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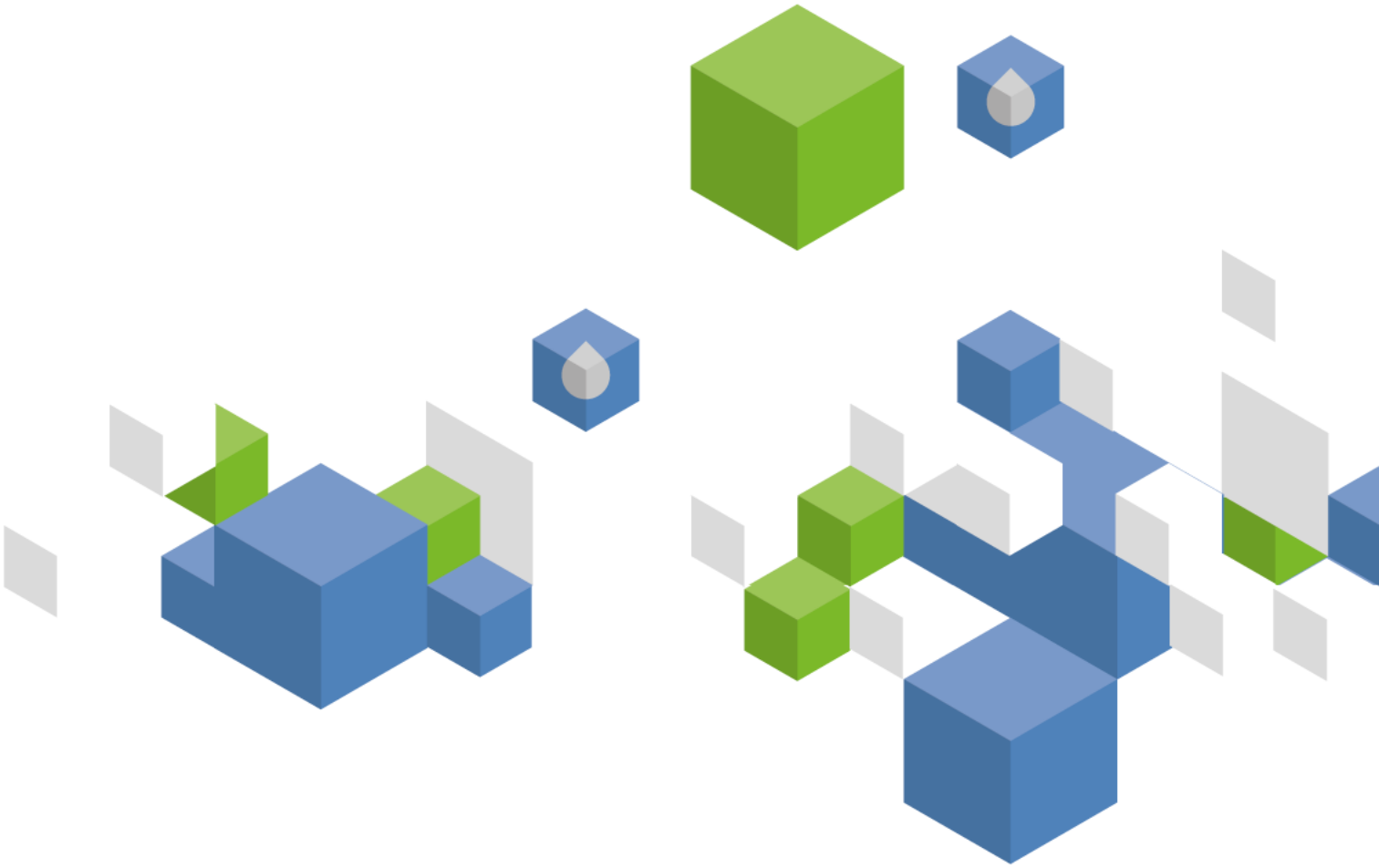

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Saint Kitts and Nevis

GEOGRAPHY, CLIMATE AND POPULATION

Geography

The Federation of St. Kitts and Nevis comprises two relatively small islands, located about 100 km west of Antigua and Barbuda. The total area of the country is 260 km^2, of which Saint Kitts accounts for 170 km^2 and Nevis accounts for 90 km^2. The twin island Federation is located between latitudes 17º10'N and 17º7º25'N and longitudes 62ºW and 63ºW, and is part of the Leeward Island group of the Eastern Caribbean.

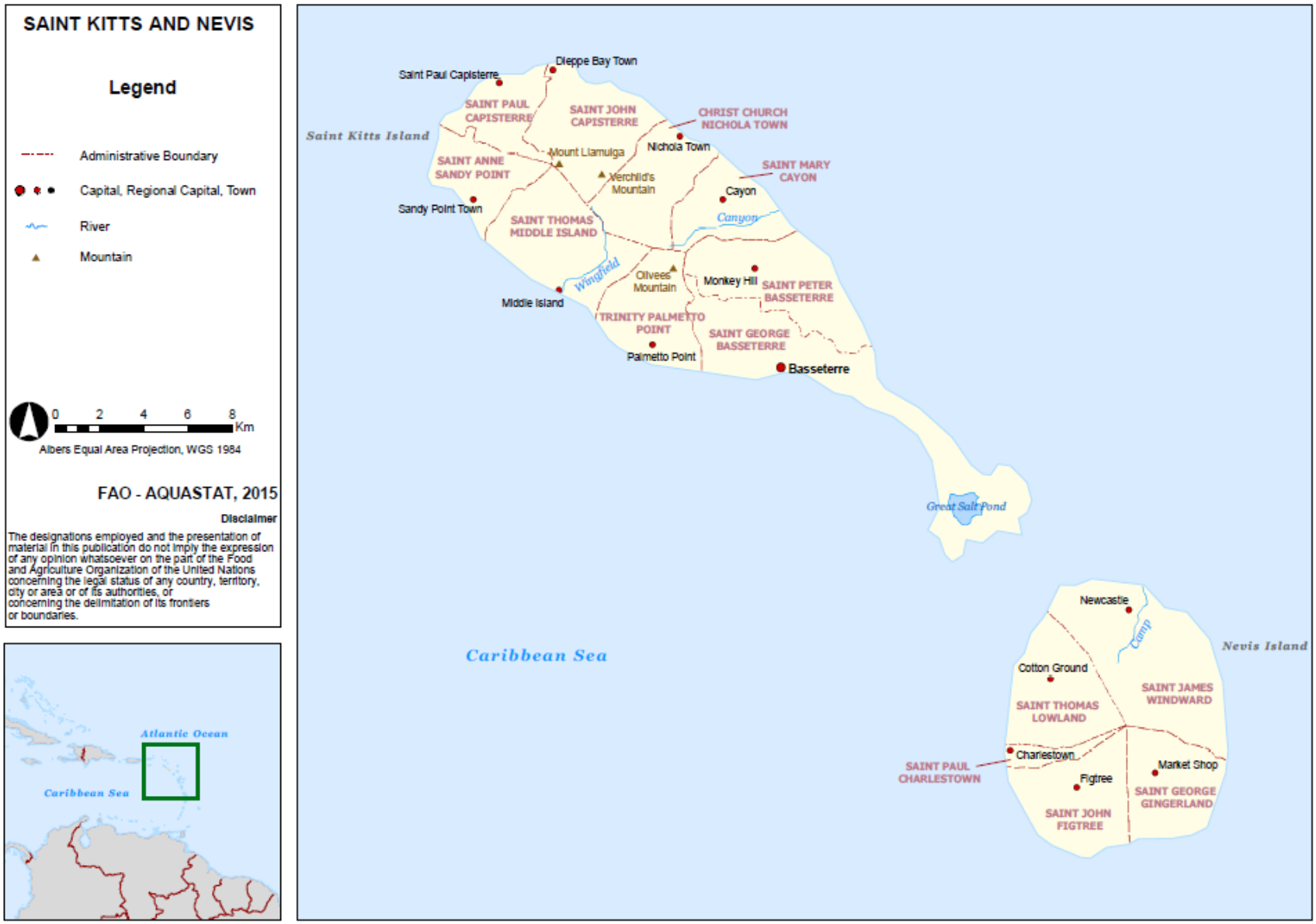
Saint Kitts and Nevis is politically divided into 14 parishes. The capital is Basseterre.

In 2012, the total physical cultivated area was estimated at 5 100 ha, of which 98 percent (5 000 ha) consisted of temporary crops and 2 percent (100 ha) of permanent crops. Permanent meadows and pasture cover 900 ha, which brings to total agricultural area to 6 000 ha (Table 1).

TABLE 1
Basic statistics and population

Physical areas:			
Area of the country	2012	26 000	ha
Agricultural land (permanent meadows and pasture + cultivated land)	2012	6 000	ha
• As % of the total area of the country	2012	23	%
• Permanent meadows and pasture	2012	900	ha
• Cultivated area (arable land + area under permanent crops)	2012	5 100	ha
- As % of the total area of the country	2012	20	%
- Arable land (temp. crops + temp. fallow + temp. meadows)	2012	5 000	ha
- Area under permanent crops	2012	100	ha
Population:			
Total population	2013	54 000	inhabitants
- Of which rural	2013	69	%
Population density	2013	208	inhabitants/km^2
Population economically active	2013	24 000	inhabitants
• As % of total population	2013	44	%
• Female	2013	42	%
• Male	2013	58	%
Population economically active in agriculture	2013	5 000	inhabitants
• As % of total economically active population	2013	21	%
• Female	2013	20	%
• Male	2013	80	%
Economy and development:			
Gross Domestic Product (GDP) (current US$)	2013	743	million US$/year
• Value added in agriculture (% of GDP)	2012	2	%
• GDP per capita	2013	13 760	US$/year
Human Development Index (highest = 1)	2013	0.750	-
Gender Inequality Index (equality = 0; inequality = 1)	-	-	-
Access to improved drinking water sources:			
Total population	2012	98	%
Urban population	2012	98	%
Rural population	2012	98	%

FIGURE 1
Map of Saint Kitts and Nevis



Land above the 305 m above sea level is designated as the forest reserve where no development is permitted. The large southeastern peninsula is primarily covered with scrub vegetation, while the remaining low elevation landscape is made up of rock areas, salt ponds and beaches. Mid-level elevations are characterized by mixed uses, including grazing, farming of food and tree crop and abandoned sugarcane farms.

The physical landscape of Saint Kitts is characterized by three volcanic centres: (i) Northwest Range, dominated by Mount Liamuiga (1 156 m); (ii) Middle Range, consisting of a number of irregular related peaks dominated by Verchild's Mountain (975 m); (iii) Southeast Range, which also consists of a number of irregular related peaks, Olivees Mountain being the highest (900 m).

Climate

Both islands have a tropical climate influenced mainly by the northeast trade winds of the Inter-tropical Convergence Zone. The average annual rainfall of the country is 1 427 mm. The average rainfall in Saint Kitts is 1 625 mm, varying from about 890-1 000 mm along the coast to about 2 500-3 800 mm in the central mountain ranges. Average rainfall in Nevis is a bit lower. Generally, rainfall is unevenly distributed between years and between months, but there is a reliable wet period from September to November and a dry period from January to April.

Seasonal and diurnal variations in temperature are small. Mean temperature in summer months is around 26-27ºC, dropping by only a few degrees to 24-25ºC in the cooler months of December to February.

Population

In 2013, the total population was about 54 000 inhabitants, of which around 69 percent was rural (Table 1).

About 78 percent of the population lives on the island of Saint Kitts and 22 percent on the island of Nevis. The majority lives near the coastline, as the interior tends to be extremely rugged and steep. About 40 percent of the population of Saint Kitts lives in or around the capital Basseterre, located on the coast. The population density is 208 inhabitants/km^2. The average annual population growth rate in the 2003-2013 period has been estimated at 0.7 percent.

In 2012, 98 percent of the total population had access to improved water sources. In 2007, 87 percent of the total population had access to improved sanitation.

ECONOMY, AGRICULTURE AND FOOD SECURITY

In 2013, the gross domestic product (GDP) was US$ 743 million. In 2012, agriculture accounted for 2 percent of GDP, while in 1992 it accounted for 7 percent. In 2013, total population economically active in agriculture is estimated at 5 000 inhabitants (21 percent of economically active population), of which 20 percent is female and 80 percent is male.

Sugarcane was the main export crop up until 2005 when the sugar industry was closed down, the moment its production accounted for only 5 percent of the GDP (a drop of 68 percent in 24 years). Since then, the travel and tourism sector has become the main economic activity. In 2011, tourism contributed directly 8 percent to GDP and indirectly 28 percent, and similar percentages of direct and indirect employment respectively. The islands still carry on small-scale production of crops, including rice, yams, bananas and cotton.

Agriculture on both islands is mainly rainfed. Approximately 80 percent of the land on Saint Kitts is owned by the government; while on Nevis 70 percent of the land is under private ownership. In Nevis the Ministry on Agriculture reports that 162 ha are under fruit trees and there are 202 ha of pasture land for livestock and temporary crop including vegetables. Only two government farms exist on Nevis with

a total of 500 ha. Most agricultural production takes place at lower elevation, while land at mid-level elevation is dominated by housing and other infrastructural developments. In Nevis, vegetables and root crops are cultivated on a subsistence basis and some cotton is grown for export. The livestock sector includes cattle, small ruminants and pigs.

WATER RESOURCES

Surface water and groundwater resources

Annual average surface water resources are estimated at 3.6 million m^3 and groundwater resources at 20 million m^3. Considering no overlap between surface water and groundwater resources, the total renewable water resources are estimated at 23.6 million m^3 (Table 2).

TABLE 2
Renewable water resources

Renewable freshwater resources:			
Precipitation (long-term average)	-	1 427	mm/year
	-	371	million m^3/year
Internal renewable water resources (long-term average)	-	24	million m^3/year
Total renewable water resources	-	24	million m^3/year
Dependency ratio	-	0	%
Total renewable water resources per inhabitant	2013	444	m^3/year
Total dam capacity	-	-	million m^3

Most of the rivers of the country no longer have year-round flows. Small rivers flow from the mountain ranges in the wet season, drying up partially or completely in the dry season. Two important seasonal rivers are the Wingfield and Cayon rivers on Saint Kitts, which during the wet seasons flow to the Caribbean Sea.

The main groundwater supply is from a coastal aquifer, with seven groundwater basins. The estimated safe yield is approximately 38 million litres or 38 000 m^3 per day. This figure, however, is now under discussion since the groundwater aquifers are being impacted on by sea level rise and will eventually be negatively impacted by saline intrusion due to climate change.

The Great Salt Pond on Saint Kitts is the largest lake in the country. Some small dams and structures have been made, with a total capacity of about 32 000 m^3.

WATER USE

Freshwater in Saint Kitts is available in three forms: springs, groundwater and desalination plants. There are seven springs, with an average total flow of approximately 9 000 m^3 per day, that are used supply five mainly independent water distribution systems. The rest of the freshwater supply is provided by a network of 30 wells which have a combined capacity of approximately 23 000 m^3 per day. Freshwater in Nevis is available from mountain springs, supplemented (seasonally) by water from several earthen dams.

According to the Water Services Department (WSD), in 2012 the total annual surface water produced was 4.26 million m^3 in Saint Kitts and 0.28 million m^3 in Nevis. Groundwater produced was 5.03 million m^3 in Saint Kitts and 2.48 million m^3 in Nevis. This gives a total of 12.05 million m^3, all referring to municipal water withdrawal, of which 37 percent surface water and 63 percent groundwater. The small irrigation area is estimated to withdraw about 0.2 million m^3 per year. While some of the water is coming from the public water supply, and therefore should be considered as municipal water withdrawal, most is considered to be being self-abstracted from the constructed tanks and therefore the amount has been put under agricultural water withdrawal. Desalinated water produced was estimated at 3.3 million m^3 in 2005 (UNEP/CEHI, 2006) (Table 3, Figure 2 and Figure 3).

TABLE 3
Water use

Water withdrawal:			
Total water withdrawal	2012	15.55	million m^3/year
- Agriculture (Irrigation + Livestock + Aquaculture)	2012	0.2	million m^3/year
- Municipalities	2012	15.35	million m^3/year
- Industry	2012	0	million m^3/year
• Per inhabitant	2012	288	m^3/year
Surface water and groundwater withdrawal (primary and secondary)	2012	12.25	million m^3/year
• As % of total actual renewable water resources	2012	51	%
Non-conventional sources of water:			
Produced municipal wastewater	-	-	million m^3/year
Treated municipal wastewater	-	-	million m^3/year
Direct use of treated municipal wastewater	-	-	million m^3/year
Direct use of agricultural drainage water	-	-	million m^3/year
Desalinated water produced	2005	3.3	million m^3/year

FIGURE 2
Water withdrawal by sector
Total 15.55 million m^3 in 2012

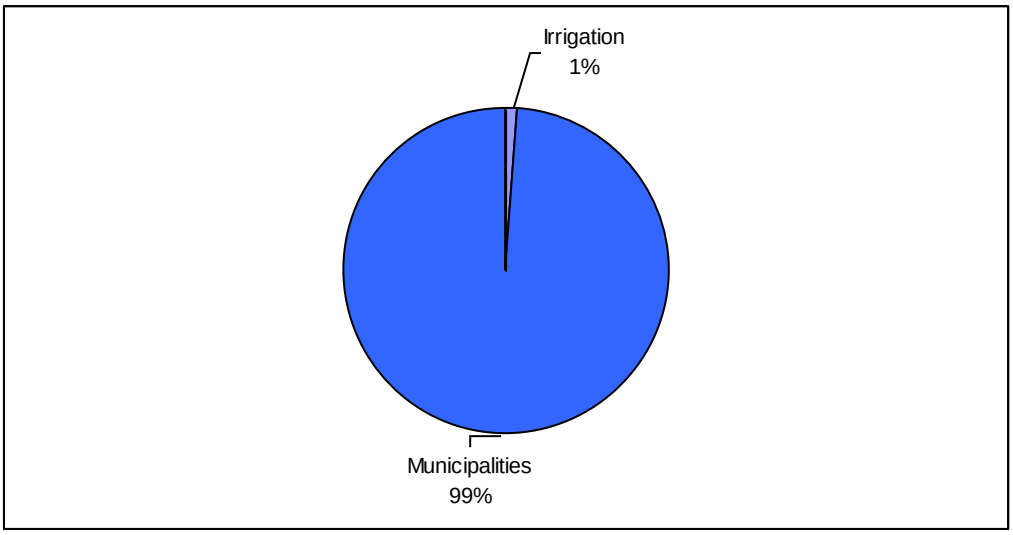
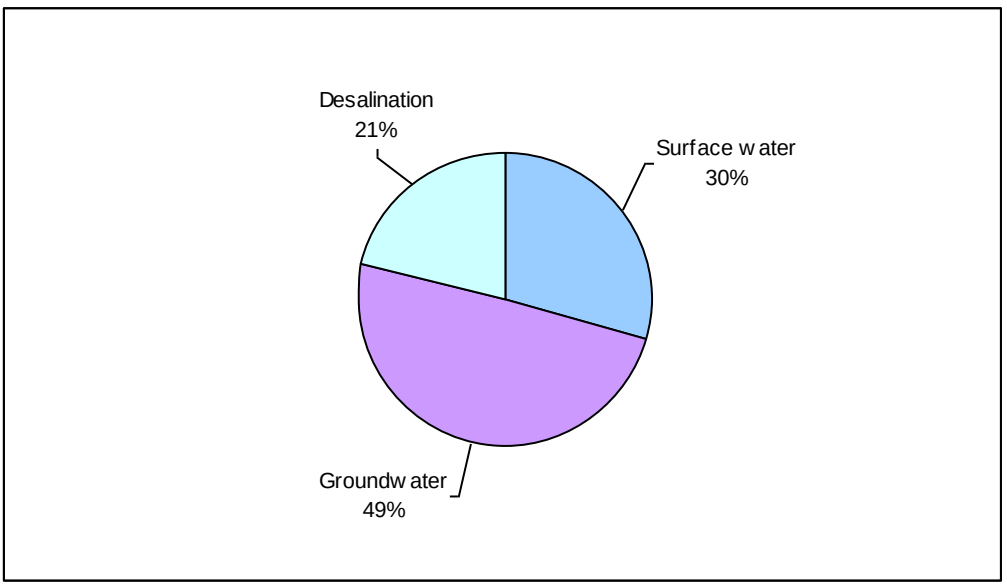


FIGURE 3
Water withdrawal by source
Total 15.55 million m^3 in 2012



There are five water distribution systems on Saint Kitts, which generally operate independently of each other. Some ability to divert water between them under various conditions, such as drought or emergency and for maintenance and repairs to the system, exists. The surface water systems include an intake structure, a distribution reservoir, and a distribution network. The five systems are:

1. Wingfield–St. Paul's (surface water and groundwater): serves the leeward towns and villages from Old Road to Dieppe Bay.
2. Basseterre (surface water and groundwater): serves the area west of Old Road, Basseterre and the surrounding areas including Frigate Bay, Stapleton and Conaree.
3. Lodge (groundwater): serves the Lodge area.
4. Cayon (surface water and groundwater): serves Cayon, Brighton, Keys, Stapleton and Monkey Hill areas.
5. Phillips (surface water and groundwater): serves windward villages from Molineux to Dieppe Bay.

The surface water provided to the capital Basseterre is supplied by the La Guerite water treatment plant which treats about 4 500 m^3 per day.

IRRIGATION AND DRAINAGE

Evolution of irrigation development

The irrigation potential is estimated at 200 ha considering on water resources and topography, of which 180 ha for Saint Kitts and 20 ha for Nevis (Table 4).

There has been limited experience of irrigation within the sugar industry. In the late 1970s and early 1980s the sugar manufacturing company utilized a rain gun, fed from a shallow well on one estate. In the case of vegetable production, a 3-ha vegetable production demonstration plot utilizing sprinkler irrigation was established on the same estate. The Caribbean Agricultural Research and Development Institute (CARDI) also undertook some experimental work. In 1997, the CARDI initiative utilized drip irrigation for a total of seven farmers on the islands.

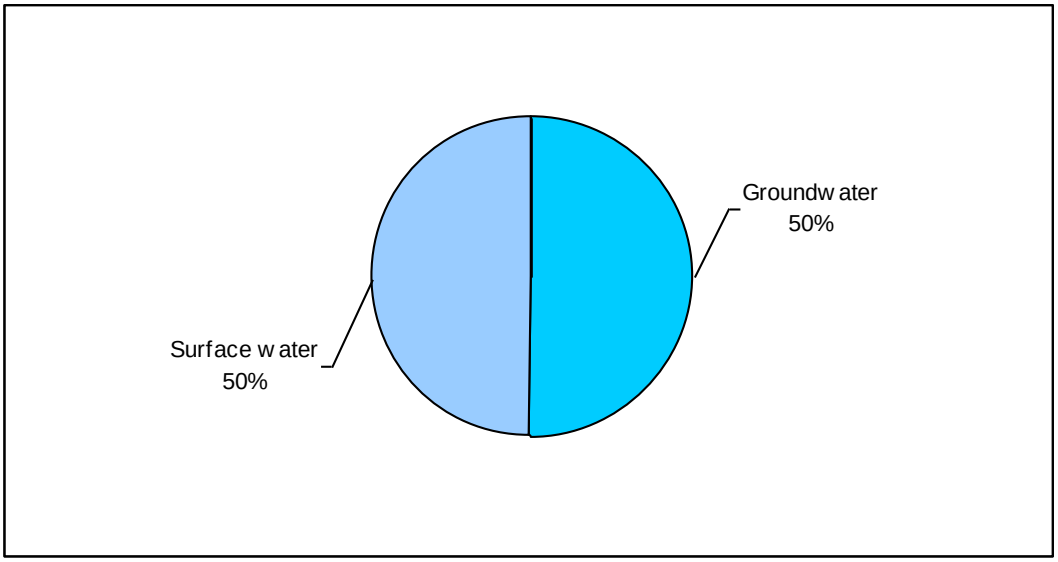
Generally, in Saint Kitts access to irrigation water is very limited, because vegetable production is carried out on the lower hillslopes. In 1997, some 8 ha were irrigated mainly on government demonstration plots and private farms using the municipal water supply. Also, the construction of tanks (average capacity 341 m^3) had been encouraged on some farms to extend the production season as far as possible. Since 1997, the construction of three intakes structures on some of the main rivers (permanent springs) has increase the volume of water available for farming in general. In Nevis, approximately 10 ha were irrigated in 1997, half from surface water and half from groundwater (Figure 4). Schemes were small and were operated by a total of eight households; 4.5 ha were privately-owned schemes, 2 ha were smallholder/government enterprises, and the remaining 3.5 ha were government schemes.

In 2012, approximately 25 ha are irrigated in the country, which accounts for 0.5 percent of the cultivated land. Most irrigated crops are vegetables.

TABLE 4
Irrigation and drainage

Irrigation potential		-	200	ha
Irrigation:				
1. Full control irrigation: equipped area		2012	25	ha
- Surface irrigation		-	-	ha
- Sprinkler irrigation		-	-	ha
- Localized irrigation		2012	25	ha
• Area equipped for full control irrigation actually irrigated			-	ha
- As % of area equipped for full control irrigation			-	%
2. Equipped lowlands (wetland, ivb, flood plains, mangroves)			-	ha
3. Spate irrigation			-	ha
Total area equipped for irrigation (1+2+3)		**2012**	**25**	**ha**
• As % of cultivated area		2012	0.5	%
• % of area irrigated from surface water		1997	50	%
• % of area irrigated from groundwater		1997	50	%
• % of area irrigated from mixed surface water and groundwater			-	%
• % of area irrigated from non-conventional sources of water			-	%
• Area equipped for irrigation actually irrigated			-	ha
- As % of total area equipped for irrigation			-	%
• Average increase per year		1997-2012	2	%
• Power irrigated area as % of total area equipped for irrigation			-	%
4. Non-equipped cultivated wetlands and inland valley bottoms			-	ha
5. Non-equipped flood recession cropping area			-	ha
Total agricultural water managed area (1+2+3+4+5)		**2012**	**25**	**ha**
• As % of cultivated area			0.5	%
Size of full control irrigation schemes:	**Criteria**:			
Small schemes	< - ha	-	-	ha
Medium schemes	> - ha and < - ha	-	-	ha
large schemes	> - ha	-	-	ha
Total number of households in irrigation		-	-	
Irrigated crops in full control irrigation schemes:				
Total irrigated grain production		2012	0	metric tons
• As % of total grain production		2012	0	%
Harvested crops:				
Total harvested irrigated cropped area		2012	25	ha
• Temporary crops: total		2012	25	ha
- Vegetables		2012	25	ha
• Permanent crops: total		2012	0	ha
Irrigated cropping intensity (on full control area actually irrigated)		2012	100	%
Drainage - Environment:				
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 4
Source of irrigation water on area equipped for irrigation
Total 18 ha in 1997



Women and irrigation

The Country Strategy Paper (2013-2015) for St. Kitts and Nevis projects increased output in agriculture on the basis of the provision of irrigation, mechanization of services and increase in facilities for product handling and storage. From a gender perspective the strategy has to go hand in hand with addressing other issues such as increasing land ownership for women, opening opportunities for the increased presence of women in protected agriculture; and addressing work-life balancing issues for women. The paper recommends, amongst others, to produce a road map to develop the agro-processing sector and address constraints such as the lack of water for irrigation and the slowness in technological adaptation, for example in greenhouse agriculture. This is now being addressed with plans to allocate green houses to more women, especially single women (CDB, 2014).

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

Institutions

Water resources management and development fall under the purview of the Water Services Department (WSD). There is no relevant legislation in place for the development of water for the agricultural sector. The Departments of Agriculture are responsible for coordinating efforts to develop the irrigation and drainage sector.

Water management

Water resources are vulnerable to sea level rise and temperature increase, leading to higher evaporation rates. Primarily the groundwater resources need to be maintained and protected. Adaptation measures would include: rational use of available water enforced by the national water authority; controlled rate of pumping from aquifers; conservation of protective forests that allows a high rate of infiltration of rainfall to the aquifers; protection of contamination of groundwater from pollution sources (UNDP, 2012).

An expanding tourism/hotel sector has the largest need for water supply. The WSD does not cater for irrigated agriculture, but has however accommodated the requests of some livestock owners. Because of the relatively high consumption and water scarcity situation, requests from crop farmers are rarely given consideration.

The Department of Agriculture, Saint Kitts, considers the lack of water for supplementary irrigation in the dry season as the major constraint to achieving one of its primary goals: year-round production of selected vegetables.

Constraints to water and irrigation development include:

- high cost of exploratory drilling
- high cost of irrigation development per unit area
- difference in altitude between farms and the groundwater aquifers near sea level
- small catchment areas, which limit the maximum size of reservoirs
- inaccessibility of mountain springs

Finances

Operational sustainability is contingent on the pricing of water services to recover full costs and investing the capital raised in operation and maintenance to provide improved service standards. This needs to be supported by the recognition that while water is a social good, it also has economic value and hence there needs to be greater effort at cost recovery. To achieve this there needs to be a better level of information, knowledge and understanding of water resources, the nature and extent of the demands on water resources, contributing conditions and the macro-economic and development context within which they are situated. Securing financing and investment is affected by government's high level of indebtedness and resultant difficulties in allocating resources in the national budget.

Policies and legislation

The Government of Saint Kitts and Nevis considers access to drinking water a basic human right and has therefore, to the extent that resources allow, implemented the following policies (GoSKN, 2004):

- Ensure that water-bearing aquifers are protected from pollution and that abstraction rates do not exceed natural rates of replenishment
- Ensure, through locational planning and control, that accessibility to safe piped water is maximized to all settlements year round
- Ensure protection of well-fields through effective development control and management

ENVIRONMENT AND HEALTH

Recent studies conducted in the Basseterre Valley Watershed have identified the following issues:

- A trend of declining static water levels in the Basseterre well field and early signs of salt water intrusion
- The potential for degradation of groundwater quality from domestic soak-away pits, agricultural pollution and industrial developments in the watershed
- Threats to the watershed recharge areas from improper land usage and insufficient development planning, leading to watershed degradation and deforestation
- Threats to the existing freshwater aquifer from climate change induced sea-level rise

The groundwater aquifers in the country are being impacted on by sea level rise and will eventually be negatively impacted by saline intrusion due to climate change.

Pressure for agricultural land has caused small farmers to clear forested plots along slopes for farming, causing deforestation, soil erosion and water pollution (UNDP, 2012).

PROSPECTS FOR AGRICULTURAL WATER MANAGEMENT

Maintaining the water system infrastructure to deliver clean and safe drinking water to customers is a great challenge for all public water system (PWS) operators. Much of the estimated 160 km of pipelines in Saint Kitts has been in service for decades and can be a significant source of water loss. In addition to physical loss of water from the distribution system, water can be "lost" through unauthorized consumption or theft, administrative errors, data handling errors, and metering inaccuracies or failure. A water loss control or reduction programme can help to locate and reduce these water losses and thus maintain or increase revenue for the PWS. Such programmes can also protect public health through reduction in potential entry points of disease-causing pathogens.

Demand for water will augment in the near future due to population increase and tourism demand, in particular the emerging golf sector. Frequent water demand analyses will need to be undertaken to determine the capacity of the Water Services Department to respond to the increased demand. The construction of desalination plants could help to cope with increasing demands (Ministry of Sustainable Development, 2007).

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