water resources management:

- The *National Water Commission Act (1963)* establishes the National Water Authority for the performance of functions relating to the supply of water.
- The *Water Resources Development Master Plan (1990)*, developed and enforced by WRA, defines the resources, supply and demand at the hydrologic basin level. An update to this master plan was drafted in 2005.
- The *Water Resources Act (1995)* provides for the management, protection, and controlled allocation and use of water resources in Jamaica. It also provides for water quality control. It establishes the formation and functions of a Water Resources Authority (WRA).
- The *Office of Utilities Regulation Act (1995)* repeals the Public Utility Commission Act and makes new provisions with regards to the supervision of utility services.
- The *National Irrigation Development Plan (1998)* assessed the state of the irrigated agricultural sector, identified and prioritized projects for implementation, proposed the establishment of Water Users' Associations (WUAs) to increase farmer participation, and proposed strategies for making NIC self-sustainable. The NIDP was used by the GOJ as a basis for future irrigation developments.
- The *National Watershed Policy (2003)* is administered by the NEPA. The policy guides watershed management by developing a legislative and institutional framework, identifying financing options, and encouraging initiatives for proper land use.
- The *Jamaica Water Sector Policy (2004)* was administered by the Ministry of Water and Housing, now the MWLECC. It describes the current situation, objectives, and implementation and strategy plans for the various sectors in water resource management including urban water and sewerage, rural water and sanitation, urban drainage, and irrigation. The *Draft Water Sector Policy (2014)* updates the 2004 policy in light of the objectives of the Vision 2030 Jamaica – National Development Plan. Major additions include the commitment to Integrated Water Resources Management (IWRM) to improve climate change resilience. It updates coverage and quality targets, and encourages private sector involvement in all service areas of the water sector where applicable. It will be administered by MWLECC.

## ENVIRONMENT AND HEALTH

Groundwater sources are becoming polluted due to the bauxite-alumina industry, saline intrusion in production wells in the southern plains, and excessive nitrates due to improper sewage disposal, especially in Kingston.

Waterlogging, salinity, disruption of water tables and damage to the natural environment and water supply systems are some of the consequences of irrigation. Many farmers do not follow best management practices related to pesticides management, fertilizer application, slope management, soil conservation, etc. Though, the use of pesticides has been reducing since 2006. This can be due to either more environmentally friendly farming practice, or reduced agricultural area being cultivated. Fertilizer imports have also decreased since 2008.

Climate change impacts are already being observed in the Jamaican agricultural sector, resulting in lower yields due to the prevalence of more pests and diseases. Coffee and banana production have faced many extreme weather events during the past years, mainly hurricanes, which have destabilized the agricultural industry and caused declining productivity and crop damage. A significant contributing factor to vulnerability is land degradation due to the use of unsuitable farming techniques.

## PROSPECTS FOR AGRICULTURAL WATER MANAGEMENT

Future trends are projected for water demand to increase in total as well as for the agricultural sector. Plans are continuing to implement the 51 irrigation projects under the NIDP. Alternative technologies for water supply are also being investigated.

Steps to identify funding sources, expand irrigation systems, and construct and operate new systems will continue. The focus of the NIC is planned to shift to partnerships between NIC and private firms, or have a private operator build and operate the irrigation scheme directly. Cost recovery efforts will include increasing the collection rate, improving operational efficiency, and moving tariffs toward cost recovery as much as possible.

Major coping strategies suggested in the FAO report “Climate change and agriculture in Jamaica: agricultural sector support analysis” include enhancing irrigation water use efficiency to reduce overall water use requirement.

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