Community Profile and Livelihood Baseline Assesment

## **South Rivers**

St. Vincent and the Grenadines















# Acknowledgements

The Government of St. Vincent and the Grenadines would like to thank the funding project partners specifically the European Union (EU) and the Caribbean Development Bank (CDB) – Caribbean Disaster Risk Reduction Fund (CDRRF). Thanks also to the other contributing partners including the Food and Agriculture Organization of the United Nations (FAO) and Social Development Commission (SDC) of Jamaica and Social Development Department Livelihood Based Assessment (LBA) participants from the British Virgin Islands (BVI).

The success of this community profile and Livelihood Baseline Assessment (LBA) can only be attributed to the many individuals who contributed their valuable input toward the preparation of the document. Many thanks also to the residents as primary stakeholders within the community of South Rivers for their support, encouragement, and constructive criticisms in making this profile a success. Also, the community leaders who participated in the focus group discussion and accompanied the facilitators are the engagement the wider community in discussions across various locations.

Special thanks, to the Ministry of National Mobilisation, Social Development, Local Government, Gender Affairs, Family Affairs, Persons with Disabilities and Non-Governmental Organisations and its hard-working team of officers who worked tirelessly under adverse weather conditions to gather the primary data and complied the draft documents without which the profile development would not have been possible. It is also imperative to note the support from the Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, the National Emergency Management Organisation as well as the Basic Needs Trust Fund office.

**Suggested citation:** CDB (2022). *Preparation of Revised Livelihood Baseline Assessment Report: South Rivers, St. Vincent and the Grenadines.* Community Disaster Risk Reduction Fund. Caribbean Development Bank. St. Michael, Barbados.

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## **Executive Summary**

Pre-disaster information is always a key resource in post disaster response (which includes post disaster assessments). When disaster strikes, it is critical to know how many people are likely to have been affected by the event and how. This requires knowledge of the demographic breakdown of the population and the vulnerability of different people to the disaster. Vulnerability will determine how badly they will be affected, how quickly they can be expected to recover and what kinds of assistance they are likely to need.

In many instances however, pre-disaster planning focuses on immediate response and action to protect human life and infrastructure, but without giving sufficient attention to damage and loss to livelihoods. Yet in the post-disaster period, if people are to recover, they need to restore their livelihoods as quickly as possible. This can only happen if detailed and quantitative information has been collected in advance of potential disasters so that livelihood based contingency plans, can be created and planned for.

In 2019, the Livelihood Based Assessment and Contingency Planning approach was applied in St. Vincent and the Grenadines to provide pre-disaster livelihood information for eleven communities involved in the Volcano Ready Communities in St. Vincent and the Grenadines (VRC in SVG) project.

South Rivers is one of the communities that was included in this process and this report provides the Livelihood Baseline Assessment (LBA) information that resulted from the asessment process.

South Rivers is a rural community within the Colonaire Enumeration District. It is located on the North Eastern Side of St Vincent and the Grenadines. It is approximately eighteen (18) miles north of capital city Kingstown, at coordinates 13o 14' 0" North and 610 8' 0" West. The Village is mostly flat to gently sloping. It is bordered by Park Hill to the South, Colonaire to the East and Fuggerson Mountain to the North. The entire settlement spans just over thirty (30) acres of land.

According to the 2012 Population Census, the population for the entire division of Colonaire in 2012 was 6,849 persons of which 3,494 were males and 3,355 females. South Rivers itself had an estimated population of 1,127, comprising of 608 males and 519 females. These individuals occupy 332 households. The average household size was 2.9 persons. A socio-demographic overview of the community is presented in Chapter 3 while Chapter 4 provides an overview of the governance structure of the community.

Chapter 5 highlights levels of employment and the occupational groups in the Colonaire Census Division, as an indication of the economic profile of the community. Chapters 1 through 5 form the Community Profile for South Rivers.

Chapter 6 is a profile of the main hazards that impact the community most directly while Chapter 7 outlines the impact of the April 2021 volcanic eruption.

In Chapter 8, the outcome of the Livelihood Baseline Assessment is detailed and includes a profile of community livelihoods and resources. The focus is primarily on agricultural livelihoods. Chapter 9 looks at the type of coping strategies that are employed to deal with hazard impacts on agricultural livelihoods.

Chapter 10 outlines the key response typologies and contingency measures that should be put in place in the event of any disaster.

The Annexes present the damage and loss cost estimates for the agricultural assets, should a disaster occur, as well as the sources of information that were consulted.

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# Acronyms

BMC	Borrowing Member Countries				
BVI British Virgin Islands					
CARDI	Caribbean Agricultural Research & Development Institute				
CARIFORUM Caribbean Forum					
СВО	Community Based Organisation				
сс	Climate Change				
CCA	Climate Change Adaptation				
CCR	Community Climate Resilience				
CCRIF	Caribbean Catastrophe Risk Insurance Facility				
CCRS	Community Climate Resilience Specialist				
CCVA	Community Climate Vulnerability Assessment				
CD	Census Division				
CDO	Community Development Organisation				
CDB	Caribbean Development Bank				
CDERA	Caribbean Disaster Emergency Response Agency				
GDP	Gross Domestic Product				
CDRRF	Community Disaster Risk Reduction Fund				
CDS	Community Development Specialist (CDRRF)				
CDS	Community Development Supervisor (SVG)				
CES	Community Engagement Survey				
CEWS	Community Early Warning System				
CHARIM	Caribbean Handbook on Risk Information Management				
СР	Community Profile				
CPA	Country Poverty Assessment				
CS	Climate Smart				
CVA	Climate Vulnerability Assessment				
CWSA	Central Water and Sewerage Authority				
DDC	District Disaster Committees				
DaLA	Damage and Loss Assessment				
DLA	Detailed Livelihood Assessment				
DRM	Disaster Risk Management				
DRR	Disaster Risk Reduction				
ECLAC	Economic Commission for Latin America and the Caribbean				
ED	Enumeration Division				
EU	European Union				
EWS	Early Warning System				
FAO	Food and Agriculture Organization of the United Nations				
FGD	Focus Group Discussion				
GAD	Gender Affairs Division				
GBV	Gender Based Violence				
GEF	Global Environmental Fund				
GIS	Geographic Information System				
GOSVG	Government of St. Vincent and the Grenadines				

GPS	Clobal Decitioning System
HH	Global Positioning System Household
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
lica	International Institute for Cooperation on Agriculture
ILIA	Initial Livelihood Impact Assessment
ILO	International Labor Organization
IWCAM	Integrated Watersheds and Coastal Areas Management project
J-CCCP	Japan-Caribbean Climate Change Program
LAS	Livelihood Assessment Specialist
LAT	Livelihood Assessment Toolkit
LBA	Livelihood Baseline Assessment
LGBTQ	Lesbian, Gay, Bi-Sexual, Trans, Queer
LPG	Liquified Petroleum Gas
M&E	Monitoring and Evaluation
MMI	Modified Mercalli Intensity
MoA	Ministry of Agriculture
MoNM	Ministry of National Mobilisation
NDVI	National Difference Vegetation Index
NEMO	National Emergency Management Organization
NGO	Non-Governmental Organization
NVEP	National Volcanic Emergency Plan
OECS	Organisation of Eastern Caribbean States
PAD	Project Appraisal Document
PM	Project Manager
PVC	Polyvinyl Chloride
RC	Red Cross
RCCVA	Rapid Community Climate Vulnerability Assessment
RDVRP	Regional Disaster Vulnerability and Reduction Project
RR	Risk Reduction
SAP	Social Assistance Programme
SD	Sustainable Development
SDC	Social Development Commission
SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
SMART	Specific, Measurable, Achievable, Realistic, Time-bound
SRC	Seismic Research Centre
STREVA	Strengthening Resilience in Volcanic Areas
SVG	St. Vincent and the Grenadines
UN	United Nations
UNFPA	United Nations Population Fund
UNISR	United Nations Office for Disaster Risk Reduction
UWI	University of the West Indies
VCA	Vulnerability and Capacity Assessment
VINLEC	St. Vincent Electricity Company
VRCinSVG	Volcano Ready Communities in St. Vincent and the Grenadines
VRCP	Volcano Ready Communities Project
WAD	Women's Affairs Division



### 1.1 THE NEED FOR A LIVELIHOOD BASELINE AND CONTINGENCY PLAN

Pre-disaster information is always a key resource in post disaster response (which includes post disaster assessments). When disaster strikes, it is critical to know how many people are likely to have been affected and how. This requires knowledge of the demographic breakdown of the population and the vulnerability of different people to the disaster. Vulnerability will determine how badly they will be affected, how quickly they can be expected to recover and what kinds of assistance they are likely to need.

In many instances however, pre-disaster planning focuses on immediate response and action to protect human life and infrastructure, but without giving sufficient attention to damage and loss to livelihoods. Yet in the post-disaster period, if people are to recover, they need to restore their livelihoods as quickly as possible. This can only happen if detailed and quantitative information has been collected in advance of potential disasters so that <u>livelihood based</u> <u>contingency plans</u>, can be created and planned for.

In 2019, the Community Disaster Risk Reduction Fund (CDRRF) of the Caribbean Development Bank (CDB) partnered with the Food and Agriculture Organization of the United Nations (FAO) to introduce Borrowing Member Countries (BMC) in the region to the Livelihood Baseline Assessment (LBA) process which was pioneered by FAO and the International Labour Organisation (ILO).

The Livelihood Assessment Tool-kit<sup>1</sup> provides welldefined guidelines for the preparation of baselines that can be used to:

- analyse and respond to the impacts of disasters on the livelihoods;
- develop and update contingency plans.

In March 2019, a one-week training and capacity building session was held in Belize and introduced persons from Belize, British Virgin Islands, Jamaica and St. Vincent and the Grenadines on the use of the LBA methodology for their own planning purposes.

## **1.2 OBJECTIVES OF THE LBA PROCESS**

The objectives of the LBA approach are:

- a) To make it possible for countries to compare the livelihood context and activities for residents in the communities and local economies before and after a disaster
- b) To establish a robust basis for making estimates of the impact of disasters on livelihoods, in particular vulnerable groups, that can feed into various appeals for aid required for reconstruction and rehabilitation of the sector(s) affected.
- c) To provide a reliable basis for immediate postdisaster assessments including the initial Livelihood Impact Appraisal (Volume 3 of the Toolkit) and the more in-depth detailed Livelihood Assessment of the impact of disasters on livelihoods and identify opportunities and recovery capacities at the local, community and household levels (Volume 4).

#### 1.3 THE LBA PROCESS IN ST. VINCENT & THE GRENADINES

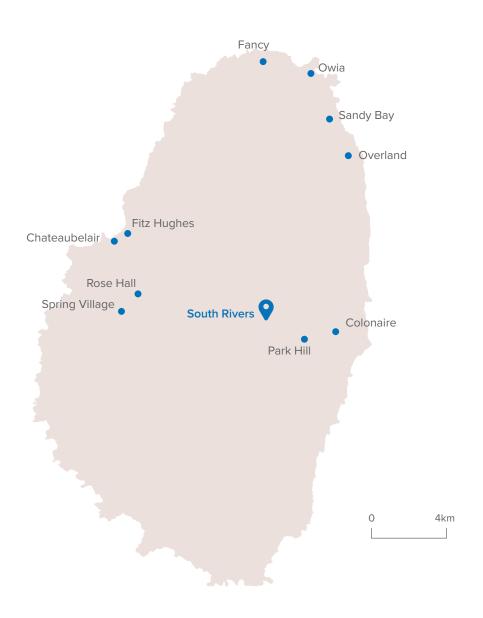
Following the February 2019 capacity building, a total of eleven (11) Community Profiles and Livelihood Assessment reports were prepared in St. Vincent & the Grenadines. These communities included:

- 1. Colonaire
- 2. Chateaubelair
- 3. Rose Hall
- 4. Fitz Hughes
- 5. Fancy
- 6. Owia

<sup>&</sup>lt;sup>1</sup> *The Livelihood Assessment Tool-kit* was published by the Food and Agriculture Organisation of the United Nations and the International Labour Organisation in April 2009.

- 7. Magum and Overland
- 8. Park Hill
- 9. Sandy Bay
- 10. South Rivers and
- 11. Spring Village

This report presents the findings that resulted from the Livelihood Baseline Assessment (LBA) and Community Profile (CP) process that was conducted for the community of **South Rivers**, St. Vincent & and the Grenadines.





The Community Profile (CP) and Livelihood Baseline Assessment (LBA) for South Rivers was compiled in October 2019 using both qualitative and quantitative data collection methods. For the community profile sections, data were gathered from government reports and data-sets made available to the public.

The LBA component was compiled using the Livelihood Assessment Toolkit developed by the International Labour Organisation (ILO) and the Food and Agriculture Organization of the United Nations (FAO) and which provided guidelines on documenting the exiting vulnerabilities of each community, the main livelihood activities, the projected impact of various hazards on livelihoods and contingency planning. Community representatives and external stakeholders also provided reviews and validation of the information presented in the document.



Field work for the livelihood assessment was conducted in October 2019 and included a focus group discussion, a transect walk for field observations and a livelihood baseline survey Responses from focus group discussion were used to generate the following tools:

- Livelihood profile
- Hazard calendar
- Seasonal calendar
- Coping Strategies Inventory
- Response Typology Matrix

A convenience sample was also utilized to collect data from residents regarding the impact of natural hazards on their livelihoods and coping strategies. Twentytwo (22) persons were interviewed in the South Rivers community. Data were collected and analysed using the KOBO Toolbox<sup>2</sup> application. Responses from the livelihood baseline assessment survey were analysed and presented separately.

Data from a Community Engagement Survey (CES) conducted in South Rivers in 2018 which utilized a sample size of 50 residents was also used to triangulate the findings from the LBA and CP exercise. This data was collected and analysed utilizing Excel and SPSS



Secondary data were reviewed in order to provide the environmental, social and economic context of the community. Sources reviewed included the 2012 Population and Housing Census, 2007/2008 Survey of Living Conditions and Hazards maps provided by the National Emergency Management Organisation (NEMO) and the Physical Planning Unit.

Additionally, qualitative information was also obtained from both the preliminary Rapid Community Climate Vulnerability Assessment (RCCVA) that was conducted in 2016 and the detailed RCCVA that was completed in 2020.

<sup>&</sup>lt;sup>2</sup> KoBo Toolbox is a free open-source tool for mobile data collection. It allows users to collect data in the field using mobile devices such as mobile phones or tablets, as well as with paper or computers.

It allows for faster data collection because data does not need to be transcribed from paper to computers before it can be analysed. Some analyses can be applied within minutes of the data being collected It is more accurate. Enumeration errors are minimised because of the data validation that can occur in real time as data is collected. Transcription errors are entirely eliminated It is optimised for humanitarian work. It also works offline and is easy to use (requires no technical knowledge to manage and enumerators can be trained within minutes. If all else fails, paper forms can be used as a backup and integrated with other data. (Source: https://www.humanitarianresponse.info/sites/www. humanitarianresponse.info/files/documents/files/unhcr\_kobo\_guidelines\_ may2016.pdf)

# 3 Description of the Community

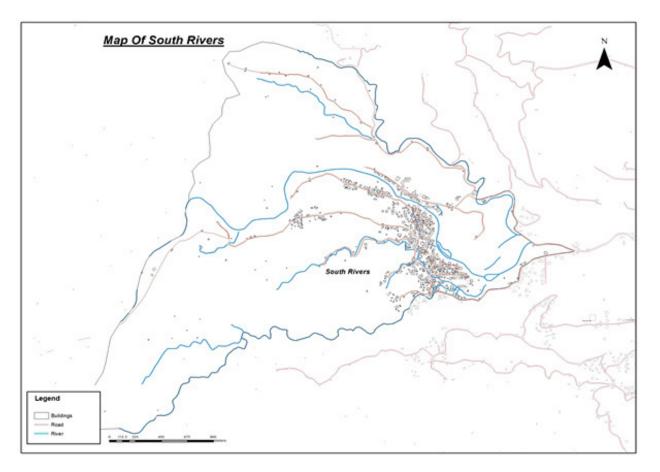


South Rivers is a rural community within the Colonaire Enumeration District. It is located on the North Eastern Side of St Vincent and the Grenadines. It is approximately eighteen (18) miles north of capital city Kingstown, at co-ordinates 13o 14' 0" North and 610 8' 0" West. To get to Colonaire from Kingstown, a left turn must be made at the last left turn-off before the Colonaire Bridge continuing westwards for about a mile inland. The Village is mostly flat to gently sloping. It is bordered by Park Hill to the South, Colonaire to the East and Fuggerson Mountain to the North. The entire settlement spans just over thirty (30) acres of land.



South Rivers was named as such because the village lies south of the Colonaire River that passes north of it. Prior to settlement in this village, this area was part of the Three-Rivers estate which was owned by Mr. Edd Beach. The exact date that the settlement was founded is unknown but workers on the estate were given first preference to own plots when the lands were subdivided. Persons were given lots with an agreement to pay over time, receiving land titles only after payments were settled.

**Figure 1:** Map of the community of South Rivers (Source: GIS Unit, Physical Planning Division, Ministry of Transportation, Works, Lands and Physical Planning, Kingstown)



Prior to settlement, residents were employed on the Three-Rivers, Colonaire, Bellevue and Mt. Bentick estates as farmers and cultivated crops such as arrowroot, sugar cane and cotton. Other workers on the estate mined stones from the river, which they pounded into gravel and sold to the government by the barrel. These stones were used as base material to construct the asphalt surfaced roads within the community during that time.

## **3.3 NATURE OF COMMUNITY** (CULTURE, TRADITIONS)

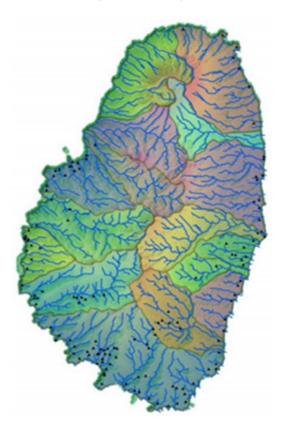
Cultural activities such as storytelling and ring games were practiced in the past, but due to the passing of the older generation as well as the fact that young people show little interest in these practices, these traditions have died.

The community is famous for its river cooks at River 14 which is located within the community. Additionally, there is an ongoing tradition called "Light up grave" which takes place annually on November 1st and 2nd. During this activity, villagers pay tribute to their family members and friends who have died and were buried in the local cemetery by lighting candles on their graves and tombs.

## 3.4 NATURAL RESOURCES (RIVERS, FORESTS, FARMING LANDS)

South Rivers has an abundance of natural resources, namely, rivers, springs, forested areas and fertile farm lands. It is renowned for being the home of River 14, as well as the Colonaire River which flows directly through South Rivers to the sea. South Rivers is located in the Colonaire watershed. Figure 2 shows the various rivers throughout St. Vincent while Figure 3 shows the various watersheds in St. Vincent.

Figure 2: Rivers in St. Vincent Saint Vincent (Source: GEF-IWCAM Proposal, No Date)



The Colonaire River is used by the St. Vincent Electricity Services Ltd. (VINLEC) to generate Hydro Power for electricity generation.

The natural resources found within all of the communities on mainland St. Vincent are in some way or the other linked to the watersheds they are located in. A watershed is defined as the land area that drains to a stream, wetland, lake or sea. It is the sloping land area over which water from rainfall flows downhill to the coast. On mainland St. Vincent, there are sixteen (16) watersheds (Figure 3) with forests that protect them. These forests are important to protecting terrestrial biodiversity and marine biodiversity through reduced soil erosion. Four (4) of these watersheds are considered to be the key ones as a result of the contribution they make to the socio-economic development of the country (see Figure 4).

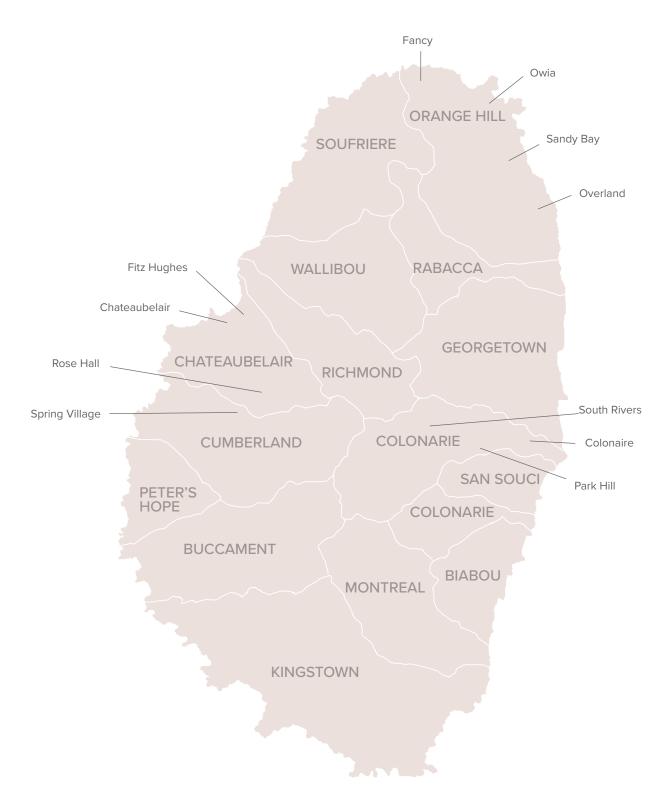


Figure 3: The Sixteen (16) Watersheds of Saint Vincent (Source: GEF-IWCAM, No Date).

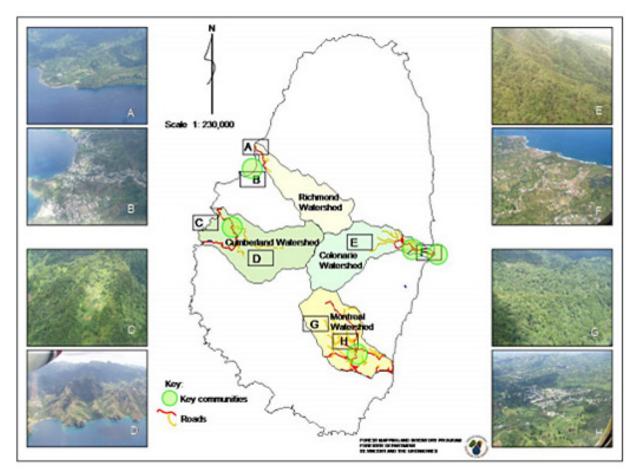


Figure 4: Key watersheds and communities in St. Vincent (Source: Forestry Dept. 2005).

Table 1: Water Statistics for SVG (Source: FAO 2005,GOSVG 2002)

	M <sup>3</sup>
Total surface water	120,000,000
Storage capacity	5,000,000
Consumption patterns	
Government institutions	1,600,000
Domestic	5,300,000
Unaccounted for water	1,800,000
Leakages	500,000

These key watersheds provide 120,000,000 cu.m/yr. of the country's total surface water to meet the varying demands (see Table 1).

Most of the watersheds on St. Vincent run from the centre of the island all the way to the coast and provide 100% of the water supply to the mainland to support our existence in addition to providing habitat for flora and fauna. The flora found in these watersheds include "coconuts breadfruit, bananas and aroids for food, forest species provide homes for birds and other wildlife; others provide stabilization to the land, are used for traditional medicines, fuel, ornamentals, craft and construction purposes" (Lennie. D. Adams 2013). The fauna found in these watersheds include "birds (whistling warblers, parrots, blackhawks swift

Figure 5: Rainfall Map of the Island of St.Vincent (Source: Joyette, 2006).

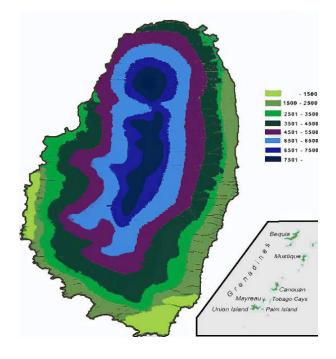
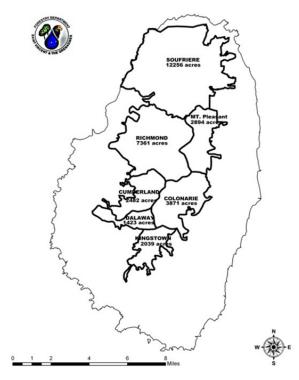


Figure 6: Protected Areas on Mainland St. Vincent (Source: GEF-IWCAM, No Date).



and wren), reptiles (black snakes, lizards and Congo snakes). Others like pigs, cattle, small ruminants, fowls are domesticated and iguanas, tattoo, crustaceans and mullets are hunted and harvested for food (Lennie. D. Adams 2013). The specific numbers of flora and fauna that has been identified on St. Vincent are as follows "more than 1,150 species of flowering plants, 163 species of ferns, 4 species of amphibians, 16 species of reptiles, 111 species of birds, and 15 species of mammals" (Draft SPCR SVG 2011).

Watersheds are therefore very important to the health and well-being of Vincentians. Three (3) of the main areas in a watershed are the streams and lakes, land and coasts. The free fresh water they provide is used to sustain several sectors in St. Vincent and the Grenadines, such as, Water, Tourism, Health, Agriculture, Fisheries, Energy, and Critical Infrastructure. In 2015, data from the CWSA revealed that the average annual rainfall across the mainland was 2063 mm with the Grenadines recording 589 mm. Figure 5 presents the rainfall map for the island. Two thirds or 70% of that rainfall occurs annually during the rainy season - June to November (Joslyn, 2008).

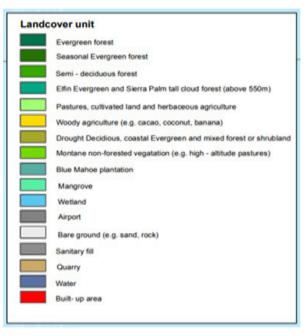
Most of the watersheds are located in forest reserves which are protected areas by law (Figure 6). All of the Central Water and Sewage Authority's (CWSAs) catchment areas and the St. Vincent Electricity Services Limited (VINLEC) Hydro-power stations are located in watersheds. Within recent years however, the watersheds have been under threat as a result of climate related events and human actions. In recent years, mudslides resulting from hazard events and also due to increased and poor farming techniques have occurred within the watersheds. Additionally, there continues to be an issue of pollution resulting from the location of pig pens on river banks. The Forestry Department, the National Parks Authority and the CWSA are responsible for managing the forests specifically regarding conservation and protection.

The possibility of the current water supply on the mainland drying up is considered to be quite low; as a result, alternatives such as desalination and drilling for underground water are not given serious consideration.

Over the past ten (10) or more years, attempts were made to put an integrated water resource management system in place to protect terrestrial and marine ecosystems, with limited success. Efforts were geared towards involving communities in empowerment activities so that they can map hotspots in local watersheds and monitor the level of land degradation and water quality (GEF- IWCAM no date).

Figure 7: Land Use and Distribution in Colonaire (Source: Westen, C.J. and Sijmons, Koert. 2016).





## 3.5 LAND USE AND DISTRIBUTION

Figure 7 shows that most of the lands of South Rivers are comprised of evergreen and seasonal evergreen forests and are predominantly agricultural or forested with built up or housing areas mostly to the south of the Colonaire River. There are no huge areas of woody agricultural (cocoa, coconut, banana) as with the communities to the north and south of mainland St. Vincent.



South Rivers is located in the Colonaire Census Division. Data from the 2012 Population and Housing Census were used for the Colonaire Census Division. According to this data, the population for the entire division in 2012 was 6,849 persons of which 3,494 were males and 3,355 females. South Rivers itself has an estimated population of 1,127, comprising of 608 males and 519 females. These individuals occupy 332 households. The average household size was 2.9 persons. In relation to population distribution by gender, males outnumber females, accounting for 52.5% of the overall population. There are also twenty-eight (28) persons in the community who have been identified as being vulnerable due to having some level of disability; comprising fifteen (15) males and thirteen (13) females. These vulnerable persons are located in various subvillages such as, Up the Road; Cro-Cro; Teek Street; Pasture; Centre Street; Cane Hole; Hog Hole; Chapel; Lazy Hole.

Table 2: Estimated Population by Colonaire Census division (Source: 2012 Population and Housing Census)

District	Number of Households	Males	Females	Population
Gorse, Mangrove and Mt. Williams	67	98	96	194
South Rivers and Three Rivers (1)	177	318	270	588
South Rivers and Three Rivers (2)	155	290	249	539
Park Hill and Coolie Hill	146	256	214	470
Park Hill and Bellevue (1)	91	149	132	281
Park Hill and Bellevue (2)	95	142	147	289
Friendly Village and Colonaire (1)	192	298	318	616
Friendly Village and Colonaire (2)	162	237	221	458
Total	2174	3494	3355	6849

## 3.7 EDUCATIONAL ATTAINMENT

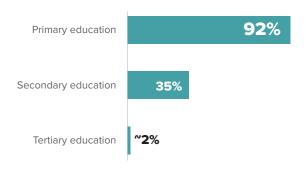
There are currently two schools housed in the Community, a primary and a preschool. A primary school has been present in the community since approximately 1928, thus making it 92 years old with a current estimated population of 181. Table 3 shows school enrollment in and around the community.

 Table 2: Educational Institutions (Source: SVG Educational Statistical Digest 2017/18)

Name of School	Enrolment	No. of Girls	No. of Boys	No. of Teachers	Pupil/ Teacher Ratio	Condition of building
South Rivers Methodist	181	79	102	12	15	Fair
South Rivers Preschool	26			2	13	Fair

As a whole the educational attainment in the district of Colonaire breaks down into ninety-two percent of the total population having achieved a primary level of education, with just about thirty-five percent having achieved a secondary level of education and slightly over two percent achieved a tertiary level of education as seen in Figure 8.

**Figure 8:** Graph showing Educational Attainment in Colonaire Enumeration District



## 3.8 HOUSING QUALITY

Most of the houses are built with modern materials such as galvanize, concrete and blocks. Most are wall structures. The houses are usually in fair condition. Historically, houses were built from thatch and board, but these changed with the advent of modern building materials. There are some houses that are built from board.



#### 3.9.1. HEALTH

The lone health care facility in the community is the South Rivers Clinic. Hospital services are accessible at the Georgetown Modern Medical Complex and the Georgetown Hospital which are located about 2.5 miles north of South Rivers.

#### Table 4: Health Care Institutions (2012 Census)

Name of Facility	Services offered	Condition of Building
South Rivers Clinic	General Health Services	Good

District Health Centres were the facility of choice for persons in the Colonaire Census Division followed by health care through Doctors' Offices and the Public Hospital.

**Table 5:** Number of Persons Utilizing Medical Facilities within Previous Month by Census Division, 2012 Main

 Medical Facility

Census Division	Public Hospital	District Health Centres/ Health Clinic	Private Doctor's Office	Pharmacy	Family Planning Clinic	Private Clinic/ Hospital	Not Stated	Total
Colonaire	126	1,081	381	12	3	21	25	1,649

#### 3.9.2. NUTRITION SERVICES (CHILDREN AGE 5+)

For the period 2017/18, approximately eighty three percent (83.43%) of students attending the South Rivers Methodist School benefitted from the services offered by the School Feeding Programme.

 Table 6: Students Enrolment in School Feeding Programme 2017/18

 (Source: SVG Educational Statistical Digest 2017/18)

Name of Facility	School Feeding Enrolment	No. of beneficiaries	% benefiting
South Rivers Methodist School	181	151	83.43



#### PUBLIC INFRASTRUCTURE (CONDITION OF ROADS, BRIDGES, DRAINS; LIGHTING, ETC.)

The road condition is generally fair to good, with the road coming into the community itself having some narrow spots with a few pot holes. However, it was noted that the feeder roads leading to the farmers' farms were in terrible condition.

The community has an adequate transportation system. The main means of transportation to and from South Rivers is by minivan, which provides a daily service to and from the community. Additionally, several households either own or have access to private vehicles for transportation. The main road leading to the community from the Colonaire Bridge is however not always in the best of condition. The majority of roads within the community are paved; these include some deadend roads and footpaths. Some of the roads and footpaths are however earthen. The connecting roads to Park Hill and Byrea are earthen in some areas and need upgrading.

Fifty two percent (52%) of respondents from the Community Engagement Survey listed poor infrastructure including roads as one of the common issues affecting the community second only to unemployment.

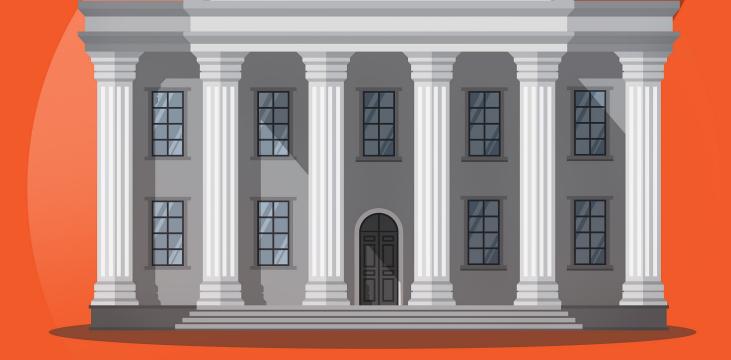


The type of social services available in South Rivers is shown in Table 7.

Турез	Name of facility	Number	Location	Condition
Cemeteries	Park Hill Cemetery	1	South Rivers	
Churches	Emmanuel Baptist Church	1	Throughout the	Good
	New Testament Tabernacle	1	entirety of the Community	Good
	New Life Tabernacle	1		Good
	Covernant Seventh Day Adventist	1		Good
Community Centre	South Rivers LRC	1		Fair
Pre-School	South Rivers Pre School	1		Good
Daycare	South Rivers LRC	1		Fair
Primary School	South Rivers Methodist	1		Good
Health Centre	South Rivers Health Clinic	1		Good
Libraries	Within LRC	1		Fair
Parks				
Playing Fields	Cricket Field	1		

Table 7: Social Services in South Rivers (Source: LBA)

## 4 Governance Profile







Constituency: North Central Windward Parliamentary Representative: Ralph E. Gonsalves (from 1994 to present)

## .2 SOCIAL/CIVIC ORGANISATIONS

Table 8 presents the various types of social and civic organisations in the community.

**Table 8:** Social and Civic Organisations in South Rivers (Source: LBA)

Name of Group	Contact Person	Status
South River High Quality Farmers Co-operative Society Limited (SOQUAFCO)	Andra McMillian	Active – Registered as a Co-operative in 2014
South Rivers Progressive Organisation (SORPO)		Active –
South Rivers Food Sustainability		Active: Vision: An effective, accountable and efficient management team that ensure proper guidelines and procedures are being met for continued productivity and upliftment for the community and all stakeholders. Mission: To work together as a farming community in order to foster sustainability

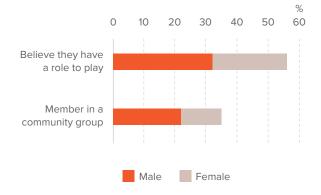
#### 4.3 METHODS OF COMMUNITY ENGAGEMENT

The CDRRF Individual Community Engagement Survey (CES) was conducted in St. Vincent and the Grenadines in collaboration with the Seismic Research Centre of the University of the West Indies and the Ministry of National Mobilisation, September 17th – 25th, 2018. The survey was conducted as part of the Volcano-Ready Communities Project as a precursor to community-based disaster risk reduction initiatives.

The purpose of the survey was to gather feedback on the community engagement needs and preferences of select groups of residents in each community. During the implementation of the CDRRF sub-projects, limited inclusion and participation of community residents in project activities resulted from the consistent use of community meetings as a main engagement strategy. It was found, that women, youths, disabled and the elderly are often excluded due to inconvenient times, days and location of community discussions. The survey therefore sought to identify the most appropriate engagement strategies to secure the involvement of the different groups of residents in these interventions.

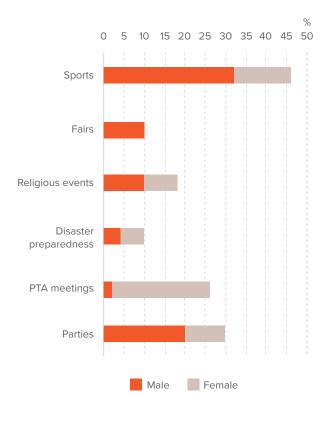
#### 4.3.1. PARTICIPATION IN COMMUNITY GROUPS

Fifty-six percent (56%) of respondents believed they have a role to play in the development of their community, and thirty-four point eight percent (34.8%) play an active role through membership in a community group. This is shown in Figure 9. Figure 9: Participation and Inclusion - South Rivers (Source: CES, 2018)



The activities most commonly attended by respondents were sport events (50%) and religious (32%). Figure 12 below shows this very clearly.

Figure 10: Participation and Inclusion – Activities (Source: CES, 2018)



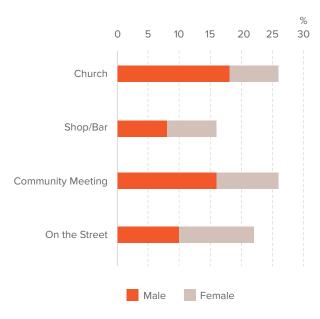
It may be of interest to note that while they are not events attended by most people, religious events are the only community activity that has a near equal representation from both men and women. The next event which has near parity of gender representation would be disaster preparedness activities.

The results of the Community Engagement Survey also revealed that sixty-four percent (64%) of persons surveyed held positive perceptions of community groups and noted that groups "are helpful" and "good for young people".

#### 4.3.2. PREFERRED METHODS FOR COMMUNITY ENGAGEMENT

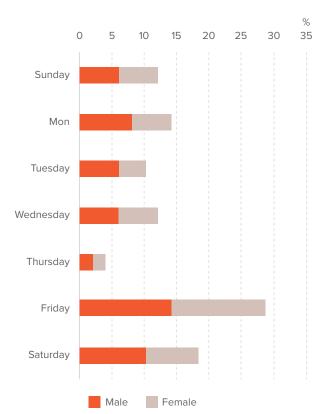
Regarding engagement for the purpose of information sharing, community members showed an almost equal preference for bi-weekly (40.8%) or monthly (40.6%) meetings on Fridays (28.6%) and Saturdays (18.4%) in semi-formal and informal settings at church (26%), community meeting place (26%) and on the street (22%). All of these findings are reflected in the following graphs:

Figure 11: Engagement Preferences – Meeting Places

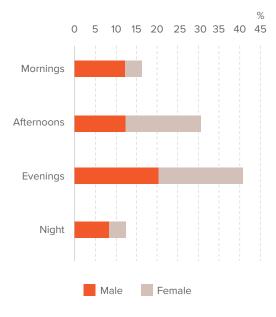


It is perhaps worth mentioning that while it is not the most preferred option, being engaged on the street was the option that had almost completely parity between men and women. It should be noted that the determined day has near parity between men and women as seen in Figure 13.

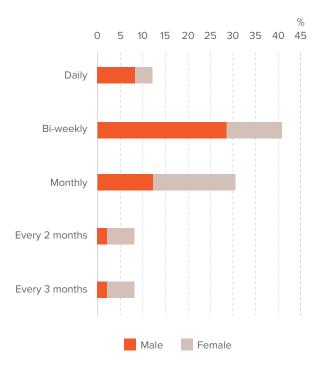
**Figure 13:** Preferred Time of Day for Community Engagement by Gender







## **Figure 14:** Preferred Frequency of Community Engagement



### 4.4 CRIME, PUBLIC SAFETY AND PERCEPTION OF COMMUNITY ISSUES

Praedial larceny is on the rise in the community. However, data gathered from the transect exercise indicate that other types criminal activities such as domestic violence, rape, larceny, murder and suicide are presently not listed as a top five (5) priority problem for the community. 38% of respondents from the Community Engagement Survey felt that crime and violence is one of the issues affecting the community. Figure 15 illustrates some of these issues.

Respondents in the Community Engagement Survey identified the following issues as the main challenges impacting the South Rivers community:

- 1. Unemployment (52%)
- Poor Community Infrastructure specifically roads (52%)
- 3. Drugs Abuse (46%)
- 4. Crime and Violence (38%)
- 5. Pollution (34%)

Other issues residents highlighted were:

- illegal dumping of garbage over cliffs and into river and streams.
- Seepage from pit latrines into nearby streams
- Farming on riverbanks
- Overuse of pesticides



Figure 15: Issues Affecting South Rivers

## 5 Economic Profile

South Rivers falls within the Colonaire Census Division. As a result, in addition to the LBA assessment, data from the 2012 Population Census was used to provide an economic profile of the community. The 2012 Census indicated that there was an employment rate of 72.5% versus an unemployment rate of 26.6% at that time (Table 9). According to this data, the unemployment rate in the Colonaire district is higher than the national average.

The employment rate for men is 74.9% versus an unemployment rate of 25.1%; and for women the employment rate is 68.8% with unemployment rate being 31.2%. The employment rate for men and women in the Colonaire district can be seen in Table 9.

**Table 9:** Employment Rate by Gender for the Colonaire

 Census Division

Gender	Employed	Unemployed
Male	72.5	26.5
Female	68.8	31.2

## THE ROLE OF AGRICULTURE

The main economic activity in South Rivers is agriculture. Like in other rural communities across St. Vincent and the Grenadines, banana was the main produce until the loss of the banana market to Europe in the 1990s. The farming crops mainly produced by the community presently include plantain, yam, cassava and tannia.

Data from the Ministry of Agriculture indicates that in 2018 there were a total of 42 farmers in Spring Village engaged in arable and pastoral farming. Most did arable farming and planted mainly ground provision, banana and vegetables. In relation to breakdown by gender, there were 31 males and 11 females. 18 were livestock farmers and 8 youth farmers. This is seen in the graphs below.

Figure 16: Farmers by Gender (Source: Ministry of Agriculture)

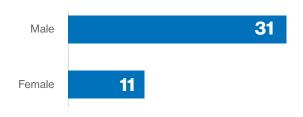


Figure 17: Farmers by Type of Farming Activity (Source: Ministry of Agriculture)



Six (6) of the twenty-six (26) respondents answered the question of whether they are registered farmers. Of these, 27.5 % are registered farmers and 12.5 are non-registered farmers. 17.5% do a mix of crops and animals, while another 17.5% plant cash crops. This can be seen in Table 10.

## Table 10: Number of Respondents Engaged in Employment (Source: LBA)

Occupation	Number
Other Employment	16
Farmer	6
Unknown	4



There are eight (8) types of local livelihood businesses in South Rivers. The most common of which are small groceries, numbering fifteen (15), followed by seven (7) bars. Persons are also employed at the single bank/ Credit Union. People and at the St. Vincent Electricity (VINLEC) power plant in the community.

 Table 11: Type and Number of Livelihood Businesses

 in South Rivers

Туре	Number
Bakery	1
Bar	7
Clothing store	1
Mechanic shop	2
Day care facility	1
Tyre shop	1
Small Grocery – basic goods	15
Tailor shop	1
Bank/Credit Union	1
VINLEC Power Plant	1

The LBA showed the classification of employment of the respondents by percentage of sixteen (16) of the twenty-six (26) respondents who answered the question on their main source of income as follows:

- Sailor 11.64%
- Braiding, Shopkeeper 15.35%
- Baby sitter, Shopkeeper/Van driver, Security guard, Gov't worker, Postal services worker, Statutory agency employee, Pre-school teacher, Labourer, Pensioner= 34.65%.

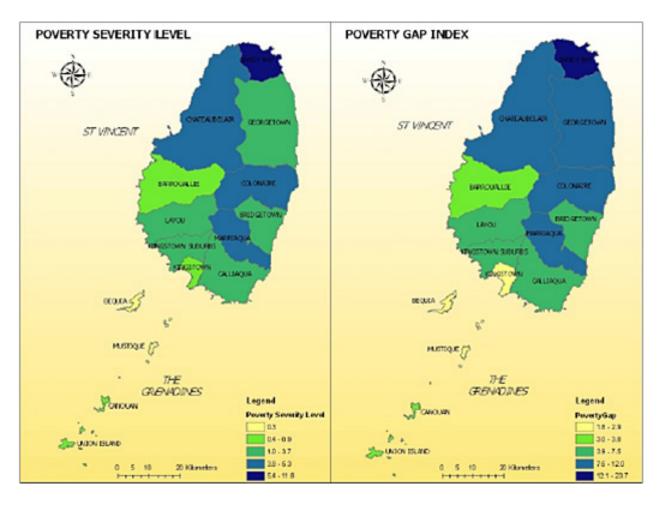
**Table 12:** Percentage of Total Number of RespondentsEngaged in Other Types of Employment

Occupation	Percentage
Sailor	11.64%
Braiding/Shopkeeper	15.35%
Baby sitter, Shopkeeper/ Van driver, Security guard, Gov't worker, Postal services worker, Statutory agency employee, Pre- school teacher, Labourer, Pensioner	34.65%



Figure 16 from the Survey of Living Conditions/Country Poverty Assessment (KAIRI, 2007/2008) shows that South Rivers experiences the second highest level of poverty ranking in the island.

Figure 17: Poverty Levels by Census District (Source: Kairi, 2007/2008)



## 6 Vulnerability and Hazard Profile

St. Vincent is exposed to high levels of risk to meteorological (high wind, extreme rainfall, hurricanes, and drought) and geophysical (earthquakes, volcanic eruptions, tsunamis) hazards, which have significant negative impacts on economic development, fiscal stability, and communities. Some of these natural hazards are being exacerbated by the adverse impacts of climate change, which put increased stress on coastal investments, national infrastructure, water availability, and livelihoods, especially of the poor and vulnerable groups. Of the disasters regularly affecting SVG, hydro-meteorological (hydromet) events occur most frequently and represent a significant source of average annual losses, which from 1996 to 2015 were estimated to be around 1.2 percent of GDP (ranked 16th globally) (Kreft et al. 2015). The trough in December 2013 resulted in extensive physical damage and economic losses estimated at approximately US\$108.4 million (15 percent of GDP). The trough hit at a time when SVG was just showing signs of recovery from the global financial crisis, and the natural disasters exerted further strain on an already challenging fiscal context.

The island of St Vincent lies in the hurricane belt, and is susceptible to both strong windstorms and heavy rains. Two-thirds of the island is forested (FAO, 2010). As noted in the 2013 Caribbean Catastrophe Risk Insurance Facility (CCRISF) report on the St Vincent and the Grenadines, the SVG islands are prone to moderate levels of a variety of hazards.

The islands lie towards the southern end of the main Atlantic hurricane belt although the complex topography can increase the risk for stronger winds, heavy rains and landslides.

The low-lying Grenadines are exposed to storm surge and wave hazards. Earthquake hazards are moderate, but there are significant volcanic hazards from both the Soufrière volcano on St Vincent and from Kick 'Em Jenny in the southern Grenadines, which is also a potential tsunami source. St Vincent and the Grenadines has limited economic diversity, with tourism important in the Grenadines where there is moderate exposure to wave and storm surge hazards.

Since bananas are the main export product from St Vincent, all farming is prone to the impact from high winds and heavy rain. Landslides commonly hamper communications on the island. Several volcanic eruptions in the past 2 centuries have killed many people and devastated areas in the north of the island. While this report is being finalized, St. Vincent and the Grenadines is experiencing a series of explosive volcanic eruptions.





Although St Vincent lies quite far south in the Lesser Antilles, hurricanes are still common, and the rugged topography of the island and low-lying nature of the Grenadines makes the impact of even moderate hurricanes potentially serious. Hurricanes Janet (1955), Allen (1980), Hurricane Lenny (1999), and Hurricane Tomas (2010). produced severe hurricane winds (greater than 110 mph) on St Vincent, although damage reports for these events are not available.





The islands are also vulnerable to flash flooding. The steep topography coupled with short (6 km) distances from the coast to the center mountain ridge creates a hydraulic system where stream concentration times are short (nominally 30 minutes). High rainfall, such as rain associated with a thunderstorm, quickly concentrates in stream channels, promoting rapid flooding. In this type of system, early warning of an actual flood event cannot be accomplished by monitoring stream levels because once they rise, it is too late. Any warning would need to be based on rainfall observations to trigger an alert.



## 6.3 LANDSLIDES, STORM SURGE AND DROUGHT

The Caribbean Handbook on Risk Information Management<sup>3</sup> (CHARIM) also notes that Landslides, particularly on the larger islands, are a significant hazard and the risk is increased during the seasonal rains. Coastal flooding is a major concern particularly relating to storm surge and high wave action. The Grenadines are more susceptible to drought.

Given its geographic location, small land mass, and topography, the entire nation is highly vulnerable to natural disasters. Because of its volcanic origin, steep slopes dominate the islands' landscape and tilted volcanic layers define the geology and soils (De Graff 1988, cited in Westen, C.J. and Sijmons, Koert. 2016). It has more than 40 rivers and tributaries, which originate in the central mountains and discharge to the Caribbean Sea or the Atlantic Ocean (DLN Consultants 2006). The combination of tropical temperatures and abundant rainfall leads to slope instabilities and the high potential for landslides. In 1988, De Graff produced an analysis of landslide susceptibility (Figure 18) and during the study identified about 475 landslides, covering about 1 percent of the country's surface. The most common type of landslides in SVG are debris avalanches, which are defined as rapid movements of an unconfined mass of soil and rock falls. Depending on the topography, another common type of landslide is debris flow, for which the movement of debris is confined to a channel. In SVG, debris flow is usually associated with river channels in the mountainous sections of the country. Debris flows can travel long distances, particularly when river flooding has occurred. They approach quickly and exhibit a considerable destructive force. Volcanic eruptions have affected the country in 1789, 1812, 1902, 1971, and 1979 and again in 2021. With the on-going eruption of La Soufriere, the combination of rainwater, debris and volcanic ash can form into lahar and can continue to pose as significant risks for months or even years to come.

<sup>4</sup> <u>http://www.charim.net/stvincent/information</u>



Figure 17: Soil erosion map of St. Vincent. (Source; Government of SVG 2011.)

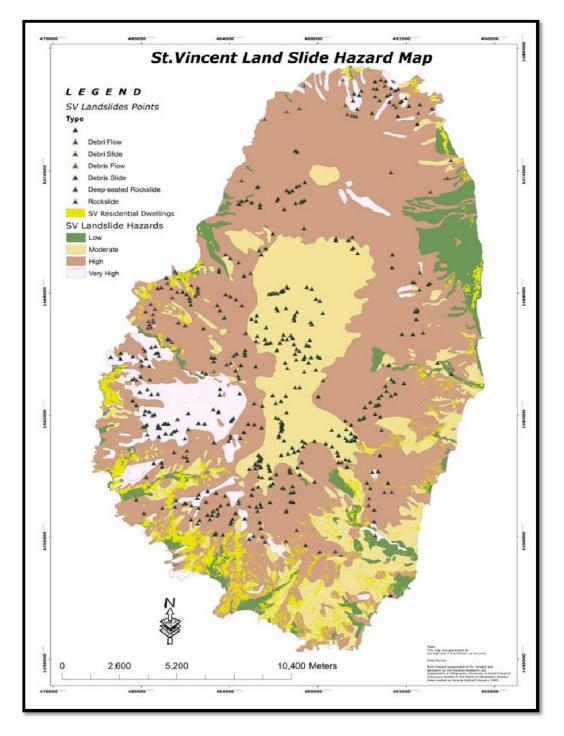


Figure 18: Landslide Hazard Map – St. Vincent (Source, cited in Joslyn, 2008)

Land Degradation Assessment of St. Vincent 2003 reports that the areas with greatest social vulnerability are generally located in densely urbanized and remote agricultural regions. Colonaire Census District ranked seventh in the SVG Socio-Economic Vulnerability rank.



### 6.4 EARTHQUAKES

An earthquake is the sudden release of stored energy in the earth crust. Most earthquakes occur along a fracture within the earth, called a fault. The shaking caused by this sudden shift is often very small, but occasionally large earthquakes produce very strong ground shaking. It is this strong shaking and its consequences – ground failure, landslides, liquefaction – that results in damaged buildings and structures and often results in negative impacts on the economy. Earthquake magnitude and intensity are measured on two different scales, the Richter Magnitude scale for source magnitude (the amount of energy released by the event) and the Modified Mercalli Intensity<sup>4</sup> (MMI) scale for the amount of shaking felt at a specific place on the ground.

St Vincent and the Grenadines lie in a relatively quiet zone of the Lesser Antilles island arc. Earthquakes are more common to both the north and south. However, there are four instances of shaking intensity (MMI<sup>5</sup>) at category VII or VIII (potentially damaging) in the past 200 years, although actual damage reports for these events are not readily available (See Figure 19). Prior the current set of eruptions, the last major volcanic eruptions, in 1979 and 1902, produced felt earthquakes as well as more devastating explosions and pyroclastic flows in valleys around the north of the island. Figure 19: Mercalli Intensity Scale Categories (Source: https://alltechinc.blogspot.com/2031/10/understanding-intensity-scale-and-sense.html)

#### I. Instrumental

Not felt by many people unless in favorable conditions

#### II. Weak

Felt only by a few people at best, especially on the upper floors of buildings. Delicately suspended objects may swing.

#### III. Slight

Fell quite noticeably by people indoors, especially on the upper floors of buildings. Many to do not recognise it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.

#### IV. Moderate

Felt indoors by many people, outdoors by a few people during the day. At night, some awakened.

### V. Rather Strong

Felt outside by most, may not be felt by some people in non-favourable conditions. Dishes and windows may break and large bells will ring. Vibrations like train passing close to house.

### VI. Strong

Felt by all; many frightened and run outdoors, walk unsteadily. Windows, dishes, glassware broken; books fall off shelves; some havy furniture moved or overturned; a few instances of fallen plaster. Damage slight.

### VII. Very Strong

Difficult to stand; furniture broken; damage negligible in building of good design and construction; slight to moderate in well-built orginary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by people driving motor cars.

#### VIII. Destructive

Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse. Damage great in poorly builts structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture moved.

### IX. Violent

General panic; damage considerable in poorly designed structures, well designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.

### X. Intense

Some well build wooden structures destroyed; most masonry and frame structures destroyed with foundation. Rails bent.

#### XI. Extreme

Few, if any masonry structures remain standing. Bridges destroyed. Rails bent greatly.

### XII. Cataclysmic

Total destruction - everything is destroyed. Lines of sight and level distorted. Objects thrown into the air. The ground moves in waves or ripples. Large amounts of rock move position. Landscape altered, or leveled by several meters. In some cases, even the routes of rivers are changes.

<sup>&</sup>lt;sup>4</sup> Modified Mercalli Intensity scale

<sup>&</sup>lt;sup>5</sup> Modified Mercalli Intensity Scale developed from Giuseppe Mercalli's Mercalli intensity scale of 1902, is a seismic intensity scale used for measuring the intensity of shaking produced by an earthquake. It measures the effects of an earthquake at a given location, distinguished from the earthquake's inherent force or strength as measured by seismic magnitude scales (such as the "Mw" magnitude usually reported for an earthquake). While shaking is caused by the seismic energy released by an earthquake, earthquakes differ in how much of their energy is radiated as seismic waves. Deeper earthquakes also have less interaction with the surface, and their energy is spread out across a larger volume. Shaking intensity is localized, generally diminishing with distance from the earthquake's epicenter, but can be amplified in sedimentary basins and certain kinds of unconsolidated soils. <u>https://en.wikipedia.org/wiki/</u> Modified\_Mercalli\_intensity\_scale





According to the Seismic Research Center (SRC) of the University of the West Indies (UWI), there are 19 active volcanoes in the Eastern Caribbean with every island from Grenada to Saba directly exposed to volcanic eruption threats. The islands of Grenada, St. Vincent, St. Lucia, Martinique, Dominica, Guadeloupe, Montserrat, Nevis, St. Kitts, St. Eustatius and Saba have active volcanic centres. On the other hand, non-volcanic islands such as Anguilla, Antigua, Barbuda, Barbados, British Virgin Islands, most of the Grenadines and Trinidad & Tobago are close to volcanic islands and are also exposed to volcanic hazards such as severe ash fall and volcanically-generated tsunamis.

St. Vincent and the Grenadines is located in the southern section of a chain of volcanic islands which comprise the Lesser Antilles. It is an archipelagic State that forms part of the Windward Islands in the Southern part of the Caribbean and is surrounded by St Lucia to the North, Barbados to the East and Grenada to the South. The state covers a total land area of approximately 150.3 square miles (388 sq. km.) and a larger marine area including a shallow coastal shelf encompassing an area of approximately 690 square miles. The main island of Saint Vincent is 28 kilometers long and 15 kilometers wide. (source: SVG National Volcano Emergency Plan, 2021).

Topographically, St. Vincent is mainly defined by a backbone of volcanic mountains that stretch much of its length and rise northwards to an elevation of approximately 1,220 m above mean sea level where the La Soufriere volcano is located. The Soufriere is a strata-volcano, with an open summit crater of 1.6 km in diameter. Volcanologists have noted that volcanic activity can be quiet and effusive or violent and explosive, and the length of time that an eruptive episode persists can vary from a few minutes to weeks, months or even decades (source: SVG National Volcano Emergency Plan, 2021).

Figure 20 shows the various volcanic hazard zones for the whole island of St. Vincent and shows that South Rivers, which is in the Colonaire Division, is in the Yellow Zone.

In 1994, Robertson described volcanic vulnerability as a "measure of the susceptibility to loss expected due to a particular volcanic event. It is a measure of the possible magnitude of losses expected from a particular volcanic event (UNDRO, 1982)". Alexander (1991, cited in Robertson 1994), presented a conceptual equation for vulnerability in which it is a function of four factors:

- risk amplification (results of bad construction practice);
- risk mitigation (due to good construction practice);
- risk perception and an indirect cultural factor.

The Soufrière volcano, whose steep sides, poorlyconsolidated bedrock and incised ravines (or 'gutters', Nanton, 2017, cited in Pyle, et.al. 2018) present a suite of ongoing hazards during periods of both quiescence and unrest (e.g. from sediment-charged flash floods and landslides).

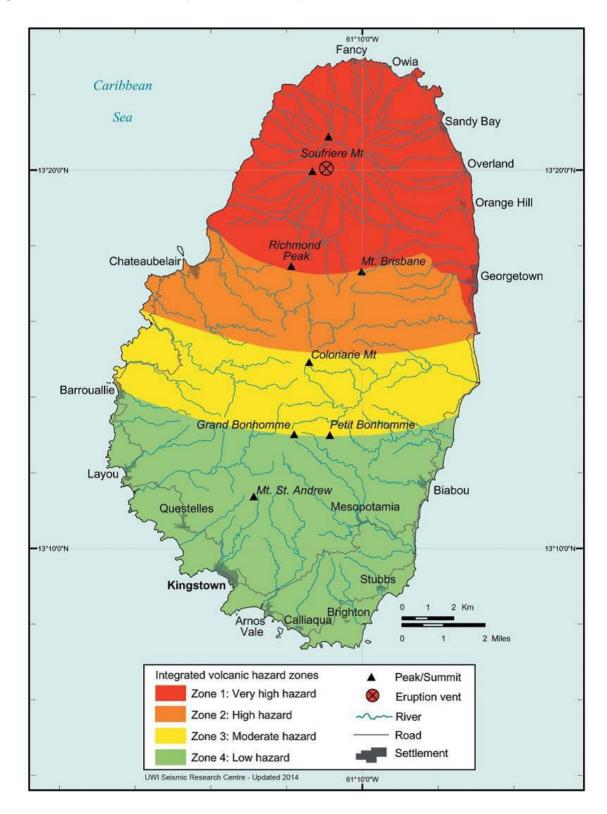


Figure 20: Volcanic Hazard Zones (Source: NEMO 2021)

As described by Pyle et.al., (2018), the summit of the Soufrière comprises a complex of intersecting craters of different ages, suggesting that it has experienced repeated eruptions during its history, most recently in 2021. In addition to 2021 activity, there have been at least five eruptions since 1718, which mean that St Vincent is – by this measure – the most active subaerial volcano in the Caribbean. Eruptions over the past 300 years have occurred against the backdrop of an evolving social, economic and political environment.

According to Robertson (1994), throughout its recorded history (post-1718), the Soufriere volcano has exhibited two contrasting styles of activity, a quiet, effusive versus a violent explosive style. Examination of the stratigraphy suggest that activity during the pre-historic period varied only slightly, with one major period of very cataclysmic Plinian type activity (Rowley, 1978a; Sigurdsson, 1981; Robertson, 1992 – cited in Roberston, 1994).

### 6.5.1. DIFFERENT TYPES OF VOLCANIC HAZARDS

The 2021 draft St. Vincent and the Grenadines: Volcano Emergency Plan and Standard Operating Procedures identifies the different types of primary volcanic hazards as follows:

- Pyroclastic flows and surges from dome collapses
- Pyroclastic flows and surges from the collapse of the crater walls
- Pyroclastic flows and surges from explosive column collapse
- Lateral Blasts Explosions with ash and rock fallout
- Mudflows or Lahars

Human and natural resource affected	Costs (USD)			
Maintenance of evacuees housed in evacuation camps	39,507 per day			
Maintenance of evacuees housed outside evacutation camps	5,269 per day			
Operation of public transport involved in the evacuation exercise	3,160			
Rehabilitation of schools, community centres and churce buildings used as evacuation camps	79,013			
Repairs to the national housing stock	2,130,069			
Repairs to the national road network	4,213,994			
Rehabilitation of agriculture	2,129,646			
Damage to the main crop (bananas)	50-60% loss of entire crop			

**Table 13:** Effect of the 1979 volcanic eruption on some aspects of the human and natural resources of St. Vincent and the Grenadines. (*Source: Robertson 1994*)

Table 14 presents these hazards and the types of impacts they can be expected to cause.

Hazard	Area Affected (Radial distance from vent, km)	Immediate Risk	Ongoing Risk	Anticipated Loss	Mitigation	Recovery Period following Cessation of Activitty
Earthquake*	5-8km	Low	Low	Small	Not applicable	Not applicable
Lava flows and domes*	1-3km	High	Low	High	Moderate	Several months to years
Pyroclastic flows and surges*	5-7km	High	High	Extreme	None	Several weeks to several months
Mudflows*	5.10km	High	High	High	None	Several weeks to several months
Ballistic projectiles*	1-5km	Moderate	Moderate	Moderate	Minor	1 week to several months
Airfall Tephra*	1 to >10km	Moderate	Moderate	Low to Moderate	Moderate	1 week to several months
Volcanic gases	1-3km	Moderate	Moderate	Low	Minor to Moderate	Not applicable
Phreatic explosions	<4km	Moderate	Low	Low	None	Several weeks to several months
Landslides*	5-8km	Moderate	High	Moderate		Several weeks to several months
Laterally directed blasts and structural collapse	5-8km	Low	Low	High		Several weeks to several months
Lightning*	<7km	Low	Low	Low	None	Days to weeks
Tsunami	5 to >10km	Low	Low	Low	Moderate	Up to 1 – 2 days

Table 14: La Soufriere Volcano Impact Matrix (Source: NEMO 2021)

\*Events which are likely to be repeated over a period of time (days, weeks to months) following the initial event

The secondary volcanic hazards are:

- Ruptured water lines which can lead to flooding.
- Fires
- Contamination of water supply
- Respiratory ailments due to dust
- Visibility issues due to dust
- Ash clouds can contribute to airport closures.

Volcanic threats to livelihoods include:

- Livestock farming
- Arable farming
- Traditional farming
- Nature tourism (Waterfalls, Ecology)
- Beekeeping
- Major impact to critical facilities such as healthcare
- Major impact to factories and small businesses
- Fishing industry (Restricted access to sea, damage to jetties and inability to access fish storage locations)

Prior to the 2021 eruption, Roberston (1994) suggested that the 1979 eruption already had huge impact on human and economic life and forced major adaptation in the patterns of human life and activity on the island of St. Vincent. But he also noted that population growth and increasingly limited options means that people would continue to live in and develop areas of high risk from eruptions at the Soufriere volcano. "Future volcanic eruptions should therefore be expected to have a greater effect socially, than has been the case in the past," Robertson suggested.

The social impact of past eruptions, such as the 1979 eruption, have varied from disruption of family life due to evacuation and relocation, to migration of entire families to foreign countries. In addition, mental and emotional stress was placed upon the evacuated population who were accustomed to more expansive personal space. The social impacts have varied from disruption of family life due to evacuation and relocation, to migration of entire families to foreign countries. In addition, mental and emotional stress was placed upon the evacuated population who were accustomed to more expansive personal space. Fortunately, even prior to the 2021 eruption, as Robertson noted in 1994, "the Soufriere volcano features prominently in the minds of most Vincentians" The degree to which this affects their actions varies largely with their economic status, recollection of past events, proximity to the volcano and knowledge of volcanic processes. The manner in which the volcanic threat is perceived is well illustrated by the fact that during all of the historic eruptions, people living within the areas of highest risk (north of the Rabacca and Wallibou rivers), begun moving away from the volcano prior to any formal evacuation exercise ordered by the governing authorities.

In 2021, the Soufriere volcano erupted once again. The impacts, damages and losses are discussed in the next section on vulnerability and risk.



"Our vulnerability to natural disasters and climate variability continues to be of grave concern"-Prime Minister of St. Vincent and the Grenadines, The Honourable Dr. Ralph E. Gonsalves (Rapid Damage and Loss Assessment, St. Vincent and the Grenadines 2016)

In recent times, the country of St. Vincent and the Grenadines has played host to several severe weather conditions that have resulted in damage occurring usually from floods and landslides. Some of the most recent events are the December 2013 floods; the passage of Hurricane Matthew, as well as well as the passage of two trough systems in the latter end of 2016. The systems caused a large number of landslides which resulted in major damage to road infrastructure. (Rapid Damage and Loss Assessment 2016). It was also noted in the Rapid Damage and Loss Assessment commissioned by the government of St. Vincent and the Grenadines after the November systems, that: "Flash floods, several of which were associated with debris flows, damaged bridges and private property with particularly devastating impacts to lower income communities." The community of South Rivers was affected both by the passage of the 2016 systems, as well as being severely affected by the 2013 floods, with over one thousand residents being affected.

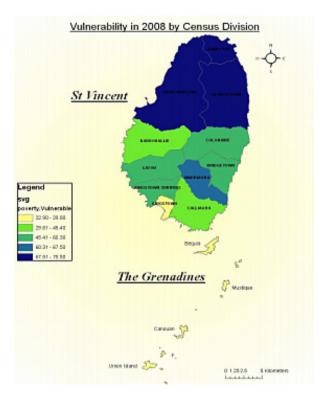


The topography of the area ranges from hilly to mountainous. The community is located in a valley and is surrounded by hills and mountains with the Three Rivers River traversing along the left edge of the settlements. As a result, those areas are prone to flooding and landslides.

The settlements are concentrated on the limited flat to gently sloping lands within the community. A lot of those settlements are located along the banks of the Three Rivers River and in the river bed. As a consequence, when there is extensive rainfall many homes are flooded

One of the main environmental issues for the community is the dumping of garbage by residents at illegal dump sites which are mainly over cliffs and into rivers and streams. Many residents in the Pasture area continue to use pit latrines. Pasture is located in an old river-bed; as a consequence, the water-table is high so pits cannot be dug deep. The solution residents utilize to overcome this situation is to raise the base of the

Figure 22: Vulnerability by Census Division (Kairi, 2007/2008)



structure 3 to 4 ft. above ground level to increase the lifespan of the latrine. This solution does not however solve the environmental issues associated with pit latrines, as seepage will still occur underground.

Residents of Pasture are at risk of flooding as that settlement is along the banks of the river and in the river-bed.

Like other predominant farming communities, South Rivers is also at risk from the overuse of pesticides on farmlands; Farming on river banks.

During the LBA, respondents had an equal view of the hazards that have and may again affect the community in the future. Eighty percent (8%) identified flooding. Eight (8%) said landslide, and another eight (8%) said hurricane. Twelve percent (12%) of those interviewed indicated that flooding was the last most recent hazard

that had impacted them personally resulting in damage to property, followed by 8% indicating loss of crops and 4% shortage of water.

However, it is important to note that the LBA assessment was done in 2019, long before the 2021 volcanic eruption. It is quite likely that if asked today, the hazard rankings would be much different.

### 6.6.1. HAZARD MANAGEMENT PRACTICES

Findings from the Community Engagement Survey indicate that ninety percent (90%) of respondents could identify an emergency shelter in the community. Thirtysix percent (36%) believed there was a community disaster plan and 24% had seen evidence of such a plan, while fifty-two percent (52%) reported having family disaster plans.

Hazard Type	Year	Season (Month)	Geography (Where)	Typical Damage Max = 5	Typical Damage Max = 5	Overall Impact on Lives & Livelihood
Flooding	2013	December	Pasture, Teak street, lot 14, Cro cro	5	5	Extensive loss to root crops, Road loss
	1979		South Rivers	3	4	Extensive loss to
	2016	Nov/Dec	South Rivers	3	2	root crops and animals
						Minimal damage to crops and animals
Landslides	2013	December	South Rivers, Jarvis, Cro cro	2	1	No road access

### Table 15: Hazard Matrix – South Rivers

# 6.7 VOLCANO READY PROJECT AND REDUCING VULNERABILITY

The Volcano-ready Communities Project in St. Vincent, which is financed by the CDRRF and is being implemented by the Seismic Research Centre (SRC), University of the West Indies, St. Augustine, Trinidad and Tobago. This project seeks to reduce vulnerability to the multi-hazard environment of the Soufriere Volcano through a combination of activities designed to enhance community early warning procedures, increase adaptive capacities, strengthen awareness, and enhance response capacities. The Project comprises four components which seek to increase the resilience of the 12 communities in St. Vincent and the Grenadines to volcanic and other natural hazard events and climate change. The communities have been grouped into two and they are (a) Windward communities comprising Fancy, Owia, Sandy Bay, Overland and Big Level, South Rivers, Park Hill, Colonaire, and (b) Leeward communities comprising Fitz Hughes, Chateaubelair, Rose Hall, and Spring Village.

The project consists of three (3) main components:

### **Component 1**

Increased Community Volcano and Other Natural Hazard Readiness;

### **Component 2**

Increased Knowledge and Awareness of Volcano and Multi-Hazards Risk Reduction and Climate Change Impacts in the Beneficiary Communities; and

### **Component 3**

Enhanced Adaptive Capacity. A fourth component covers project management and administration.CDRRF Volcano Ready Project

The proposed project is a solid example of effective partnership engagement and coordination. Strong partnerships with Red Cross and Community Development are particularly worth noting. Even though the initial consultation with the communities was over a year ago, all the communities visited during the Rapid Community Climate Vulnerability Assessment (RCCVA) mission were aware and in support of the proposed initiative. It was evident that NEMO has a strong working relationship with the proposed communities and a detailed understanding of the social and environmental challenges. Relationships with a broad range of stakeholders in government, civil society, and the private sector ensure a holistic approach to the implementation of the project. This collaborative approach will also facilitate the sharing of knowledge and skills which could lead to greater impacts.

To also seek to effectively incorporate climate change in the proposed initiative, it will be important to broaden the focus from the volcanic hazards to the "volcanic environment" in general. In other words, to determine how the presence of the volcano creates other hazards that can interact with or be exacerbated by climate-related hazards.. For example, due to the steep slopes, landslides and rates of flooding could increase under future changes in climate. The focus should be on building general resilience of the targeted communities rather than trying to build resilience to a specific hazard. The rationale is that increasing the resilience of particular parts of a community to specific disturbances may result in resilience lost in other ways.

### 6.7.1. FINDINGS FROM THE 2016 RAPID COMMUNITY CLIMATE VULNERABILITY ASSESSMENT (RCCVA)

During the focus group discussions (FGD) held in September 2016 across the Volcano Ready Communities, the participants identified agriculture as the most predominant livelihood activity in their communities. Problems were identified such as poor access to markets that limit income security at all times, and thereby undermine resilience in the face of hazards. Unemployment and constrained livelihood opportunities in the north of the island are therefore accentuating underlying vulnerability to disasters. Addressing the high level of uncertainty and problems related to agriculture will be key to resilience-building efforts at the community level. Other livelihoods are also under pressure as unemployment is widespread in these communities.



### 6.7.1.1. Finding 1

The consensus from the focus group discussions is that disaster impacts generally affect women more or in a worse way. In Fancy, the female farmers have organized themselves into a group (Fancy Ladies) to offset negative impacts on their livelihoods. Women are particularly involved with livestock production (sheep, goats, pigs). It will be important to consider these gender dynamics during the implementation of the project.



### 6.7.1.2. Finding 2

While La Soufriere Volcano is a hazard that can have a direct impact on the entire island as well as in the neighbouring islands, the proposed communities are also exposed to floods, hurricanes, droughts, landslides and coastal erosion. These are also major concerns. The most recurrent events are hurricanes and tropical storms. Given the island's topography, the types of construction and the places where these have been built, frequently in unstable hill areas, rain and wind often cause severe damages to buildings, infrastructure and agriculture. Landslide is also a major challenge facing the communities due to the steep topography, friable soils, and localized rainfall events. The situation is amplified in some areas by poor construction and land management practices which often lead to increased sedimentation and degradation of the marine environment. The proposed multi-hazard approach will ensure that a holistic approach is taken to reduce exposure to multiple stressors and shocks.



### 6.7.1.3. Finding 3

During the focus group discussions, the participants indicated the use of savings as the most typical coping strategy. Strong support from community members was also cited as a key coping strategy. The recovery process, or what people do after a hazardous event has impacted their household, seems to be based on a combination of factors: continuing with daily routines and activities, accessing assistance from the state, and using their savings or relying on their families and friends. The fact that the island is prone to the impact of multiple hazards means that recovering is made more difficult by the possibility that another hazard might impact soon after. For example, after the eruption in 1979, Hurricane Allan struck the island in 1980 and caused a lot of damage to crops that had been recently planted. Other problems, such as plant disease also impact farmers.





### 6.7.1.4. Finding 4

The main challenges facing the communities include:

- Marketing of agricultural produce (farmers are primarily dependent on Traffickers<sup>6</sup>)
- Land space and tenure access to arable land are limited in most of the proposed communities
- Pest & Plant disease: Farmers indicated that they had experienced an increase in the frequency of pests and plant disease
- Drought and heavy rains: Drought was identified as 'silent' stressor while the increased frequency of heavy rain is a major concern
- Extension service: Farmers expressed the need for improvement in extension services to their communities
- Quality of seeds and planting material:
- Praedial Larceny
- Landslides
- Social cohesion: strong but formal groups are relatively weak

### 6.7.1.5. Finding 5

The success of the Community Early Warning Systems (CEWS) will be dependent on the strength of the community groups. While groups exist in most of the proposed communities, their capacities are limited and will need strengthening to effectively support the implementation. Of particular importance will be the building of awareness of local income-generating opportunities. In general, the communities are not sufficiently informed about national plans for coping with geologic hazards and do not have adequate resources, training and information with which to mitigate their impact. Building community adaptive capacity to volcanic eruptions can be challenging. The indicators and outcomes should be revised to focus on the volcanic environment in general and to capture and address the multi-hazard risks facing the targeted communities.

<sup>&</sup>lt;sup>6</sup> Traffickers" are not to be confused with illegal trafficking. This term is the popular term to define persons who are legally allowed to buy and sell produce. In other countries, they are sometimes referred to as "higglers".

# 7 The 2021 Volcanic Eruption

In December, 2020, the La Soufriere Volcano became active once again and on April 9th 2021 it erupted explosively.

The explosive volcanic activity prompted mass evacuation of persons from communities in the red and orange zones (Figure 20) – the northeast and northwest of the island. Numerous farmers were been displaced from their communities and relocated to southern communities.

Late in April 2021, once the eruptions had subsided enough for Damage and Loss Assessments Teams (DaLAT) to formed and assessments to be conducted of the infrastructure and crop damage, Detailed Agriculture Damage Assessment (DADA) reports were prepared. This LBA report includes the data and information that were collected from these preliminary reports.

The Eruption precipitated a mass evacuation from communities in the northeast and northwest of the country with over 13,000 persons moving from the hazard zones to public and private dwelling within the safer zones in the south of the country. Numerous farmers have been displaced from their communities and relocated to southern communities in the process. Extensive acreages of crops have been lost or damaged as a direct and or indirect consequence of the eruptions or from secondary reasons related to the abandonment of the crops and free roaming animals let loose by farmers before they evacuated.

The eruptions both directly and indirectly affected agriculture, forestry, fishing and agriculture infrastructure throughout the country resulting in damages and losses ranging from as low as 7% in the Green Zone to 100% in a substantial number of commodities in the Red and Orange Zones.

Table 16 summarizes the estimated damage and loss by sectors. However, the Assessment team have suggested that while their preliminary report estimated a loss of \$54,000,000 (USD \$20,000,000) in general agriculture infrastructure, "the full extent of the damage and loss will need to be comprehensively assessed and may result in much higher estimates."

With respect to the livestock sector, the damage and loss was initially estimated to be low as farmers were advised to let their animals loose. However, "with the limited availability of feed and water in a highly ash contaminated environment, the prediction was that indirect losses in animals will increase ranging from 10 to 30 percent due to health and other complications." Overall, the preliminary DADA report indicates the estimated value of total damage and loss sustained by the crops, livestock, apiculture, fisheries and forestry sectors is \$142,628,402.00.

A further cropland damage assessment done on April 26 2021 by Ghosh et.al., and employed Normalized Difference Vegetation Index (NDVI) analysis to assess the magnitude of ash damage to crop and vegetative cover and found that the changes in NDVI values are much higher in the surrounding areas of the volcano.

<sup>&</sup>lt;sup>7</sup> Normalised Difference Vegetation Index (NDVI) "quantifies vegetation by measuring the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs) <u>https://</u> gisgeography.com/ndvi-normalized-difference-vegetation-index/

Table 16: Crop Damage and Loss Assessment

Crop type			Expected Yield		Costof	Estimated total	Fam gate	Total Value of	Estimated total	Estimated total
an su fa ga fa fa fa fa	production	(lbs)	(Lbc)	Damage	Production/	Value of damage	price/Lb	Losses	Damage and	Dama ge and Loss
				(acreage)	acre				Loss EC\$	USS
Arrowroot	98	9,000	882,000	98	\$5,700.00	\$558,600.00	\$1.00	\$\$\$ 2 000 00	1,440,600,00	533,555,56
Asparagus	5	8,000	40,000	0.2	\$3,705.00	\$741.00	\$10.00	\$16.000.00	16,741.00	6,200.37
Beet	1.5	4,000	6,000	0.5	\$4 268 00	\$2,134.00	\$1.00	\$2 000 00	4.134.00	1.531.11
Bruccolli	1.5	7,000	10,500	1	\$7,245.00	\$7,245.00	\$4.00	\$28,000.00	35,245.00	13.053.70
Cabbage Carrots	20	12,000	240,000	12	\$7.065.00	\$\$4,780.00	\$2.00	\$288.000.00	372,780.00	138.066.67
Cassava	60 80	8,000	480,000 2,000,000	54	\$7.685.00	\$414,990.00	\$2.50	\$1,080,000,00	1.494.990.00	553,700.00
Cauliflower	11	9,000	99,000	6	\$7,532.00	\$512.176.00 \$41.310.00	\$0.90 \$6.00	\$1,530,000,00	2.042.176.00 365.310.00	756.361.48
Celery	3	6,000	18,000	3	\$6.885.00	\$18,219,00	\$3.25	\$32,4,000,00 \$58,500,00	76,719.00	28,414,44
Chive	66	8,000	528,000	59	\$8,054,00	\$475,186,00	\$1.75	\$\$2,6,000,00	1.301.186.00	481,920,74
Com	48	12,000	576,000	7	\$4,783.00	\$33,481,00	\$1,50	\$126,000.00	159,481.00	59.067.04
Cucumber	35	18,000	630,000	35	\$6,336.00	\$221,760.00	\$1.00	\$63.0.000.00	851,760.00	315,466.67
Dasheen	400	14,000	5,600,000	100	\$4,166.00	\$416,600.00	\$0.80	\$1,120,000.00	1,536,600.00	569,111.11
Eddocs	550	11,000	6,050,000	138	\$4 100 00	\$565,800,00	\$1.00	\$1 518 000 00	2.083.800.00	771.777.78
Eggplant	6	15,000	90,000	6	\$6.853.00	\$41,118.00	\$2.00	\$1\$0.000.00	221.118.00	81.895.56
Flavour pepper Ginger	120	20.000	2,400,000	11	\$9.342.00	\$9.342.00 \$91.520.00	\$2.50 \$3.00	\$37,500.00 \$660.000.00	46.842.00	17.348.89
Hot Pepper	5	15,000	75,000	1.5	\$8,922.00	\$13,383,00	\$3.00	\$67,500.00	\$0.883.00	278.340.74 29.956.67
Lettuce	8	3,000	24,000	8	\$7,712.00	\$61,696.00	\$3,50	\$\$4,000.00	145,696.00	53,961.48
Melons	8	20,000	160,000	8	\$6,416.00	\$51.328.00	\$3.00	\$480,000,00	531.328.00	196.788.15
Ochra	12	6,000	72,000	1	\$5,206.00	\$5,206.00	\$2.00	\$12,000.00	17,206.00	6.372.59
Parsley	2	4,000	8,000	2	\$6,277.00	\$12,554.00	\$6.75	\$54,000.00	66.554.00	24.649.63
Pak-choi	3	12,000	36,000	3	\$5,955.00	\$17,865.00	\$2.00	\$72,000.00	\$9,865.00	33.283.33
Peanut	32	3,000	96,000	22	\$5,525,00	\$121,550.00	\$\$.00	\$528,000.00	649,550.00	240.574.07
Pigeons Peas Pumpkins	20	10,000	200,000	14	\$4,914.00	\$68,796.00	\$7.00	\$98.0.000.00	1.048.796.00	388.442.96
Radish	1	10,000 8,000	130,000 4,000	13	\$5.039.00 \$4.268.00	\$65.507.00 \$2,134.00	\$1.00 \$3.50	\$130.000.00 \$14.000.00	195,507.00	72.410.00
Serrel	8	5,000	40,000	6	\$5,198.00	\$31,188,00	\$3.00	\$90,000,00	121.188.00	44,884,44
Squash	5	15,000	75,000	5	\$5,303.00	\$26,515,00	\$3.16	\$237,000.00	263.515.00	97,598,15
String Beans	8	5,000	40,000	4	\$4,478.00	\$17,912.00	\$2.20	\$44,000.00	61,912,00	22,930,37
Sweet Pepper	55	7,000	385,000	33	\$5,683,00	\$187,539.00	\$4.00	\$97.4.000.00	1.111.539.00	411.681.11
S Potatoes	100	8,000	800,000	80	\$2,965.00	\$237,200.00	\$1.50	\$960.000.00	1.197.200.00	443.407.41
Tannia	150	9,000	1,350,000	45	\$5,983.00	\$269,235.00	\$2.50	\$1,012,500.00	1.281.735.00	474.716.67
Tom atoes	73	15,000	1,095,000	66	\$11.417.00	\$753,522.00	\$3.00	\$2,970,000,00	3,723,522.00	1.379.082.22
Turmerie Water Melons	8	34,000 20,000	272,000	4	\$10.043.00	\$40.172.00	\$1.50	\$204.000.00	244.172.00	90.434.07
Other Yam	8	12,000	96,000	7	\$5,416.00	\$96.240.00 \$55.181.00	\$2.20 \$4.00	\$660,000,00	756.240.00 391.181.00	280.088.89 144.881.85
PYam	40	8,000	320,000	36	\$9,879.00	\$355,644.00	\$4.00	\$1,152,000.00	1.507.644.00	558,386,67
White Yam	110	12,000	1,320,000	99	\$7,883.00	\$780,417,00	\$4.00	\$4,752,000.00	5.532.417.00	2.049.043.33
Yellow Yam	8	8,000	64,000	7	\$8,159.00	\$57,113,00	\$4.00	\$22,4,000,00	281,113,00	104,115,93
Avocado	123	9,000	1,104,000	49	\$2,209.00	\$108.241.00	\$0.80	\$705,600.00	813.841.00	301,422.59
Banana	593	20,000	11,854,800	534	\$11,340.00	\$6.055.560.00	\$0.92	\$9,825,600.00	15.881.160.00	5.881.911.11
Breadfruit	137	24,500	3,352,000	55	\$1,889.00	\$103,895.00	\$2.00	\$5,390,000.00	5,493,895.00	2.034.775.93
Breadnut	14	15,000	211,800	6	\$1,889.00	\$11.334.00	\$3.00	\$540.000.00	551.334.00	204.197.78
Carambol a Christophene	15	9,000	135,000 24,000	6	\$2.268.00	\$13,608.00	\$2.00	\$216.000.00	229.608.00	85.040.00
Clave	4	8,000	24,000	1	\$2,851.00	\$17,106.00	\$1.96	\$23,520,00	40.626.00	15.046.67
Caena	540	5,000	2,700,000	405	\$1,900.00 \$2,500.00	\$1,900.00	\$25.00 \$1.50	\$40.000.00 \$6.075.000.00	401.900.00 7,087,500.00	148.851.85 2,625,000.00
Coconut	1500	15,000	22,500,000	1350	\$1,689.00	\$2,280,150,00	\$0.50	\$20,250,000,00	22,530,150,00	8.344.500.00
Gold en apple	116	21,000	2,437,000	17	\$2,209.00	\$37,553.00	\$1.00	\$714,000.00	751.553.00	278.352.96
Grapefruit	10	20,000	200,000	1	\$2,028.00	\$2,028,00	\$1.00	\$40,000.00	42.028.00	15.565.93
Guava	24	24,000	576,000	5	\$2,099.00	\$10,495,00	\$1.00	\$240.000.00	250.495.00	92.775.93
Ju jub ce	5	24,000	112,686	3	\$2,268.00	\$6,804.00	\$3.00	\$432,000.00	438.804.00	162.520.00
Lemon	5	18,500	93,848	0.5	\$1,288.00	\$644.00	\$2.50	\$46 250 00	46.894.00	17.368.15
Lines Manderine	12	18,500	222,000	2	\$1,288.00	\$2,576.00	\$4.00	\$296.000.00	298.576.00	110.583.70
Mangoes	2 400	16,000	27,615	80	\$1,288.00 \$1,969.00		\$1.00 \$0.50			
Nutmeg	400	17,300	32,000	4	\$1,969.00	\$157,520.00 \$7,600.00	\$3.50	\$1,400,000.00 \$22,400.00	1.557.520.00 30.000.00	
Orange	15	27,000	405,000	1.5	\$2,367.00		\$1.00	\$\$1,000.00	84,550,50	
Passion Fruit	10	8,000	80,000	10	\$2,841.00			\$20 0.000.00	228,410.00	84.596.30
Pawpaw	8	15,000	120,000	4	\$5,334.00		\$2.00	\$12,0,000,00	141.336.00	
Pin capple	30	15,000	450,000	27	\$7.098.00	\$191.646.00	\$\$.00	\$3,240,000.00	3.431.646.00	1.270.980.00
Plantain	700	30,000	21,000,000	595	\$8.092.00	\$4,814,740.00	\$1.00	\$17.850.000.00	22.664.740.00	
Sapodilla	2	18,000	36,000	0.2	\$1,900.00	\$350.00	\$2.00	\$14,400.00	14,780.00	
Soursop	14	20,000	287,000	2	\$1,914.00			\$96,000.00	99,828.00	
Sugarapple Tangerine	8	12,000	91,000	0.5	\$1,914.00			\$24,000.00	25.914.00	
Waxapple	10	20,000	200,000	2	\$1,288.00 \$1,900.00	\$644.00 \$3,800.00	\$1.00 \$1.00	\$16.000.00 \$\$0.000.00	16.644.00 \$3.800.00	
TOTAL	6,556.4	- sejondi	200,000		31,900,00	\$21,722,919.10	0.00000000	\$93,637,170.00		42,725,958.93
	0,000									
CULTIVATED	9,000.4		<u></u>							

Figure 23 shows that the entire region was affected after the eruption and clearly shows that the "changes in NDVI values are much higher in the surrounding areas of the volcano."

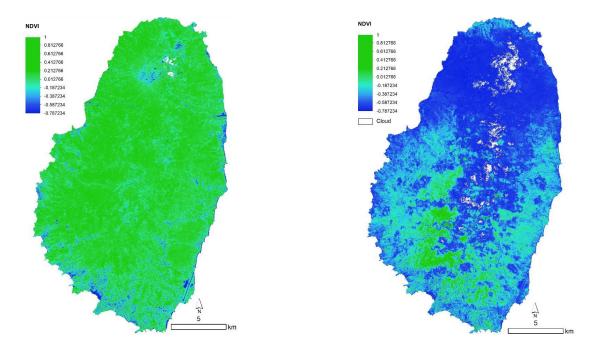
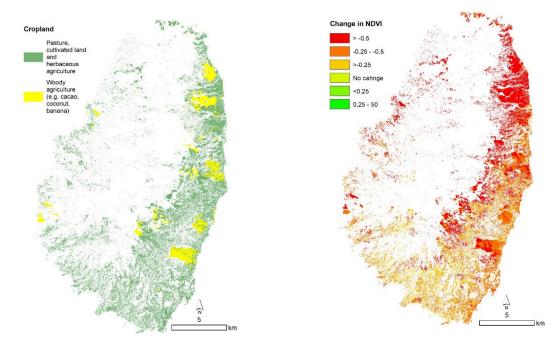


Figure 23: Vegetation changes (NDVI) using Sentinel 2 after April 10th 2021 (left: Jan1-Apr9 and Right: Apr10-Apr26)

Figure 24 illustrates type of damage and changes in NDVI for specific types of land cover, including pasture, crops, and woody agriculture (tree crops).

Figure 24: NDVI Changes after 10th of April over the cropland area (left: Cropland, Right: NDVI change)



The NDVI analysis estimated that a total of 43% of all the cultivated lands in the island were severely impacted (roughly 3200 hectares), while 3000 hectares were partly affected and only 0.6% of lands were not affected.

## Tables 17 and 18 provide further detailed estimated area of damage and the types of changes in vegetation and crop land in each of the hazard zones.

**Table 17:** Impacted cultivated land (ha) in Saint-Vincent Islands based on land cover, vegetation changes (NDVI), by hazard zones, land cover and administrative units

Hazard	Units cultivated land and herbaceou	cultivated	Woody agriculture (e.g. cacao,	Impacted cultivated land (cropland)				
		herbaceous agriculture	coconut, banana)	Total	High	Medium	Low	No change
Red	Charlotte	1089.45	347.16	1436.61	1234.18	170.19	25.68	1.68
Red	Saint David	223.16	16.78	239.94	226.65	7.92	0.99	0.12
Orange	Charlotte	484.35	132.89	617.23	388.92	213.50	13.37	0.31
Orange	Saint David	196.55	6.28	202.83	138.05	56.54	6.52	0.06
Orange	Saint Patrick	5.21	0.00	5.21	2.77	1.87	0.33	-
Yellow	Charlotte	1017.34	127.19	1144.53	499.00	557.64	81.00	2.11
Yellow	Saint Andrew	1.19	0.00	1.19	0.30	0.27	0.45	0.01
Yellow	Saint David	7.58	0.00	7.58	2.81	4.03	0.43	0.04
Yellow	Saint Patrick	141.49	0.14	141.64	48.15	76.63	15.60	0.18
Green	Charlotte	1038.32	401.21	1439.53	448.07	795.65	184.73	6.12
Green	Saint Andrew	454.53	0.07	454.60	53.07	206.40	187.11	6.56
Green	Saint George	1680.96	4.06	1685.02	150.03	840.51	677.19	26.90
Green	Saint Patrick	83.37	56.65	140.02	48.39	73.63	15.53	0.67
	Total	6424	1092	7516	3240	3005	1209	45

 Table 18: Impact severity (%) on cultivated land based on vegetation (NDVI) changes, administrative units and hazard zones

Hazard zones	Admin Units	Negative changes (based on NDVI) in cultivated areas (cropland)						
		High <-0.5	Medium -0.5 to -0.25	Low <-0.25	No change			
Red	Charlotte	85.91	11.85	1.79	0.12			
Red	Saint David	94.46	3.30	0.41	0.05			
Orange	Charlotte	63.01	34.59	2.17	0.05			
Orange	Saint David	68.06	27.88	3.21	0.03			
Orange	Saint Patrick	53.26	35.89	6.42	-			
Yellow	Charlotte	43.60	48.72	7.08	0.18			
Yellow	Saint Andrew	25.62	22.31	38.01	0.83			
Yellow	Saint David	37.10	53.18	5.71	0.52			
Yellow	Saint Patrick	34.00	54.10	11.01	0.12			
Green	Charlotte	31.13	55.27	12.83	0.48			
Green	Saint Andrew	11.67	45.40	41.16	1.44			
Green	Saint George	8.90	49.88	40.19	1.6			
Green	Saint Patrick	34.56	52.58	11.09	0.48			

### Table 19: Total Effect of Volcanic Eruption to the Agriculture Sector

Category	Crops	Apiculture	Livestock	Forestry	Fisheries	Infrastructure	Grand Total EC\$	Grand Total US\$
Damage	21,722,919	116,500	447,662	20,832,500	423,947	54,000	43,597,528	16,147,232.59
Loss	93,637,170	110,250	522,243		4,815,211	-	99,084,874	36,698,101.48
Total	115,360,089	226,750	969,905	20,832,500	5,239,158	54,000	142,682,402	52,851,334.07

The Damage and Loss Assessment Team included officials from the Ministry Agriculture Planning Unit, Forestry, Fisheries, Extension and Advisory, Animal Health and Production Division, Banana Services Division, Inter American Institute for Cooperation Agriculture, Caribbean Agricultural Research and Development Institute (CARDI) and Food and Agriculture Organisation of the United Nations (FAO).

**Figure 25:** Map of St. Vincent Showing Agricultural Districts and Hazard Zones

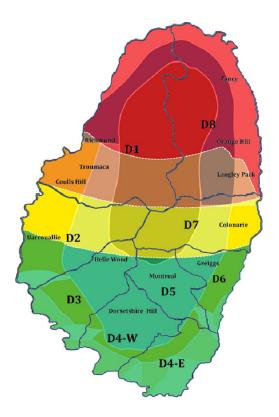


Figure 25 Composite map of St Vincent including Agro-ecological zones (CARDI), Agricultural Regions and Districts (MAFFRTIL) and Volcanic Hazard Zones (UWI SRC). Layers and overlays put together by Colville King, Diversification Officer MAFFRTIL, April 2021.

The National Emergency Management Organization (NEMO) reported that a total of 13,303 persons<sup>8</sup> were evacuated. Of these persons, approximately 2875 were registered farmers and 278 were fisherfolk who

were dislocated from the red and orange zones (Table 17). Additionally, some farmers and fishers from the Yellow Zone, especially on the leeward side, were evacuated.

Table 19: Farmers	5 Disaggregated	d by Hazard Zones
-------------------	-----------------	-------------------

Zones	Total numbers of registered farmers	Total number registered fishers	Total by zone
Red	1850	125	1975
Orange	1023	153	1176
Yellow	2569	2	2571
Green	4996	1468	6464
	10,438	1,748	12,186

Figure 25 is a map of St Vincent showing the Hazard Zones and Agricultural Districts and a table showing the demographic distribution of registered farmers and fishers. Table 19 shows the distribution of farmers according to the different Hazard Zones.

A mixed methodology was employed to conduct the DADA and included "field visits, telephone and personal interviews, the use of data from the Ministry and other institutions, review of past damage assessment documents and statistics from MAFFRTIL and the Ministry of Finance and Economic Planning."

Crop loss was calculated using the acreages affected multiplied by the expected yield foregone multiplied by the market price. Loss calculations for tree crops were done using the extended period of 24 months since recovery for this commodity group will take 2 to 3 years before full recovery.

<sup>&</sup>lt;sup>8</sup> National Emergency Management Organization update, dated April 19, 2021

Validation of these estimates was made using further resources and information from FAO, IICA and CARDI, as well as national statistics.

Livestock damage was calculated based on field visits and reports on deaths of animals and damage estimated using market values by type of animal. Losses were calculated based on production and farm gate prices.

Fisheries damage was calculated based on the estimated market value and repair costs to vessels, equipment and facilities affected. Fisheries losses were calculated based on two sets of variables (i) estimation based on vessels damaged (ii) an estimated 30% of the total fish landings for 2020.

Damage and loss in the forestry sector was not easily quantifiable due to the nature of the forestry ecosystem and services. Notwithstanding, observation and reports were used to estimate the damage done to plantation, primary and secondary forest. An estimate was made on the total number of acres of plantation and natural forest damaged and calculated using a multiplier.

The infrastructure estimation was done using visual observations from field visits and estimates of costs for damages.



The DADA provides detailed estimates for each of the main crops grown (primarily arrowroot, vegetables, root crops, bananas and plantains, and tree crops). Table 18 shows these DADA estimates in detail.



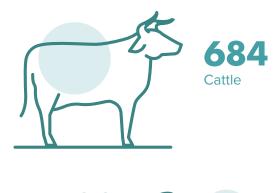
The DADA report found that country's "thriving apiculture industry" (with 713 hives) was not severely impacted since less than 10 percent of the hives are located in the red and orange zones. The total damage was estimated at \$116,500.00 and loss amounted to \$110,250.00.



However, the extensive loss of vegetation (pasture and other forage on which to graze animals) in the red and orange zones will further exacerbate preliminary estimated livestock losses which were determined to be at least \$447,662.00 in the red and orange zones with an overall estimated loss \$522,243.00. Even if farmers can get their livestock to safe zones, there are significant costs "associated with the protection, feeding and veterinary support of these livestock and their relocation to the areas."

The estimated livestock farmers affected in the red and orange zones is 1,233.

The affected animal population in the red zone for small ruminants is 4990, cattle 684 and approximately 400 pigs. More losses are expected as a result of respiratory and dietary issues and other complications.





### Table 20: Livestock Damage and Loss

	DAMAGES						LOSSES			
PRIVATE			PUB	PUBLIC		PRIVATE				
Commodity	No. of animals lost	Value of animals	Infrastructure damage value	No. of animals lost	Value of animals	ltems	Infrastructure damage value	Farmgate loss	Production loss Apr-Dec	
Poulty	2872	\$59,720.00	\$89,550.00	0	\$0.00	Pens	\$10,000.00	\$304,875.00	\$0.00	
Sheep	45	\$26,000.00	\$32,000.00	9	\$3,250.00	Guttering	\$3,000.00	\$13,020.00	\$11,620.00	
Goat	90	\$52,320.00	\$4,704.00	8	\$13,200.00	Fencing	\$2,950.00	\$28,040.00	\$20,600.00	
Pig	59	\$45,725.00	\$22,308.00	10	\$850.00	Forage bank	\$12,585.00	\$57,520.00	\$37,708.00	
Cattle	17	\$63,500.00	\$6,000.00	0	\$0.00			\$42,560.00	\$6,300.00	
TOTAL	3083	\$247,265.00	\$154,562.00	27	\$17,300.00		\$28,535.00	\$446,015.00	\$76,228.00	

### Table 21: Livestock Infrastructure Damage and Loss

	PRIVATE			TOTAL	ХСД	USD
DAMAGE	No. of Animals	3083	27	3110		
	Value of Animals	\$247,265.00	\$17,300.00	\$264,565.00	\$447,662.00	\$164,769.41
LOSS	Infrastructure damage value	\$154,562.00	\$28,535.00	\$183,097.00		
	Farmgate Loss	\$446,015.00	0	\$446,015.00	\$522,243.00	\$192,220.18
	Production loss Apr- Dec	\$69,648.00	\$6,580.00	\$76,228.00		
	TOTAL	\$917,490.00	\$52,415.00		\$969,905.00	\$356,989.58

## 7.4 FISHERIES

The DADA reports that the fishery sector in the red, orange and yellow zones has been significantly impacted. Approximately 800 fishers have been affected among which 278 relocated.

The number of vessels damaged were reduced as the MAFFRIL provided prior advice to fishers to safeguard their vessels. It was reported that seven (7) vessels

with their engines and other equipment have been damaged.

As a result, the preliminary estimated damage and loss for fisheries is \$5,017,060.00 with \$361,850.00 representing damages and losses of \$4,655,210 (loss on fish landing, damaged vessels and aquaculture). International export of fisheries products also ceased due to the closure of the airport. The quantification of such loss is still to be determined.

### Table 22: Summary of Fisheries Sector Damage

Number	Type/length	Boat	Engine HP	Beach Seine Net	Buoys / Fishing gears and auxillaries	Oars	Damage	Loss	Total
1			27,000.00				27,000.00	-	27,000.00
1	Pirogue 26ft	40,000.00	38,000.00				78,000.00	147,000.00	225,000.00
1	Double Ender 28ft + Beach Seine Net	20.000.00		35,000.00		800	55,800.00	324,000.00	379,800.00
3	Double Ender 14 (support boat) ft (x3)	13,000.00	-			300	13,300.00	147,000.00	160,300.00
1	Double Ender 11ft	5,000.00	-				5,000.00	36,750.00	41,760.00
1	Bow and Stern 13ft	20,000.00	15,800.00				35,800.00	73,500.00	109,300.00
1	Deck Boat 30ft	100,000.00	38,000.00		8,950.00		146,950.00	122,500.00	269,450.00
	Total	198,000.00	91,800.00	35,000.00	8,950.00	1,100.00	361,850.00	850,860.00	1,212,600.00

### Table 23: Fish Landing loss

Fish landing weight	Fish Price (\$)	Fish value
559,636	7.00	\$3,804,460



The DADA estimated that "established plantations and the natural forest suffered in excess of 65% damage in the Red, Orange and Yellow zones. The estimated damage is \$56,247,750."

### Table 24: Forestry Damage

Forest area	Location	Cultivated area/ no. of trees/ stands (before disaster) Acres	Damaged/ Affected area/ no. of trees	Repair Cost (where applicable)	Replacement Cost (where applicable)	Ecosystem service value	Est. Value of Damage (USD\$)
Standing timber		569.47	No. Trees/ acre	Salvage/ Rehabilitation	Planting		
Plantation Forest			200				
Red & Orange zone		76.25	76.25/ 15,250	76,250.00	381,250.00		\$457,500.00
Yellow and Green		493.22	98,644	nil	nil		
Forest Access roads	Cumberland			10 miles	Tractor		
roads	Perseverance						
	Rabacca						
Natural Forest	Central	31,500	20,475			Wildlife, watershed	\$20,475,000.00
Upper Montane		10,500	Destroyed	Monitoring	Protection		
Montane							
Coastal							
Total		43,165.94					\$20,832,500.00 (XCD \$56,247,750.00)

### 7.6 AGRICULTURE INFRASTRUCTURE

Substantial damage was done to agricultural infrastructure in the Red and Orange zones, since most of the agricultural investments were in this area (Agricultural Biotechnology Center, arrowroot and cassava factories, fisheries complex, CARDI Field Station, Ministry of Agriculture Livestock Centre, Langley Park Palletisation Centre, and Perseverance Agricultural Station). At the time the preliminary DaLA was completed, the information on the extent of damage and loss to private sector infrastructure (shade houses, farm sheds, animals housing and equipment) were not yet fully assessed. However, it was very clear that "roadways in agricultural areas in the red and orange zones as well as a number of bridges and feeder roads" were affected. The damage to the bridges and roads was an indirect result of erosion due to heavy rains, lahars and pyroclastic flows, clogged streams and rivers due to fallen trees and vegetation. The DADA recommendations include: "urgent attention to avoid catastrophic outcomes" such as flowing down stream and river pathways as was experienced in December 2013. The amount of \$54,000,000 was quoted in the preliminary report however, from qualitative reports provided the extent of the damage maybe more. Given the extreme flooding that also later occurred in late April 2021, further damage to agricultural infrastructure will need to be documented. Table 25 presents and inventory of both public and private agricultural infrastructure and shows which assets are located in Colonaire Census Division which includes Park Hill community and what damage was noted during the DADA.

### Table 23: List of General Agriculture Infrastructure

Location	Name Public	Name Private	Volcanic Zone	Impact	Proposed Relocation
Owia	Owia Fisheries Complex		Red	Ash accumlation	Not Applicable (NA)
	Arrowroot Factory		🛑 Red	Destroyed	No relocation recommende
Orange Hill	Orange Hill Agricultural Training Institute		Red	Ash accumulation	NA
	Apiaries ATI		Red	Total collapse	Botanical Gardens
	Irrigation Unit		Red	Ash accumulation	Recommend to be moved t acquired lands in South Un
	Orange Hill Biotechnology Centre		Red	Total green house collapse	Montreal Green House Par
Rabacca Farms	Rabacca Livestock Station		🛑 Red	Partial damage	Montreal Green House Par
CARDI Field Station	Rabacca Farms		🛑 Red	Partial damage	Montreal Green House Par
Langley Park	Langley Park Palletization Centre		e Red	Ash accumulation	No relocation recommende Assistance in rebuilding, no relocation
Langley Park		Little Nut	e Red	Total collapse of installation	No relocation recommende
Perserverance	Perserverance Agriculture Station		e Red	Total green house collapse	No relocation recommende
Perserverance		Hadley Cocoa Drying Facility	Red	Ash accumulation	No relocation recommende
Congo Valley		Congo Valley Mountain Top	Orange	Ash accumulation, disruption of water	No relocation recommende
Mt. Young		Mt. Young ALCO Hatchery	🛑 Orange	Death of chicks	No relocation recommende
Byera		Mt. William Estate	🛑 Orange	Ash accumulation	No relocation recommende
Three Rivers	Three Rivers Agriculture Station		😑 Yellow	Ash collection	No relocation recommende
New Grounds	New Grounds Nursery		😑 Yellow	Ash collection	No relocation recommende
Montreal Garden	Montreal Green House Park		Green	In good condition	No relocation recommende
Dumbarton Garden	Dumbarton Agriculture station		Green	In good condition	No relocation recommende
La Croix	La Croix Palletization Centre		Green	In good condition	No relocation recommende
Rivulet	Rivulet Cannabis Authority		Green	In good condition	No relocation recommende
Rivulet	Research and Development		Green	In good condition	No relocation recommended
Kingstown	Kingstown: MAFFRTIL head office		Green	In good condition	No relocation recommend
Kingstown	Plant Quarantine Port		Green	In good condition	No relocation recommende
Kingstown	Aviary Old Montrose		🔵 Green	In good condition	No relocation recommended
Kingstown	Fisheries Division Headquarters		Green	In good condition	No relocation recommende
Campden Park	Plant Protection Unit head office		Green	In good condition	No relocation recommended
Campden Park	Bureau of Standards		Green	In good condition	No relocation recommende
Campden Park		East Caribbean Feed Mills	Green	In good condition	No relocation recommende
Campden Park		East Caribbean Flour Mill	🛑 Green	In good condition	No relocation recommende
Rillian	Taiwan technical Mission Pembrook		Green	In good condition	No relocation recommende
Peters Hope	Peters Hope Germ Plasm		Green	In good condition	No relocation recommende
Barrouaillie	Barrouaillie Fisheries Complex		Green	In good condition	No relocation recommende
Walliabou	Walliabou Agriculture Station		😑 Yellow	In good condition	No relocation recommende
Belle Isle	Research and Development Plot at Belle Isle		😑 Yellow	Ash accumulation	No relocation recommende
Belmont	Belmont Livestock Station		🛑 Orange	Partial damage	No relocation recommende

### 7.7 VULNERABLE GROUPS

According to the United Nations<sup>9</sup> appeal, most vulnerable groups Vulnerable groups in Saint Vincent and the Grenadines will be disproportionately affected by the eruption, with a long and difficult road to recovery ahead of them. High-risk groups include poor and vulnerable households, single female-headed households with children and dependents, pregnant women and girls, farmers and fisherfolk, people living with disabilities, as well as those living with HIV/AIDS, the LGBTQ<sup>10</sup> community, youth (aged 15-29) and children, especially those under five, and the elderly. Poverty is perhaps the broadest cross-cutting issue affecting vulnerable groups.

Prior to the eruption of La Soufrière, poverty was already expected to worsen significantly due to the impact of COVID-19 on livelihoods, projected to increase from 30.2 per cent to 38.5-43.8 per cent, while severe poverty was expected to jump from 2.9 per cent prepandemic to 11.9 per cent, significantly diminishing the resilience of affected people to recover from this crisis.

Tourism and agriculture are the backbone of the Vincentian economy, making workers in these sectors particularly vulnerable during the current emergency, especially women and youth. Unemployment disproportionately affects women (30.1%) and youth (ages 15-29), for whom joblessness is twice the national rate. Some of the poorest and most vulnerable populations, many of whom are dependent on agriculture and fisheries, reside in high-risk communities that have suffered losses and damages to housing, crops, livestock as well as the tools and equipment they depend on for their livelihoods. Those dependent on these sectors will be displaced from their source of livelihood, beyond the immediate shortterm, as the sector's recovery could take months, if not years.

The current volcanic eruption appears to be far worse than what has happened in previous years. Several communities have had to be completely evacuated from the island entirely and are now on cruise ships waiting indefinitely to return once the volcanic activity has ceased. But the eruption has also produced excessive amounts of ash across the entire island and as far a field as Barbados and other islands. More importantly, the ash has been so have that it has disrupted electricity supply, completely covered crops, stressed livestock, weighed down and snapped trees, and very importantly contaminated the island's water supply.

Farmers<sup>11</sup> in St Vincent's breadbasket region are already counting thousands of dollars in losses after the decimation of their crops from the erupting La Soufriere volcano's ashfall.

Without water, livestock cannot be kept alive and crops cannot be salvaged.

## 7.8 LINKS/INTERACTION WITH COVID-19

The eruption of La Soufrière comes as Saint Vincent and the Grenadines is recovering from its largest COVID-19 surge amid the pandemic, and the region's worst Dengue outbreak in recent history. La Soufrière is likely continue to erupt in the coming weeks and maybe even months. The long-term effects of a protracted eruption on agriculture and tourism, which are the mainstays of the Vincentian economy and contribute about half of the Gross Domestic Product (GDP), will further exacerbate the already devastating socioeconomic impact of COVID-19. It will also reduce capacity for recovery and erode hard-earned development gains.

<sup>11</sup> Smith, Kareem. Farmers dig out from tonnes of ash, face uncertain future. Barbados Today. April 17, 2021. <u>https://barbadostoday.</u>

bb/2021/04/17/farmers-dig-out-from-tonnes-of-volcanic-ash-faceuncertain-future/

 <sup>&</sup>lt;sup>9</sup> United Nations. April 2021. UN Global Funding Appeal. Explosive Eruption of Soufriere Volcano: St. Vincent
 <sup>10</sup> Lesbian, Gay, Bi-Sexual, Trans, Queer

# 8 Livelihood Assessment and Contingency Planning



Livelihood assessment data are collected in advance about the normal emergency appeal timetable and other elements of the Livelihood of the population in an area likely to be affected by a hazard.

Livelihoods consist of the capabilities, assets (both material and social resources), and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, and provide net benefits to other livelihoods locally and more widely, both now and in the future, while not undermining the natural resource base (*The Livelihood Assessment Tool-Kit*).

To plan for and evaluate the possible impact hazards may have on the livelihoods within a community, an understanding of the types of livelihoods present, the sources needed, the susceptibility of these livelihoods to hazards (natural and man-made) and the existing and required response mechanisms is needed.

## 8.1 LIVELIHOOD ASSETS

Documentation of livelihood assets is very critical to any contingency planning. It is especially important to document the physical, natural and human resource assets that exist in case they are damaged or lost in any particular disaster.

Focus group participants in South Rivers identified the six (6) main types of livelihood categories in the community. These are namely: Labourers, Farming, Hairdressing, Janitor, Vending and Dress Making. The major crops cultivated by farmers are dasheen, eddo, sweet potato, plantain, banana, tannia and yam. Data from the Ministry of Agriculture indicate that there are (42) registered farmers in South Rivers. Feedback from residents indicates that about 25% of farms will be impacted if there is an extreme flooding event. Pasture is said to be the area most vulnerable to extreme flooding. There are about sixty (60) households in this area.

### Table 26: Livelihood Asset Inventory – Park Hill

Livelihood	Skills Needed	Tools & Equipment	Natural Resources
Labourer	Sweep, pick up garbage, trimming	Cutlass, rake, hoe, bucket, shovel, broom	River, road (Land)
Farming	Weeding, knowledge of moon, seedling	Hoe, scoop, fork, spraycan, chemical string.	Land, water, human resource
Hairdressing	Hair technique/ style knowledge of product and hairstyle	Dryer, sink, comb, brush, chair, towel, products	Water, human resource
Janitor	Knowledge of sweeping mopping dusting	Bucket, broom, disinfectant, mop	Water
Vending	Friendly, patience, products, recipes, sales.	Trolley, basket, box, tray.	Tree, land, fruits
Dress Making	Sewing skill, fashion consciousness	Machine, needle, ruler, scissors, chalk	Human resource, Land



Seasonal calendars indicate what type of livelihoods are taking place at any particular time of the year. This illustrates livelihood activities in a year without a hazard and the changes or coping strategies employed when there is a hazard event over the course of a year.

Seasonal Calendar shows livelihood activities in a year without a hazard and the changes or coping strategies employed when there is a hazard event over the course of a year. Farmers who depend on root and cash crop, service providers such as teachers, carpenters, fishermen, and hunters are most affected by the flooding and landslides. Farmers suffer significant losses to crops already planted therefore harvest or reaping is drastically reduced leading to significant financial losses.

Tables 27 and 28 detail the Seasonal Calendars for normal and hazard years for Labourers, Farmers, Hairdressers, Janitors, Vendors and Dress Makers in South Rivers.

Activities	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Labourer								Х	Х	Х	Х	Х
Farming (main crops):	Х	Х	Х	Х	Х	Х	Х	Х	х	х	Х	Х
Dasheen					Р						н	н
Sweet Potatoes			H <sub>2</sub>	P <sub>1</sub>				H <sub>1</sub>			P <sub>2</sub>	
Eddoes			H <sub>2</sub>		P <sub>1</sub>				H <sub>1</sub>		P <sub>2</sub>	
Plantain*	ΡH	ΡH	ΡH	РН	ΡH	РН	РН	ΡH	ΡH	РH	РН	РН
Banana*	ΡH	ΡH	ΡH	РН	ΡH	РН	РН	ΡH	РH	РН	РН	РН
Tannia	Р											н
Yam	H <sub>2</sub>		P <sub>1</sub>				P <sub>2</sub>		H <sub>1</sub>			
Hairdressing	Х					х	Х		х	х		Х
Janitor	Х	×	Х	×	×	×			х	×	×	Х
Vending	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
Dress Makers				X		Х	Х	Х	Х			Х

### Table 27: Seasonal Calendar – Normal Year

Key: Plant P Harvest H

\*Farmers indicated that banana and plantain are planted and reaped all year round

Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Labourer												
Farming (main crops)												
Dasheen	Н	н					Р					
Sweet Potatoes			H <sub>2</sub>	P <sub>1</sub>				H <sub>1</sub>			P <sub>2</sub>	
Eddoes			H <sub>2</sub>		P <sub>1</sub>				H <sub>1</sub>		P <sub>2</sub>	
Plantain**			Н				Р					
Banana**			Н				Р					
Tannia	Р											Н
Yam	H <sub>2</sub>		P <sub>1</sub>				P <sub>2</sub>		H <sub>1</sub>			
Hairdressing												
Janitor												
Vending												
Dress Makers												

### Table 28: Seasonal Calendar – Hazard Year

Key: Plant P Harvest H \*\*Farmers indicated that plantain and banana are the cash crops mostly affected during in a drought year. Planting is therefore done in July and harvesting in March of the following year.

# 9 Coping Strategies

Understanding how people cope with various hazards and disasters is critical to knowing how to plan and support them. People may have both positive and negative coping strategies. For contingency planning, it is important to find measures to support the positive coping strategies, while finding alternative measures of support to mitigate against the negative coping strategies.

Negative coping strategies for example might include selling all livelihood assets, selling livestock, using all of one's savings, taking children out of school, and so on.

To cope with the occurrence of a hazard, farmers seek assistance from the government for seedlings and

livestock or seek employment elsewhere. In the case of service providers, households seemingly cut back on their usage as an urgent recovery strategy. They also seek assistance from the government to rebuild. Money for food takes precedence.

Table 29 below illustrates the coping strategies outlined by residents of South Rivers. The main strategies used by the residents to cope with the fallout from the hazards are to seek government assistance in the form of farming equipment, inputs and housing materials. They salvage from damage crops and depend on relatives overseas for remittances. Some also diversify their livelihood by doing temporary odd jobs such as sewing and vending.

### Table 29: Coping Strategy Inventory for South Rivers

Likely Climate Impact	Positive Coping Strategies and Practices	Negative Coping Strategies and Practices
Government Assistance - farming equipments, inputs, housing materials	Replant crops/ Plant in a quicker time	Gap between salvage and harvest
Salvage form original crops	Provide for family	Forced to beg family/friends overseas
Remittances, Diversify (sew, vend)	Make money	Under pay, stress

# 10 Response and Recovery Typologies

With respect to the 2021 Volcanic Eruption, the DADA reports that have been completed identify both a number of short-term and long-term types of responses that should be implemented both at community and institutional levels. These are presented here:

### 10.1 IMMEDIATE RESPONSE NEEDS (NEXT 3 TO 6 MONTHS)

- Protection of the public and private livelihoods assets in the red and orange zones (livestock, planting materials, tools/equipment, in-vitro facilities, etc.)
- Income support to farmers, fishers and farm workers.
- Initiative to make food readily available and accessible (to reduce food and nutrition insecurity).
- Policy on loan moratorium for farmers with financial institutions to reduce foreclosure.
- Infrastructure to support relocation of farm and farm assets.
- Identification of lands to relocate farmers (a land bank approach).
- Program to engage farmers, youth and women in initiatives at the evacuation centres.
- Procurement of planting materials, genetic stock for crop and livestock
- Clearing of rivers and streams especially in the upper watersheds in red and orange zones.
- Establishment of crop and livestock support systems.

### 10.2 MEDIUM TO LONG TERM RECOVERY AND REHABILITATION NEEDS (NEXT 6 TO 12 MONTHS)

- A comprehensive plan for recovery and rebuilding of a modern, competitive agricultural sector
- Farm relocation
- Introduction of technology and innovation
- Incentive program to encourage young people into farming.
- Policy support for incentives, infrastructure, information and intelligence to build a modern agriculture sector.

### 10.3 RESPONSE TYPOLOGIES IDENTIFIED FOR SOUTH RIVERS

While individuals employ their own responsive mechanisms/coping strategies, external interventions are usually required for the effective and efficient restoration of livelihoods. In the event of a hurricane and/or storm surge, possible responses post-disaster could include the replacement of farming equipment for economic purposes and dwellings for Shelter. The clearing of the main drains in the district post-flood would alleviate excess flood waters.

Participants in South Rivers indicated the types and costs of strategies needed in response to the two (2) main hazards, namely, flooding and landslides that have the greatest impact on their lives and livelihood. It is important to note that in addition to earning a living from the sale of roots, tubers and livestock, farmers across SVG also earn a livelihood from the sale of fruits. There is an abundance of fruit trees across mainland SVG. Along with selling their produce locally, many farmers export their produce to regional markets such as Trinidad and Tobago, Barbados, Grenada and the BVI.

As was noted during the focus group discussions done for the RCCVA, participants indicated the use of savings as the most typical coping strategy. Strong support from community members was also cited as a key coping strategy. The recovery process, or what people do after a hazardous event has impacted their household, seems to be based on a combination of factors: continuing with daily routines and activities, accessing assistance from the state, and using their savings or relying on their families and friends. The fact that the island is prone to the impact of multiple hazards means that recovering is made more difficult by the possibility that another hazard might impact soon after. For example, after the eruption in 1979, Hurricane Allan struck the island in 1980 and caused a lot of damage to crops that had been recently planted. Other problems, such as plant disease also impact farmers.

### **Table 30:** Response Typology - South Rivers

Type of Response Needed	Geographical Area	# of Households likely to be affected	Required quantity (US\$)	Duration	Cost (US\$)	Responsibility
Replacement cost of plant material:						
Dasheen Sweet Potato Eddoes		24 37 18	7,260 plants @\$0.74x8 ac 14,520 plants @\$0.37x14 ac 11,616 plants @\$0.74x5 ac	One-off One-off One-off	42,979 75,214 42,979	Min. of Agri.
Cost of production per acre*:						
Dasheen Sweet Potato Eddoes		24 37 18	8 acres (ac)@\$1,543 14 acres (ac)@\$1,098 5 acres (ac)@\$1,519		12,344 15,372 7,595	Min. of Agri.
Loss of Livestock:		10				Min. of Agri.
Damage to Housing: Support for house repairs	Pasture	30	\$925.93 per structure	One-off	27,778	Min. of Housing
Rental Assistance	Pasture	10	222.22 per month	6 months	13,333	Min. of National Mobil.
Interim assistance benefit	Pasture	60	184.19 Per month	9 months	99,851	Min. of National Mobil.
Cleaning of drains and scattered debris	Pasture		00 Ft	1 week		BRAGSA
Uniform assistance	Pasture	89	\$55.56 per student	One-off	4,945	Min. of National Mobil.
Meals & transport subsidy	Pasture	89	\$66.67 per student	9 months	53,403	Min. of National Mobil.

\*Cost of production per acre includes: labour operations (clearing, digging, planting, weeding, fertilizer application, moulding and harvesting); materials (herbicide, fungicide, insecticide, fertilizer, tools, other); other costs (transportation, land lease).



# ANNEX 1 - MINISTRY OF AGRICULTURE, INDUSTRY AND LABOUR COMPENSATION LIST FOR AGRICULTURAL CROPS AND LIVESTOCK (2019)

Agriculture Region and District	No. of crops	Name of cash crop	Acres	Average number of farmers per crop	Plants per acre	Expected Yield (XCD\$)	Growing Duration (months)	Value at stage in mid of hurricane season (XCD\$)	Value (XCD\$)	75% dependent on crop grown above grown (XCD\$)	55% dependent on crop grown underground	Justification
	1					CHATE	AUBELAIR*					
REGION ONE District 1	1	Ginger	2	16	21,780	20,000	9	\$2.00 per plant	87,120		47,916	Roots and tubers are more like to be affected by flash floods as a result of run-off water from heavy rains
	2	Eddoes	1	28	11,616	11,000	6	\$2.00 per plant	23,232		12,778	
Leeward	3	Dasheen	1	6	7,260	14,000	7	\$2.00 per plant	14,520		7,986	
						FITZ	HUGHES					
District 1	1	Eddoes	2	15	11,616	11,000	6	\$2.00 per plant	46,464		25,555	
	2	Ginger	1	11	21,780	20,000	10	\$0.10per sq. ft.	4,356		2,396	
	3	Sweet Potatoes	1	14	14,520	7,000	4	\$1.00 per plant	14,520		7,986	
						ROS	E HALL					
District 1	1	Carrots	7	60	264,000	8,000	3/4	\$0.10per sq. ft.	30,492		16,771	Flash floods
	2	Tomatoes	6	90	21,780	15,000	3	\$2.00 per plant	174,240	130,680		Plant like to be damaged/ destroyed by heavy rains and high winds
	3	Cabbages	3-4	90	14,520	12,000	3	\$0.30 per plant	14,810		8,146	Flash flood, heavy rains and drought
						SPRING	G VILLAGE					
District 1	1	Eddoes	30	134	11,616	11,000	6	\$2.00 per plant	696,960		383,328	
	2	Sweet potatoes	14	103	14,520	8,000	4	\$1.00 per plant	406,560		223,608	
	3	Corn	7	93	9,680	25,000	3/4	\$2.00 per plant	67,760	50,820		Plants are likely to be damaged by high winds

\*Hurricane intensifies in the latter half of the season and costs were based on this trend and period estimate for growth

Agriculture Region and District	No. of crops	Name of cash crop	Acres	Average number of farmers per crop	Plants per acre	Expected Yield (XCD\$)	Growing Duration (months)	Value at stage in mid of hurricane season (XCD\$)	Value (XCD\$)	75% dependent on crop grown above grown (XCD\$)	55% dependent on crop grown underground	Justification
						COL	ONARIE					
REGION THREE District 7	1	Plantain	4	12	1,210	30,000	11	\$12.00 per plant	58,080	43,560		Plants are likely to be damaged/ destroyed by high winds
	2	Sweet Potatoes	7	23	14,520	8,000	4	\$1.00 per plant	101,640		55,902	
Windward	3	Yams	4	7	4,840	12,000	9	\$5.00 per plant	96,800		53,240	
	4	Bananas	50	18	680	20,000	9	\$10.00 per plant	340,000	255,000		
						FÆ	NCY					
District 7	1	Sweet Potatoes	5	20	14,520	8,000	4	\$1.00 per plant	72,600		39,930	
	2	Groundnuts	3	16	87,120	3,000	4	\$0.10 per sq. ft.	13,068		7,187	
	3	Eddoes	3	15	11,616	11,000	6	\$2.00 per plant	69,696		38,333	
						PAR	K HILL					
District 7	1	Yams (Portuguese)	7	18	2,723	20,000	7	\$5.00 per hole	95,305		52,418	Extensive dry periods can result in produce smaller in size or loss of plantlets due to the heat. The method of calculation can apply for loss during a drought.
	2	Sweet Potatoes	5	17	14,520	8,000	4	\$1.00 per plant	72,600		39,930	
	3	Dasheen	2	7	7,260	14,000	7	\$2.00 per plant	29,040		15,972	
						C	AIWO					
District 8	1	Sweet Potatoes	12	33	14,520	8,000	4	\$1.00 per plant	174,240		95,832	
	2	Tannia	9	32	4,840	9,000	9	\$2.00 per plant	87,120		47,916	
	3	Eddoes	7	25	11,616	11,000	6	\$2.00 per plant	162,624		89,443	

Agriculture Region and District	No. of crops	Name of cash crop	Acres	Average number of farmers per crop	Plants per acre	Expected Yield (XCD\$)	Growing Duration (months)	Value at stage in mid of hurricane season (XCD\$)	Value (XCD\$)	75% dependent on crop grown above grown (XCD\$)	55% dependent on crop grown underground	Justification
						OVERLAND	AND MAGN	UM				
District 8	1	Sweet Potatoes	12	47	14,520	8,000	4	\$1.00 per plant	174,240		95,832	
	2	Tannia	9.5	43	4,840	9,000	9	\$2.00 per plant	91,960		50,578	
	3	Eddoes	5	29	11,616	11,000	6	\$2.00 per plant	116,160		63,888	
						SAN	DY BAY					
District 8	1	Tannia	23	73	4,840	9,000	9	\$2.00 per plant	222,640		122,452	
	2	Sweet Potatoes	22	77	14,520	8,000	4	\$1.00 per plant	319,440		175,692	
	3	Eddoes	9.3	39	11,616	11,000	6	\$2.00 per plant	216,058		118,832	
						SOUT	H RIVERS					
District 7	1	Dasheen	8	24	7,260	14,000	7	\$2.00 per plant	116,160		63,888	
	2	Sweet Potatoes	14	37	14,520	8,000	4	\$1.00 per plant	203,280		111,804	
	3	Eddoes	5	18	11,616	11,000	6	\$2.00 per plant	116,160		63,888	

Please note that agriculture regions 1 and 3 tend to be severely affected by hurricanes and other natural disasters. Both regions are in the north of the country and experience a greater intensity of wind and heavy rainfall.

Livestock	Cost per animal	Infrastructure	e cost	
Sheep	300	\$35/sq. ft.	roof \$8/sq	8800/sq. ft. fencing
Goat	300	\$35/sq.ft.	roof \$8/sq	8800/sq. ft. fencing
Pigs	450	\$35/sq.ft.	roof \$8/sq	
Cattle Female	3000			
Cattle Male	4000			
Poultry Boiler	1.25			
Poultry Layer	4.25			
Peak layers	20			
Pre Peak	10			

Annexes 67

# ANNEX 2 – MINISTRY OF NATIONAL MOBILISATION - SERVICES OFFERED UNDER THE SOCIAL ASSISTANCE PROGRAMME (XCD\$)

#### BACKGROUND

The Ministry of National Mobilisation etc. is charged with the national portfolio of providing social protection to vulnerable households through the Public Assistance Programme guided by the Public Assistance Act. Due to societal changes during the past two (2) decades, additional types of monthly and emergency assistance were added to compliment the traditional services. The following are some of the services currently being offered under this programme:

- 1. Uniform Assistance (\$100&150/student once per year).
- 2. Rental Assistance (\$400-\$600/person per month for six months).
- 3. School fees & Exam Fees (\$200/student).
- 4. Meals & Transport Subsidy (\$180/student per month).
- 5. Basic Amenities & Disaster Relief (\$250&\$1200/person (one-off assistance).
- 6. Interim Assistance Benefit (\$500/family for nine (9) months).
- 7. Medical & Funeral (\$2000/person (one-off assistance).

# ANNEX 3 MINISTRY OF AGRICULTURE, INDUSTRY AND LABOUR – COMPENSATION LIST FOR AGRICULTURAL AND FORESTRY CROPS

IELD CROPS	COSTS (XCD\$)	FIELD CROPS	COSTS (XCD\$)
Arrowroot	10 cents per sq. ft.	Grasses (cultivated)	5 cents per sq. ft.
Bananas	\$3.00 per plant up to 3 months	Ground Nuts	10 cents per sq. ft.
	\$6.00 per plant at medium stage \$10.00 per plant if bearing	Yams (Portuguese)	\$3.00 per hole when young \$5.00 per hole if matured
Plantain	\$4.00 per plant up to 3 months \$7.00 per plant at medium stage \$12.00 per plant if bearing	Dominic	\$2.00 per hole when young \$4.00 per hole if matured
MaughFaugh Baugh	\$1.00 per plant up to 3 months	Water	\$1.00 per hole when young
	\$3.00 per plant at medium stage \$6.00 per plant if bearing	White	\$3.00 per hole if matured
Grindy	\$3.00 per plant up to 3 months	Bascombe	75 cents per hole when young
	\$6.00 per plant at medium stage \$9.00 per plant if bearing	Others	\$2.00 per hole if matured
Sugar Cane	\$1.00 per hole	Sweet Potatoes	25 cents per hole when young \$1.00 per hole if matured
Cassava	30 cents per hole up to 3 months \$2.00 per plant when matured	Ochro	25 cents per hole when young \$1.00 per hole if matured
Corn	15 cents per hole up to 3 months \$2.00 per plant when matured	Ginger	10 cents per sq. ft.
Pigeon Peas	\$1.00 per hole in pure stand \$6.00 per isolated tree	Sorrel	15 cents per hole when young 25 cents per hole if matured
Cotton	60 cents per hole up to 2 months	Tobacco	50 cents per hole up to 3 months
Eddoes	<ul><li>\$2.00 per plant if bearing</li><li>50 cents per hole up to 3 months</li><li>\$2.00 per plant if matured</li></ul>	Pineapple	\$1.75 per hole up to 3 months \$3.50 per hole up to 3 months \$7.50 per hole up to 3
Tannia	50 cents per hole up to 3 months \$2.00 per plant if matured	Dasheen	50 cents per hole up to 3 months \$2.00 per plant if matured

GREEN VEGETABLES	COSTS (XCD\$)	GREEN VEGETABLES	COSTS (XCD\$)
Beans	10 cents per hole non flowering 25 cents per hole if bearing	Lettuce	20 cents per hole for young plants \$1.00 per plant if bearing
Beets	10 cents per hole	Pepper (List or Succet)	25 cents - 50 cents for young plants
Cabbage	25 cents per hole when immature \$2.00 per plant when matured	<ul> <li>(Hot or Sweet)</li> <li>Tomato</li> </ul>	\$1.00 per plant if bearing 10 cents – 50 cents per young plant non flowering
Carrots	10 cents per sq. ft.		\$1.50 - \$2.50 per plant if bearing
Cauliflower	25 cents per plant when immature \$1.00 - \$2.00 per plant when matured	Pumpkin	10 cents -50 cents per hole when immature \$5.00 per hole if bearing
Christophene	\$1.00 per hole when immature \$5.00 per hole if bearing	Passionfruit	\$1.00 per non bearing vine \$5.00 per vine if bearing
Cucumber	10 cents per plant when immature \$2.00 per plant if bearing	Black Pepper	\$1.00 per plant not bearing \$5.00 per plant if bearing
Egg Plant	10 cents - 50 cents per plant when immature \$2.00 per plant if bearing	Pineapples	\$1.75 up to 3 months \$3.50 up to 6 months \$7.50 up to and over 12 months

#### FOREST CROPS (XCD\$)

SPECIES	BEARING TREES	DAMAGED OVER 10 YRS	DAMAGED OVER 5-10 YRS	DAMAGED 0-5 YRS
Mahogany	\$140.00	\$80.00	\$45.00	\$35.00
Teak	\$140.00	\$80.00	\$45.00	\$35.00
Red Cedar	\$140.00	\$80.00	\$45.00	\$35.00
White Cedar	\$140.00	\$80.00	\$45.00	\$35.00
Суре	\$140.00	\$80.00	\$45.00	\$35.00
Honduras Mahogany	\$100.00	\$60.00	\$30.00	\$20.00
W.I Mahogany	\$100.00	\$60.00	\$30.00	\$20.00
Blue Maho	\$100.00	\$60.00	\$30.00	\$20.00
Galba	\$100.00	\$60.00	\$30.00	\$20.00
Pinus Caribbean	\$100.00	\$60.00	\$30.00	\$20.00
Angeline	\$100.00	\$60.00	\$30.00	\$20.00
Bamboo	\$100.00	\$60.00	\$30.00	\$20.00

### **ORCHARD TREES AND PERMANENT CROPS (XCD\$)**

SPECIES	BEARING TREES	DAMAGED OVER 10 YRS	DAMAGED OVER 5-10 YRS	DAMAGED 0-5 YRS
Breadfruit	\$120.00	\$60.00	\$45.00	\$45.00
Breadnut	\$90.00	\$50.00	\$30.00	\$25.00
Сосоа	\$80.00	\$60.00	\$45.00	\$35.00
Coconut	\$100.00	\$70.00	\$60.00	\$45.00
Coffee	\$45.00	\$35.00	\$30.00	\$15.00
Cashew	\$50.00	\$45.00	\$30.00	\$15.00
Custard Apple	\$15.00	\$10.00	\$8.00	\$6.00
Golden Apple	\$75.00	\$50.00	\$30.00	\$20.00
Sugar Apple	-	\$15.00	\$8.00	\$6.00
Guava	\$40.00	\$30.00	\$20.00	\$10.00
Mango (other)	\$70.00	\$45.00	\$30.00	\$15.00
Mango (grafted)	\$120.00	\$60.00	\$45.00	\$35.00
Mammie Apple	\$56.00	\$40.00	\$30.00	\$15.00
Nutmeg	\$120.00	\$90.00	\$60.00	\$35.00
Pawpaw	\$30.00	\$20.00	\$10.00	\$5.00
Plum	\$70.00	\$50.00	\$30.00	\$15.00
Plumrose	\$50.00	\$35.00	\$25.00	\$15.00
Sapodilla	\$70.00	\$50.00	\$30.00	\$15.00
Pear (Avocado)	\$90.00	\$60.00	\$45.00	\$30.00
Grapefruit	\$90.00	\$60.00	\$45.00	\$30.00
Orange	\$90.00	\$60.00	\$45.00	\$30.00
Tangerine	\$90.00	\$60.00	\$45.00	\$30.00
Ortanique	\$90.00	\$60.00	\$45.00	\$30.00
Lime	\$90.00	\$60.00	\$45.00	\$30.00
Soursop	\$50.00	\$40.00	\$30.00	\$15.00
Clove	\$70.00	\$50.00	\$40.00	\$30.00
Cinnamon	\$70.00	\$50.00	\$40.00	\$30.00
Mauby	\$50.00	\$40.00	\$30.00	\$15.00

# **ANNEX 4 – COST OF PRODUCTION**

Source: Ministry of Agriculture, Industry and Labour, SVG.

# CROP: Ginger VARIETY: Jamaican ACREAGE: One (1) Acre DATE: 7/10/2018

ARET. Sunded				
ITEMS	UNITS	RATE(\$)	NO,	COST(\$)
LABOUR OPERATIONS				
Land clearing (Cutlass & Clean) / spraying	M/day	40.00	12	480.00
Ranging	M/day	40.00	15	600.00
Gathering / preparation of planting material	M/day	40.00	5	200.00
Chopping holes and planting	M/day	40.00	6	240.00
Weeding manually ( X 2 ) & Moulding( X 1 )	M/day	40.00	28	1120.00
Fertilising - Band application ( X 3 )	M/day	40.00	4	160.00
Harvesting (pull, cut, wash, dry, bag)	M/day	40.00	30	1200.0
Heading out of field	M/day	40.00	20	800.0
Subtotal				\$ 4,800.00
MATERIALS				
Planting Materials ()	Lbs	1.50	3000	4500.0
Grammoxone & pre-emergent	Gal			205.0
Fertiliser (NPK)	Sack	65.00	12	780.0
Tools(e.g.) Spray can Fork, Hoe, Cutlass, File		665.00	1	665.0
Other(Bags)		1.00	200	200.0
Subtotal				\$ 6,350.0
OTHER COSTS				
Land charges (Lease)	Acre	500.00	1	500.0
Transportation		300.00		300.0
Supervision				
Interest on Ioans (9 - 11%)				
Depreciation on tools & equipment				
Other				
Subtotal				\$ 800.00
Total cost of production				\$ 11,950.0
Total cost per unit of output(\$/Lb)				\$ 0.60
ASSUMPTIONS				
a) Plant spacing	1 X 3 Within Row X Betw	veen Row (Ft)		
b) Plant density	14,520 plants per acre			
c) Marketable yields	20,000 Lbs			
d) Losses & main cause	Negligible.(Due nemato	de)		
e) Maturation Period	10 Months			
f) Price per unit yield - Farmgate :				

## CROP: Eddoe VARIETY: Black ACREAGE: One (1) Acre DATE: 31/12/2014

ITEMS	UNITS	RATE(\$)	NO,	COST(\$)
LABOUR OPERATIONS				
Land clearingSpraying/Cleaning	M/day	40.00	2	80.00
Digging Holes	M/day	40.00	15	600.00
Gathering and preparing plant material	M/day	40.00	4	160.00
Planting (Including heading and dropping)	M/day	40.00	8	320.00
Weed control (herbicide)(X2)	M/day	40.00	3	120.00
Fertiliser application (X 2)	M/day	40.00	4	160.00
Moulding (x1)	M/day	40.00	12	480.00
Harvesting (incl. Sort & heading)	M/day	40.00	12	480.00
Heading out of field	M/day	40.00	8	320.00
Subtotal				\$ 2,720.00
MATERIALS				
Planting materials (Slips)				
Herbicide -(Grammaxone)	Gal.	136.00	2	180.00
Fertiliser (types) N.P.K.	sack	100.00	9	900.00
Tools(e.g.) Fork, Hoe, Cutlass, File, Spray can				
Other (e.g.) Boxes, bags				
Subtotal				\$ 1,080.00
OTHER COSTS				
Land charges (Lease/ Rent/ Share)	Acre			
Transportation				300.00
Supervision				
Subtotal				\$ 300.00
Total cost of production				\$ 4,100.00
Total cost per unit of output(\$/Lb)				\$ 0.37
ASSUMPTIONS				
a) Plant spacing	2 X 3 Within Row	v X Between Row (ft)		
b) Plant density	7,260 plants per a	acre (plants/acre)		
c) Marketable yields(lbs)	11,000			
d) Losses (Rejects & Spoils)	Negligible			
e) Maturation Period	6 Months			
f) Price per unit yield - Farmgate :	\$0.75/Lb			

## CROP: Dasheen VARIETY: Upland ACREAGE: One (1) Acre DATE: 31/12/2014

ITEMS	UNITS	RATE(\$)	NO,	COST(\$)
LABOUR OPERATIONS				
Land clearingSpraying/Cleaning	M/day	40.00	2	80.00
Digging Holes	M/day	40.00	15	600.00
Gathering and preparing plant material	M/day	40.00	3	120.00
Planting (Including heading and dropping)	M/day	40.00	5	200.00
Weed control (herbicide)(X2)	M/day	40.00	3	120.00
Fertiliser application ( X 2 )	M/day	40.00	4	160.00
Moulding (x1)	M/day	40.00	12	480.00
Harvesting (incl. Sort & heading)	M/day	40.00	12	480.00
Heading out of field	M/day	40.00	8	320.00
Subtotal				\$ 2,560.00
MATERIALS				
Planting materials (Slips)				0.0
Herbicide -(Grammaxone /Touchdown)	Gal.	170. /136	2	306.0
Fertiliser (types) N.P.K.	sack	100.00	10	1,000.0
Tools(e.g.) Fork, Hoe, Cutlass, File, Spray can				
Other (e.g.) Boxes, bags				
Subtotal				\$ 1,306.00
OTHER COSTS				
Land charges (Lease/ Rent/ Share)	Acre			
Transportation				300.00
Supervision				
Subtotal				\$ 300.00
Total cost of production				\$ 4,166.00
Total cost per unit of output(\$/Lb)				\$ 0.3
ASSUMPTIONS				
a) Plant spacing	2.5 X 3 Within Ro	w X Between Row (ft)		
b) Plant density	5,800 plants per	acre (plants/acre)		
c) Marketable yields(lbs)	14,000			
d) Losses (Rejects & Spoils)	Negligible			
e) Maturation Period	8Months			
f) Price per unit yield - Farmgate :	\$.60/Lb			

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