# DRAFT ENVIRONMENTAL AND SOCIAL ASSESSMENT REPORT AND MANAGEMENT PLAN

# ENVIRONMENTAL AND SOCIAL ANALYSIS OF THE MODERNISATION OF THE AGRICULTURE SECTOR PROGRAM JA-L1083

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## PROPRIETARY RESTRICTION NOTICE

# Acknowledgements

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Finally, ESL would like to acknowledge its team for the collaborative approach towards the development of this report:

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The views expressed herein are those of the authors and do not necessarily reflect the views of the IDB.

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# 1 Introduction

## 1.1 Purpose

This document presents a Draft Environmental and Social Assessment (ESA) of the *Modernisation of the Agricultural Sector Program (MASP) JA-L1083* being funded under an agreement between the Government of Jamaica (GOJ) and the Inter American Development Bank (IDB). The assessment has been conducted in accordance with the IDB *Environment and Safeguards Compliance Policy and Guidelines* to identify and assess potential environmental and social impacts of the development and implementation of the MASP, and is submitted in support of the project preparation phase of the IDB's undertaking. Based on the ESA an Environmental and Social Management Framework /Plan (ESMP) has been prepared for the mitigation and management of the identified potential impacts and risks during the life of the program.

The ESA and ESMP have been prepared by Environmental Solutions Ltd under a consultancy agreement with the IDB. This report is organized into 3 main sections: Section 1- Environmental and Social Assessment; Section 2- Environmental and Social Management Plan; and Section 3- Consultation Plan and Grievance Mechanism.

## 1.2 Contextual Background

The agricultural sector is an important contributor to Jamaica's economic development and is recognized as a priority in the Government's mid-term economic and social development plans. The sector accounts for 7.5 percent of Jamaica's GDP, and employs approximately 17 percent of the labour force. Agri-food products represent 20 percent of total merchandise export earnings, and 16 percent of the total merchandise import bill. With a high import bill and the need to become more competitive, resilient and sustainable for both the local and export markets, it is essential to displace high value imports particularly through technology transfer and infrastructure improvements (World Bank, 2018 and Ministry of Agriculture and Fisheries, 2015). Small farmers tend to be at a comparative disadvantage on the local and international markets, and there have been several initiatives toward greater inclusion.

The Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF) has had challenges over the years in the development of this small-scale agriculture sector. This sector is considered to be underexploited with several challenges preventing farmers from being competitive on the local and international market. High costs of some production inputs, relative cost and productivity of labour, praedial larceny, limited use and investment in modern technology, poor business practices, limited infrastructure, vulnerabilities to pests and diseases and limited to no coordination among farmers are key barriers to optimal agricultural production and sale. To improve small-scale farmer competitiveness in larger local and international markets, production practices and outputs need to meet market requirements; quality and cost are key factors. To better achieve this, MICAF has recognised the need to create synergies among small-holders, provide development support and connect agricultural producers to a wider market of consumers (World Bank, 2018 and personal communication).

Over the years, several programmes have been implemented to assist the small-scale agriculture sector to become more competitive.

One such program was the IDB investment loan of USD$15M in 2010 - the Agricultural Competitiveness Program JA-L1012 (ACP), aimed at increasing farmers access to markets. The ACP was re-scoped in 2013 at the request of the Government of Jamaica (GoJ), to continue the development of small-scale agriculture in Jamaica, with greater focus on increasing agricultural competitiveness and modernization of the sector. The new scope was entitled Modernization of the Agricultural Sector Program (MASP), JA-L1083.

# SECTION 1

# ENVIRONMENTAL AND SOCIAL ASSESSMENT

# 2 Modernisation of the Agriculture Sector Program (MASP)

## 2.1 Overview

The MASP is intended to provide support for various growth-enhancing reforms and development programs to increase agricultural productivity and market linkages through improved:

(i) animal and plant health services;
(ii) food safety services;
(iii) agricultural extension; and
(iv) promoting public-private partnerships (PPP) in the agricultural sector.

To achieve the above objectives the following two components have been identified:

**Component 1.** Agricultural health and food safety. This component will finance activities related to:

(i) strengthening animal health: improvement of disease surveillance and control, traceability systems, animal quarantine facilities, formulation of protocols and operational regulations, staff training, equipment, and inputs for the veterinary laboratories;
(ii) strengthening plant health: improvement of pest surveillance and control, traceability systems, plant quarantine facilities, enhancement of integrated border controls, formulation of protocols and operational regulations, staff training, equipment, and inputs for the plant health laboratories;
(iii) improving food safety: assessment of the food safety policy and the related legal framework, analysis of the institutional arrangements of the agricultural health and food safety system, improvement of the surveillance, inspection and monitoring systems, enhancement of the monitoring system for agricultural inputs, strengthening of good agricultural practices and certification procedures, formulation of protocols and operational regulations, staff training, equipment and inputs for the relevant laboratories.

**Component 2:** Public agricultural infrastructure for Public Private Partnerships. This component will finance activities related to:

(i) development of a national, comprehensive policy and operational strategy for the conception and management of PPP in the agricultural sector and, specifically, of Agro-Parks;
(ii) the financing of key public infrastructure to complement PPP that will be identified through competitive processes including rigorous technical evaluations as well as socio-economic and environmental analyses;
(iii) the provision of specific agronomic and business training to producers' organizations located in the existing Agro-Parks;
(iv) the provision of demand-based agricultural public services and information to facilitate market integration and synergies.

The following Component 2 activities have been identified to date. Further details of these are presented in Appendix I.

- 2.1: Development of a comprehensive framework for agricultural PPPs;
- 2.2: Market-driven agricultural PPPs to improve productivity and farm to market linkages
- 2.3: Public infrastructure and services to support market-driven agricultural PPPs
- 2.4: Development of a pilot Productivity Innovation Fund
- 2.5: Systems and tools to strengthen management and data collection in agro-economic zones.

## 2.2 The Development of Agro Parks

In 2008 the Government of Jamaica (GOJ) and the Inter-American Development Bank (IDB) allocated a sum of $219 million to execute the National Irrigation Development Project, which was designed to drill wells and develop irrigation distribution networks in namely: Colbeck, St. Catherine; New Forest, Manchester; Duff House, St. Elizabeth and Yallahs in St. Thomas. In addition Water User Groups (WUG) and Water User Associations (WUA) were to be legally registered and members engaged in training for irrigation management, farm management and marketing techniques (JIS, 2007). This project was not able to complete all the works intended and subsequently in 2010 the Ministry of Agriculture and Fisheries launched the Agro Parks Programme. Funding (J$427M) was obtained from the European Union/Sugar Transformation Unit Programme, and the Inter-American Development Bank funded (J$620M) the Agriculture Competitiveness Programme (ACP) to set up Agro Parks across Jamaica.

Stakeholder consultations with MICAF indicated that the development of Agro Parks is a major avenue to improving the competitiveness of the small-scale agriculture sector.

The Ministry of Agriculture and Fisheries in 2014 published a Ministry Paper (48) on the Agro Park Development Programme. The document defines an Agro Park as "*an area of intensive, contiguous, parcel of land for agricultural production, which seeks to integrate all facets of the agricultural value chain from pre-production to production, post harvesting and marketing*". All these activities are being executed by the Agro Investment Corporation (AIC) within the framework of a tripartite partnership involving the Government, the farmers/investors and marketing entities.

The following are features that should be present in the Agro Parks:

1. The requisite infrastructure and facilities
2. An environment that supports integrated, sustainable agricultural production, processing and logistics
3. Processes are integrated along a value chain in a deliberate way
4. Partnerships involving Government, farmers/investors & marketing organizations

Agro-Parks are being strategically implemented across Jamaica to facilitate the following:

- Promote Public Private Partnership investments
- Promote efficiency in resource allocation and utilization - thus reduction in costs
- Improve economies of scale – e.g. in the procurement of goods and services
- Improved market access
- Promote and encourage sustainability
- Create long term and seasonal employment
- Create focal points for agricultural development

Nine (9) Agro Parks were targeted for implementation, but only 7 are currently in operation as outlined in Table 2.1 below. Four of these Agro Parks were selected for environmental and social assessment as recommended by MICAF. These are highlighted in the Table.

*Table 2.1: Land Availability and Distribution in Agro Parks (AIC, 2014)*

| Agro Park | Parish | Acres Available | Acres Leased | Acres in Production |
|---|---|---|---|---|
| **Plantain Garden River (PGR)** | St. Thomas | 290 | 290 | 43.73 |
| **Yallahs** | St. Thomas | 252 | All Private | 22.5 |
| **Amity Hall** | St. Catherine | 2,100 | 1,400 | 208.8 |
| **Hill Run** | St. Catherine | 300 | Private | 238 |
| **Ebony Park** | Clarendon | 1400 | 683 | 374 |
| **Spring Plain** | Clarendon | 1,149 | 638 | 19.8 |
| **New Forest/Duff House** | Manchester, St. Elizabeth | 779 | All Private | 105 |
| **Meylersfield** | Westmoreland | 90 | All Private | 0* Not in operation |
| **Small Ruminant Abattoir Cluster** | Westmoreland | acreages to be determined | All Private | 0* Not in Operation |
| **Total** | | **6,360** | **2,756** | **1,011.83** |

## 2.3 Quarantine Facility for Exporting Goods

MICAF is also seeking to develop an appropriate quarantine facility to facilitate the export of agricultural goods. The Agricultural Marketing Corporation (AMC) Complex on Spanish Town road, is an existing facility currently being run by the Agro Investment Corporation (AIC). This complex is identified for further development under MASP as a quarantine facility with the appropriate amenities that can facilitate the post-harvest processing and packing of Global GAP certified and HACCP certified produce for export. This facility was also environmentally and socially assessed under this Consultancy.

# 3 Methodology

The Consultants developed the approach and methodology according to the IDB Safeguard Policies and Guidelines (OP 703) and the Terms of Reference provided by the IDB. As part of the general approach, a multidisciplinary team of experienced scientists and environmental professionals were assembled to conduct the institutional review, environmental assessment, social assessment, stakeholder consultations, determination of potential impacts, recommendations for mitigation measures and development of an environmental and social management plan.

The team utilized the Charette-style approach to data gathering, analysis, and presentation, whereby team members conducted the field investigations together to determine critical elements for analysis and

the issues to be highlighted. Team meetings were used as a means to discuss the progress of work and to facilitate integration of data toward achieving the project objectives outlined above.

The following (Sections 3.1 to 3.7) are specific tasks to be completed in order to achieve the project objectives.

## 3.1 Project Initiation/Kick-off

The project began with an initial client meeting on July 4, 2019 to discuss the project work plan and schedule and any anticipated changes to this. Discussions were also had regarding data collection being essential for timely submission of the deliverables due under this consultancy.

## 3.2 Data Collection and Review

The Consultants conducted desktop research to collect and review existing data as well as review relevant documentation provided by the client and executing agency related to this project. Existing data collected for review are referenced in this ESA Report.

## 3.3 Field Visits

Field investigations were conducted at the locations identified for assessment as follows:

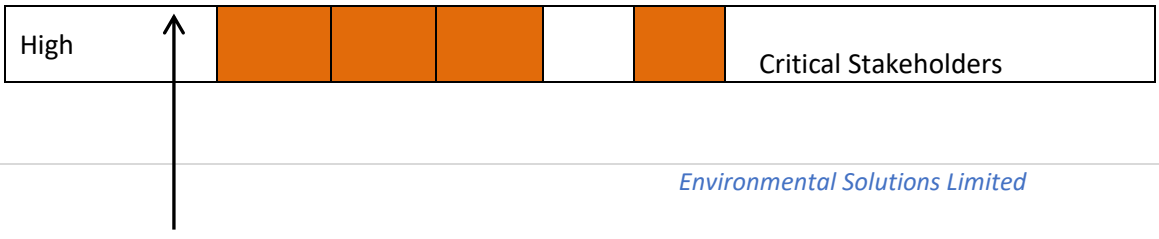
- Yallahs Agro Park – July 26, 2019
- Spring Plain/Ebony Park Agro Park – July 30, 2019
- New Forest/Duff House Agro Park – July 30, 2019
- Agricultural Marketing Corporation (AMC) Complex – August 12, 2019

These sites were selected based on their level of compliance to international best practices as identified by information received from MICAF. The sites were screened for physical, ecological and social issues that could impact operations.

Potential, social and environment risks were flagged along with lessons-learned from previous activities; relevant areas directly and indirectly affected by the operation; identification of socioeconomic and cultural profile of main stakeholders and potential beneficiaries. Information was disaggregated by gender where applicable and available.

## 3.4 Stakeholder Consultations

A Stakeholder Mapping Exercise was conducted, stakeholder groupings were identified and classified based on their role and potential influence on the project. Figure 3.1 illustrates.



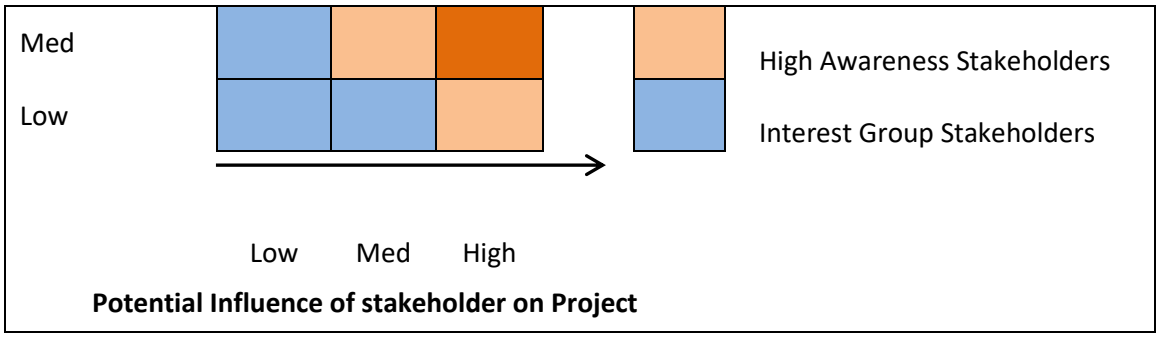



*Figure 3.1: Stakeholder Mapping*

The stakeholders identified were grouped as follows:

- Stakeholders to be affected, directly or indirectly, by aspects and effects of Project implementation
- Stakeholders that participate in the Project implementation
- Stakeholders being able to influence Project implementation

The method of engagement was outlined for the various stakeholder groups, in order to meet the varying needs identified. Figure 3.1 below shows the various levels of stakeholders and the engagement approaches that were utilised during this aspect of the project.

*Table 3.1: Stakeholder Level of Engagement and Approaches*

| Level | Role or responsibility | Communication | Nature of Relationship | Engagement Approaches |
|---|---|---|---|---|
| Monitor | Monitor stakeholders' views. | One-way; stakeholder to company | Long term | Media and internet tracking. Second-hand reports from other stakeholders possibly via targeted interviews. |
| Inform | Inform or educate stakeholders. | One-way; company to stakeholder, no invitation to reply. | Short or long term relationship with stakeholders. | Bulletins, letters, brochures, reports, and websites. Speeches, conference and public presentations. Open house and facility tours. Road shows and public displays. Press releases, press conferences, media advertising, lobbying. |
| Transact | Work together in a contractual relationship where one partner directs the objectives and provides funding. | Limited two-way; setting and monitoring performance according to terms of contract. | Relationship terms set by contractual agreement. | Public Private Partnerships and Private Finance Initiatives, Grant-making, cause related marketing. |
| Consult | Gain information and feedback from stakeholders to inform decisions made internally. | Limited two-way; company asks questions and the stakeholders answer. | Short or long term involvement. | Surveys, focus groups, workplace assessments, one-to-one meetings. Public meetings and workshops. Standing stakeholder advisory forums. On-line feedback and discussion. |

| Level | Role or responsibility | Communication | Nature of Relationship | Engagement Approaches |
|---|---|---|---|---|
| Involve | Work directly with stakeholders to ensure that their concerns are fully understood and considered in decision making. | Two-way, or multi-way between company and stakeholders. Learning takes place on both sides. Stakeholders and company take action individually. | May be one-off or longer term engagement. | Multi-stakeholder forums. Advisory panels. Consensus building processes. Participatory decision making processes. |
| Collaborate | Partner with or convene a network of stakeholders to develop mutually agreed solutions and joint plan of action. | Two-way, or multi-way between company and stakeholders. Learning, negotiations, and decision making on both sides. Stakeholders work together to take action. | Long-term. | Joint projects, voluntary two-party or multi-stakeholder. Initiatives, partnerships. |
| Empower | Delegate decision-making on a particular issue to stakeholders. | New organizational forms of accountability; stakeholders have formal role in governance of an organization or decisions delegated out to stakeholders. | Long-term. | Integration of stakeholders into governance structure (e.g. as members, shareholders or on particular committees etc.) |

The results of the stakeholder mapping exercise were used to inform a Consultation Plan, prepared and put forward to the Borrower and IDB as a suggested consultation methodology for going forward.

## 3.5 Policy Legislative and Institutional Review

Key policies and legislation were reviewed to identify and make reference to those that may apply under implementation of the MASP.

The capacity of the Executing Agency, MICAF, to manage environmental, social, cultural, institutional health and safety and labor issues was reviewed with a view to recommend and technical and/ or institutional strengthening program that may be needed. This was informed by desk research and key stakeholder interviews.

## 3.6 ESA Report Preparation

The ESA and ESMP was prepared using the information gathered in 3.1 to 3.5 above and reported as guided by the terms of reference.

## 3.7 Limitations

This project did not collect raw/primary data and so was heavily reliant on available existing data. Some data such as air quality and noise baselines are not available for the area and therefore could not have been discussed. Additionally, more accurate estimates for population data was not available from STATIN within the short timeframe and as such, the Social Development Commission (SDC) community profiles

available for communities within or bordering the Agro Parks were used as reasonable substitutes in assessing the social setting.

The Albion Community Profile, a community located in the south of the Yallahs Agro Park was used to inform the social setting. The Milk River Development Area Profile of which Spring Plain is a part was used to provide the social setting for Spring Plain and Ebony Park Agro Parks. The Bull Savannah Community Profile, which immediately neighbours Duff House and New Forest to the west was used to inform the social setting for the Duff House/New Forest Agro Park. Parish totals from the 2011 Census data were also used where data was deemed useful and applicable.

Of note is the fact that whereas the TOR refers to an ESA of MASP which includes several components, this document covers only a limited aspect of the overall programme. It is intended that this assessment will guide the further development of other aspects of the programme.

# 4 Yallahs Agro Park (YAP)

## 4.1 Location

The Yallahs Agro Park is located in the Yallahs River floodplain within the Yallahs River Watershed Management Unit in the parish of St. Thomas. Many of the farms are located along the sandy river banks. Extensive quarrying was noted on the south western bank. The Agro Park includes the communities of West Albion, Spring Garden, Norris, Heartease, Poor Man's Corner and Phillipsfield (Figure 4.1).


*Figure 4.1: Yallahs Agro Park in St. Thomas*

## 4.2 Farmers in YAP

The ACP project completed the Yallahs Irrigation Scheme and the establishment of the Water Users Association which was named the *Yallahs Irrigation Specially Authorised Society*. This Friendly Society operates the Yallahs Agro Park. The ACP Project funded the training and Global G.A.P. certification of

farmers within the area and constructed for them a Global G.A.P. certified Packaging Facility. There are currently seven certified Global G.A.P. Farmers in the Yallahs Agro Park, five males and two females (See Appendix III) (AIC, 2019).

All the lands in this Agro Park are privately owned and farmers reside on their farm plot. Each farmer owns an average of a ½ to 1 acre of land. This Agro Park largely has under production, tree crops such as mangoes, ackees and bananas; however, other crops are produced, such as onions, peppers, melons, gungo peas, carrots, cucumbers, bell peppers and okras. All the farmers are equipped with metered irrigation water from the Yallahs Irrigation Scheme, which provides water from three well sources. The supply is reported to be good and consistent with most farmers practicing sprinkler irrigation. A few farmers have invested in and practice drip irrigation (Figure 4.2).

*Figure 4.2: Farms in the Yallahs Agro Park using Sprinkler and Drip irrigation*

Farmers largely do their own marketing of goods on the local market. However, the certified farmers have been assisted with market linkages to export mangoes and peppers.

## 4.3 Infrastructure

The road network in Yallahs was recently upgraded under the ACP Bridging Project (2015-present). River shingle was used to upgrade the roads on the flat, with the exception of a small hillside community called Red Hills that was asphalted to minimize the risk of erosion (Figure 4.3). Major earth drains were also

cleared and a few culverts were constructed to reduce the risk of flooding and damage to the newly upgraded road network. This Bridging project will also fund additional training and the recertification of the Global G.A.P. certified farmers in the YAP.


*Figure 4.3: Road and Irrigation Infrastructure Constructed in the Yallahs Agro Park*

## 4.4 *The Yallahs Agro Park Packaging Facility*

The Agro Park has been equipped with a grading and packaging/processing facility constructed in the Heartease community under the previous ACP Project (2010-2015) (Figure 4.4). The facility was constructed using containers and was observed to be adequately labelled although underutilized evidenced by the dust, wasp nests and rusting metal work (Figure 4.5). Farmers within the west Albion area of the park complained that the facility was too far away from their farms and it is not feasible for them to utilize it. The Facility is equipped with appropriate gender distinguished bathrooms and a common lunch area. An enclosed room in the middle of the facility has been designated for the storage of pesticides and other chemical used by the farmers.


*Figure 4.4 Yallahs Agro Park Packaging Facility*

The Packaging Facility is located ~230 meters east-north-east of the Heartease pumping well but is supplied water via a trucking system. The Facility was designed to be self-sufficient and was handed over to the Agro Investment Corporation (AIC) and the Yallahs Irrigation Specially Authorised Society for use and maintenance. It was equipped with a solar panel and associated batteries for electricity and large water storage tanks, which can be filled by the Friendly Society users as needed.

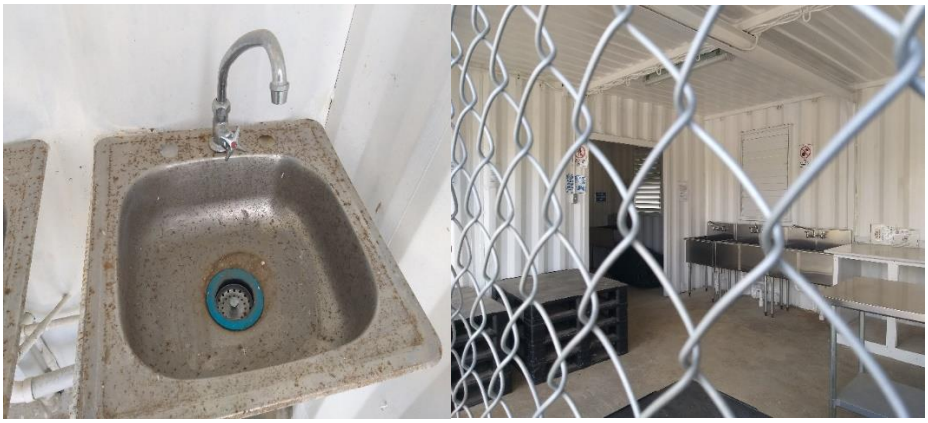


*Figure 4.5 Rusting metal works at Yallahs Agro park Packaging Facility*

A wastewater treatment (WWT) system comprising a septic tank, reed bed and soak away pit has been constructed; no tertiary treatment (disinfection) was identified. The packing facilities at each Agro Park have a similar wastewater treatment system. It was stated that the relevant permits were obtained from the National Environment and Planning Agency (NEPA) although no related signs were observed.

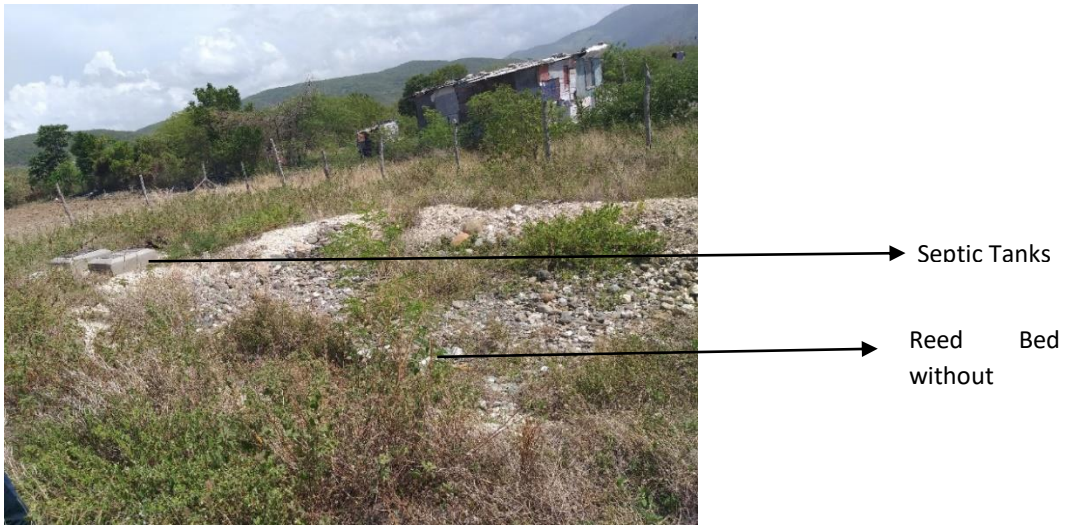



*Figure 4.6: WWT System at Yallah Agro Park showing Septic tanks and Reed Bed*


*Figure 4.7: WWT System at Yallahs Agro Park showing Reed Bed and Soakaway Pit*

## 4.5 Existing Environmental and Social Setting

### 4.5.1 Physical Setting

#### *4.5.1.1 Geology*

The YAP is located on the Yallahs River flood plain, therefore the underlying rocks are recently deposited Alluvium. The older geology around the YAP appears to be largely faulted. The oldest rocks exposed appear to be olistrotromes of coarse-grained breccias (Donovan & Pickerill, 2008) of the Middle Eocene Font Hill Formation of the Yellow Limestone Group (Mitchell, 2016)). These are fault bounded against blocks of the Gibraltar-Bonny Gate Fromation and Montpelier Formation of the White Limestone Group and younger rocks of the Coastal Group (Figure 4.8).

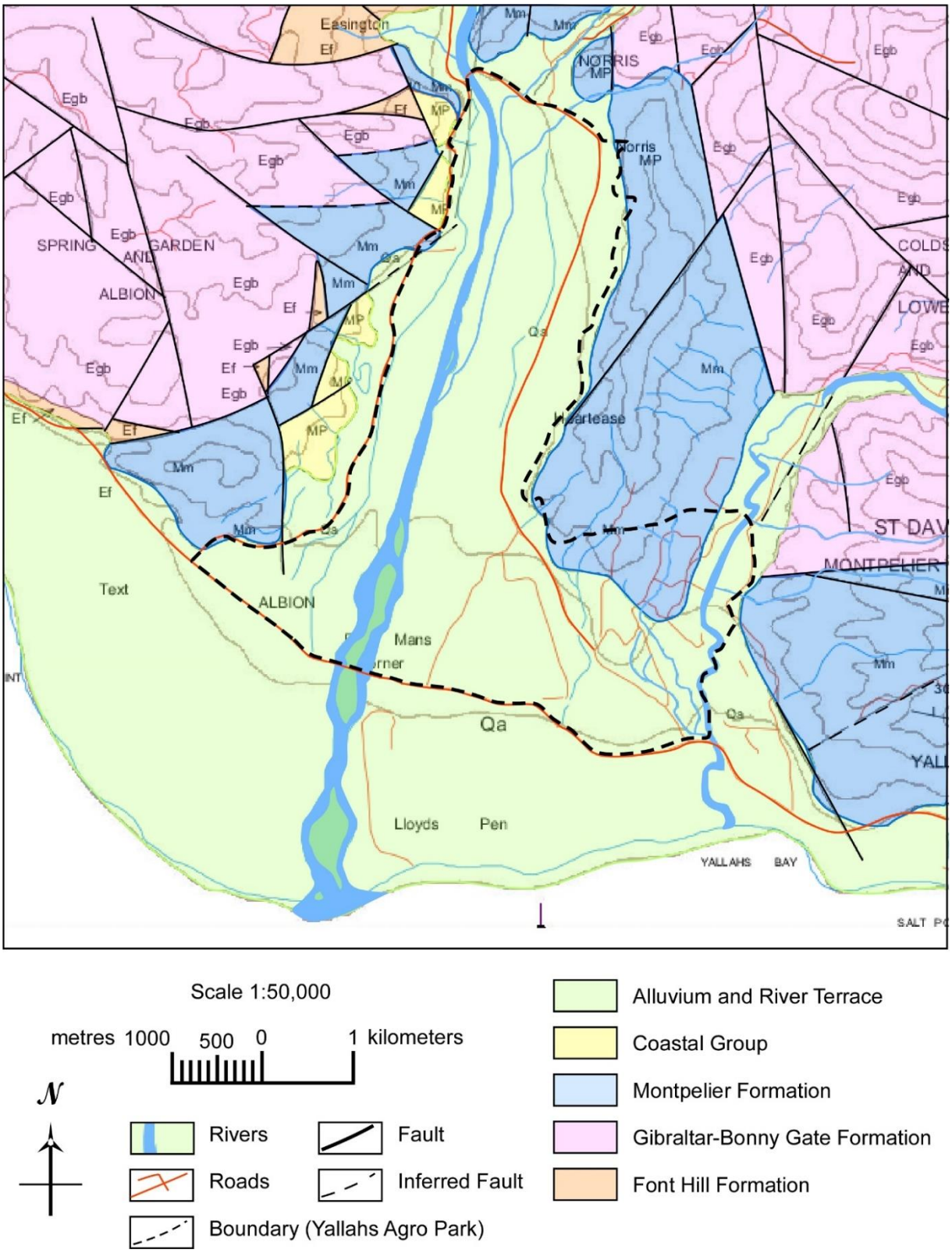



*Figure 4.8: Geology Map around the Yallahs Agro Park (modified from: (Mines and Geology Division))*

#### *4.5.1.2 Topography, Hydrology & Drainage*

The topography at the YAP is generally flat with a low gradient merging into the Yallahs fan Delta to the south (Figure 4.9). Elevation ranges from 20 msl to 80msl, as the Park sits within the wider Yallahs flood plain. The hills to the west of the Agro Park rise to a high of 380 msl and on the east to a height of 250msl.

The Yallahs River running north-south through the Park is part of the Yallahs River Watershed Management Unit and the Blue Mountains South Hydrological Basin, and is the main drainage feature of YAP. Several smaller tributaries are also present. Water wells drilled to the alluvium aquifer are located in the area, and water is used mainly for irrigation purposes.

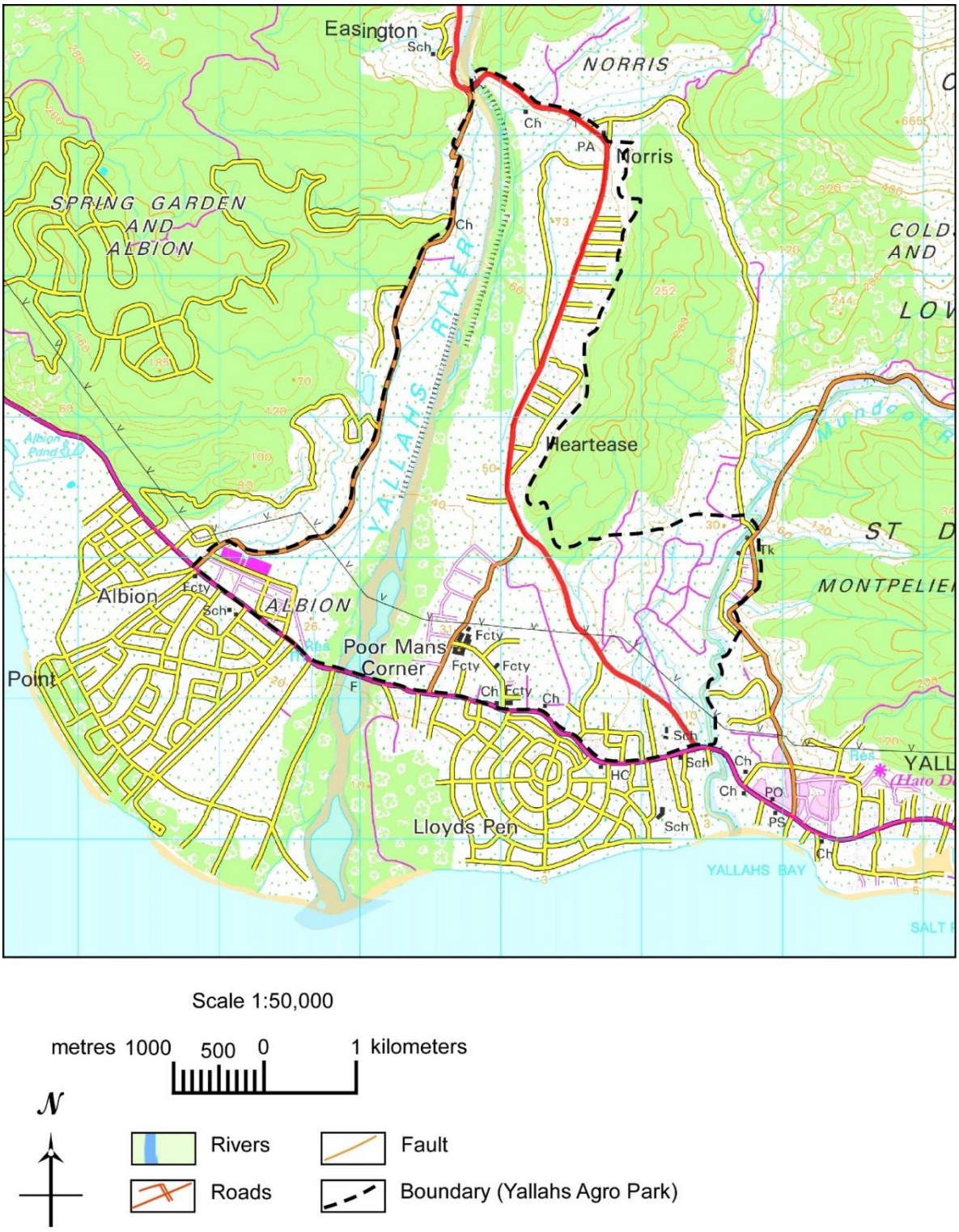



*Figure 4.9: Contour Map showing location of the Yallahs Agro Park (Black Broken Line). Exert from the Jamaica 1:50,000 (Metric Edition), Sheet 18 (National Land Agency, 2010)).*

### *4.5.1.3 Climate and Climate Change Projections*

The climate surrounding the Yallahs Agro Park is consistent with that experienced throughout St. Thomas. Average mean monthly temperatures range between 24.2°C and 26.8°C with average annual temperatures of 25.7 °C. Typically, precipitation is the lowest in March, with an average of 41 mm, and the highest in October, averaging 279 mm. This period of rain is usually accompanied by a short dry season in the earlier months of the year. Between the driest and wettest months, the difference in precipitation is 238 mm and throughout the year, temperatures vary by 2.7 °C (CGSM, 2017). St. Thomas, and by extension Yallahs, is one of the few areas across Jamaica which experiences very strong annual mean wind speeds (1.48-8.69m/s) (CGSM, 2017).

*Table 4.1: Mean monthly temperature (°C) and rainfall (millimetres) received in Yallahs, St Thomas (Source: Meteorological Service Jamaica)*

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. Temperature (°C) | 24.2 | 24.3 | 24.6 | 25.4 | 26 | 26.7 | 26.9 | 26.9 | 26.8 | 26.2 | 25.6 | 24.9 |
| Min. Temperature (°C) | 20.6 | 20.6 | 20.9 | 21.8 | 22.8 | 23.6 | 23.4 | 23.2 | 23.4 | 22.9 | 22.2 | 21.4 |
| Max. Temperature (°C) | 27.8 | 28 | 28.3 | 29 | 29.3 | 29.8 | 30.5 | 30.7 | 30.3 | 29.6 | 29.1 | 28.4 |
| Avg. Temperature (°F) | 75.6 | 75.7 | 76.3 | 77.7 | 78.8 | 80.1 | 80.4 | 80.4 | 80.2 | 79.2 | 78.1 | 76.8 |
| Min. Temperature (°F) | 69.1 | 69.1 | 69.6 | 71.2 | 73.0 | 74.5 | 74.1 | 73.8 | 74.1 | 73.2 | 72.0 | 70.5 |
| Max. Temperature (°F) | 82.0 | 82.4 | 82.9 | 84.2 | 84.7 | 85.6 | 86.9 | 87.3 | 86.5 | 85.3 | 84.4 | 83.1 |
| Precipitation / Rainfall (mm) | 58 | 52 | 41 | 66 | 155 | 160 | 91 | 137 | 192 | 279 | 161 | 84 |

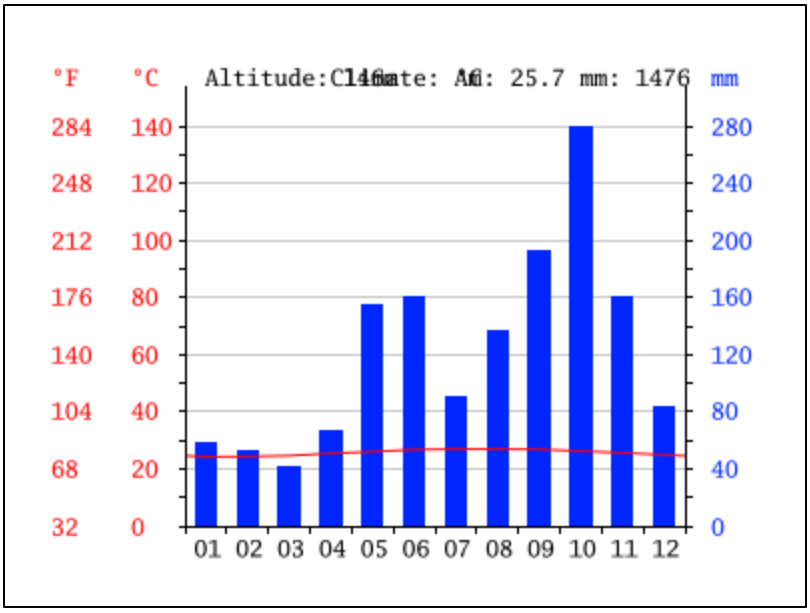



*Figure 4.10: Mean Monthly Rainfall (mm) and Temperature (°C) experienced across Yallahs, St. Thomas (Source: Climate-Data.org 1982-2012)*

Irrespective of the model used or scenario examined, Jamaica continues the warming trend seen in the historical data through to the end of the century (CGSM, 2017). Projected changes in mean temperature for the eastern end of the island where St. Thomas is located shows consistent increases in temperature.

*Table 4.2: Projected Changes in Mean Temperature in the East of Jamaica (Source: CGSM, 2017)*

| Table 33: East (Zone 2) | | | | |
|---|---|---|---|---|
| | **2020's** | **2030's** | **2050's** | **2080's** |
| **NDJ** | 1.26 – 1.32 | 1.94 – 2.06 | 2.61 – 2.77 | 3.13 – 3.34 |
| **FMA** | 1.22 – 1.27 | 1.86 – 1.95 | 2.57 - 2.70 | 3.20 – 3.38 |
| **MJJ** | 1.14 – 1.21 | 1.87 – 2.02 | 2.65 – 2.86 | 3.27 – 3.55 |
| **ASO** | 1.28 – 1.38 | 2.00 – 2.21 | 2.76 – 3.04 | 3.30 – 3.64 |
| | | | | |
| **ANNUAL** | 1.22 – 1.30 | 1.92 – 2.06 | 2.65 – 2.85 | 3.22 – 3.48 |

A drying trend is projected from as early as the mid-2020s with 0 to 2% less rainfall in the annual mean (CGSM, 2017). The 2030s will be up to 4% drier, the 2050s up to 10% drier, while by the end of the century the country as a whole may be up to 21% drier as discerned from the most severe model results. Change in rainfall during the late rainfall season is the primary driver of the drying trend noted. By the mid-2030s late season rainfall has decreased by 1-3%, while by the end of the century the mean decrease is 2-20% (ibid). Dry season rainfall generally shows small increases or no change.

### *4.5.1.4 Natural Hazards*

#### 4.5.1.4.1 Drought

Drought within the Yallahs Valley has not been associated with the short dry periods experienced throughout the year. Instead, the installation of pipelines from the Yallahs River to channel water to the Mona dam in St. Andrew have resulted in a significant reduction in the water available to farmers on the

Yallahs floodplain. Since the pipelines have been in place, farmers have reported not being able to flood their lands to maintain its moisture and this has led to an increase in the number and severity of bush fires which affect crops and housing (Gleaner, 2013).

#### 4.5.1.4.2 Flooding

Areas along the Yallahs River, and the southern region of the YAP are prone to flooding particularly after heavy rains. The 100-year return period floodplain of the Yallahs River is known to affect areas near the Poor Man's Corner and Albion communities (NWA, 2017) (Figure 4.11). Subsequent landslides along the steep valley sides which border the Agro Park are also associated with heavy rains.

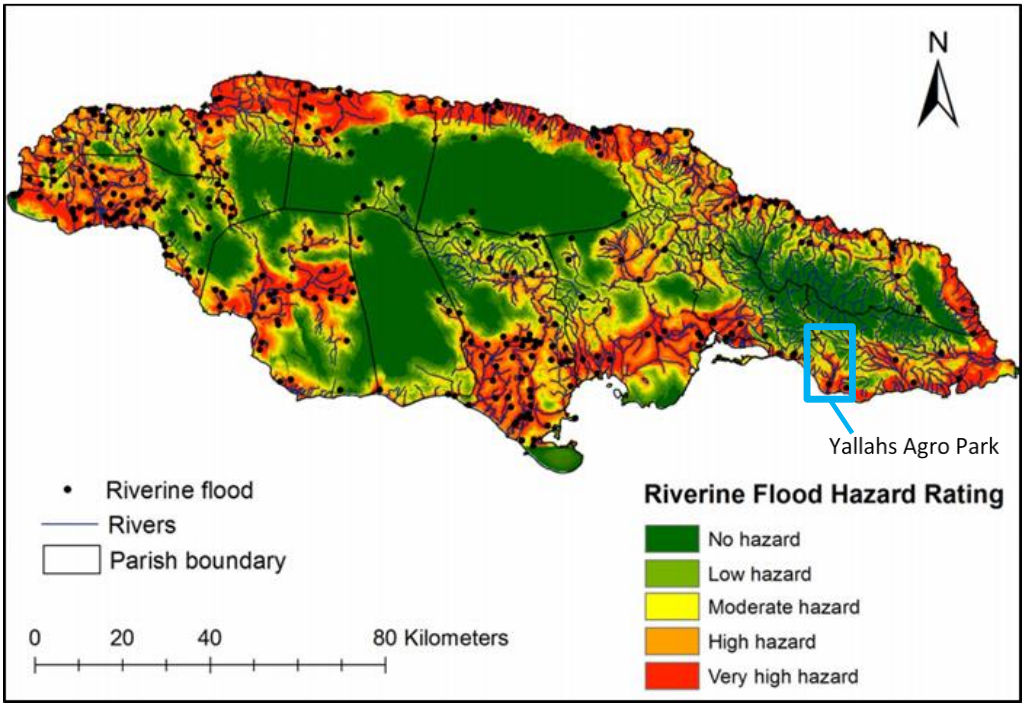



*Figure 4.11: Riverine Flood Hazard Ratings across Jamaica with Yallahs Agro Park highlighted in blue. Map indicates high to very high flood risk along the Yallahs River. Source: Nandi et al., 2016*

#### 4.5.1.4.3 Tropical Cyclones

The Yallahs Agro Park has been impacted by Tropical Storm Nicole and Hurricanes Dennis, Emily, and Gustav in recent years. These and other major storms have resulted in flash flooding, landslides which destroyed the fording (Dennis and Gustav) and Yallahs main road (Nicole). These form the major transport infrastructure link between Kingston and eastern Jamaica. The loss of these transport networks resulted in delayed earnings as some farmers were unable to transport goods to be sold.

*Table 4.3: Recent Hurricanes and Tropical Storms which have impacted agriculture and livelihoods in St. Thomas*

| Hurricane | Year |
|---|---|
| **Hurricane Dennis** | 2005 |
| **Hurricane Emily** | 2005 |
| **Tropical Storm Nicole** | 2008 |
| **Tropical Storm Gustav** | 2008 |

| | |
|---|---|
| **Hurricane Sandy** | 2012 |

#### *4.5.1.5 Earthquakes, Liquefaction and Landslides*

YAP is situated in the most active earthquake zones in Jamaica, along the Wagwater Belt (Figure 4.12). A major fault, The Plantain Garden Fault Zone is less than 20 km north of the Agro park Site (Figure 4.13). The Wagwater Belt fault zone trends NW-SE and the Plantain Garden Faults Trend E-W.

Earthquake modelling for Jamaica has identified that a strong earthquake (based on earthquake history) of magnitude VIII on the Modified Mercalli Scale can occur along the Plantain Garden Fault. Since this location is just several kilometers north of the Yallahs Agro Park, the area is expected to experience the same magnitude earthquake (VIII) (). The location of the Agro Park is also on alluvium deposits therefore the area can experience liquefaction.

Landslides may also occur on the hills to the east and west of the site and these may be earthquake induced or rainfall induced. Large and small landslides may block roads and access to nearby communities as well as affect both the eastern and western sections of the Agro Park.

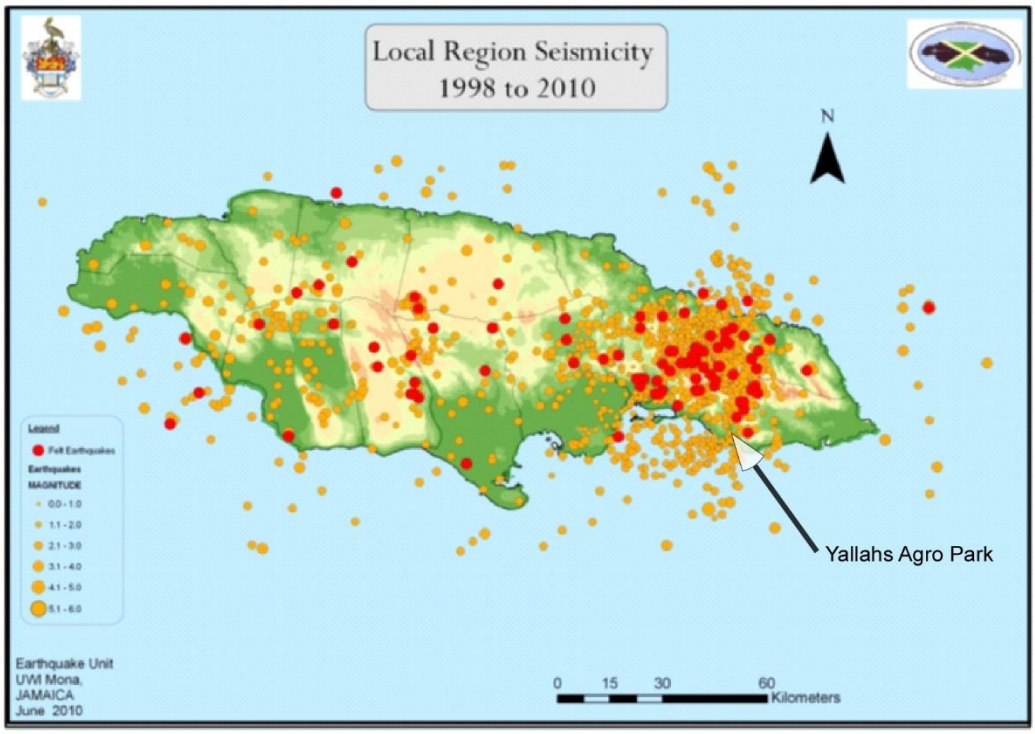



*Figure 4.12: Map showing local regional seismicity for Jamaica from 1998 to 2010 and the location of the Yallahs Agro Park (Brown, n.d.).*

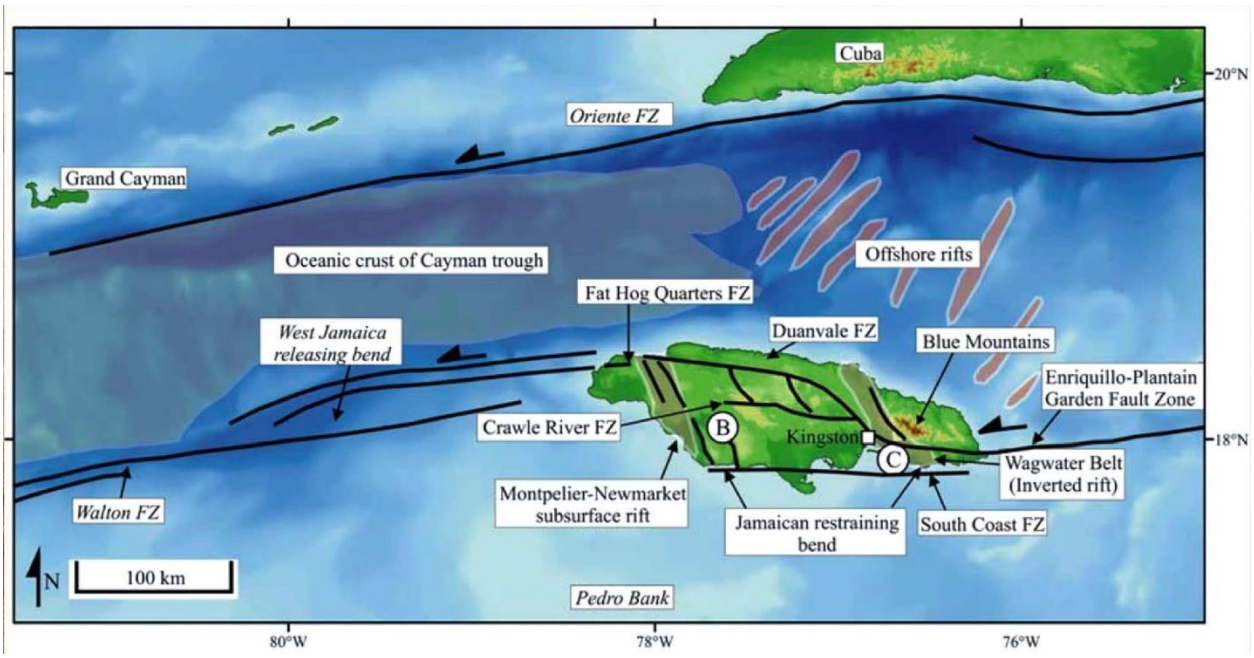



*Figure 4.13: Fault Model Map of Jamaica showing the Enriquillo-Plantain Garden fault Zone (Mann, DeMets, & Wiggins-Grandison, 2007).*

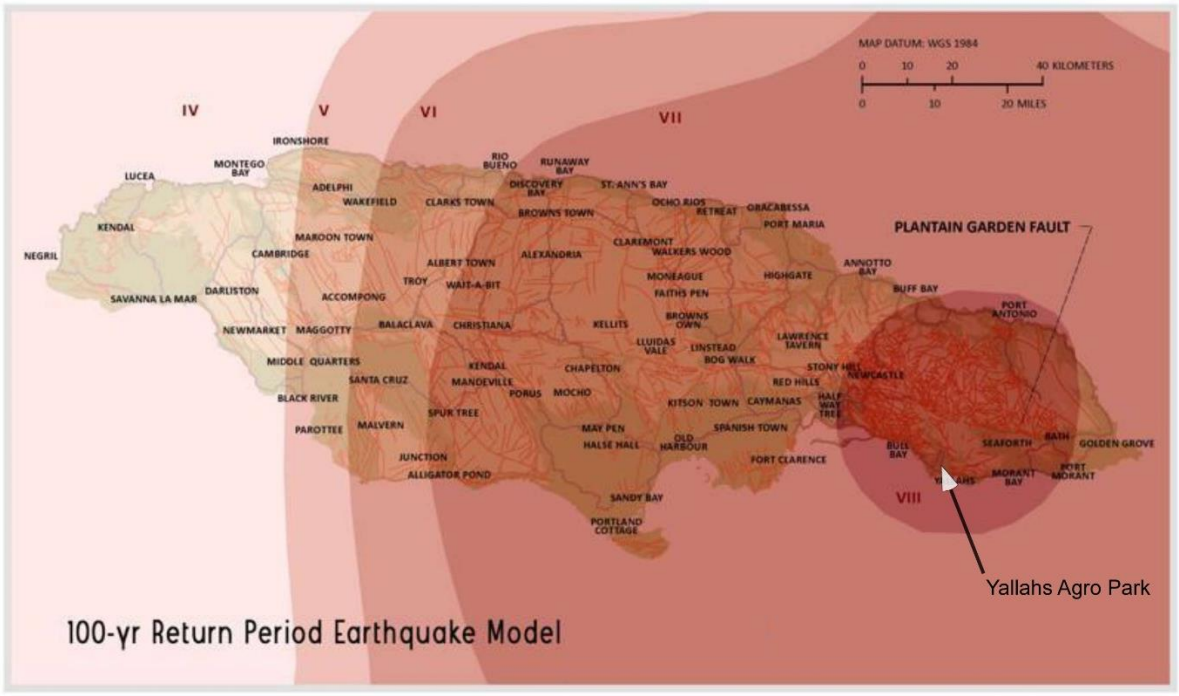



*Figure 4.14: Map showing modelled earthquake intensity on a Modified Mercalli Intensity Scale for a the Plantain Garden Fault and the location of the Yallahs Agro Park (MGI & Earthquake Unit, UWI, 2010).*

#### *4.5.1.6 Water Supply*

There are three wells and (3) pumping stations within the Yallahs Agro Park; these are located in the Norris, Heartease and Phillipsfield communities. All three wells are drilled into alluvium aquifers and are used to supply water to the Yallahs Agro Park farmers east of the Yallahs River using pressurized pipes. Farmers on the eastern bank of the Yallahs river indicate that they are not supplied with water from the NIC but instead retrieve water from a spring located outside of the watershed. In one case, a farmer receives wash water from the quarry located upstream the farm.

Water supplied from NIC is done based on demand and as such the consistent changes in the water pressure flowing through the lines can potentially impact operating costs and damage the distribution network. The irrigation system sees its highest throughput during the peak season for production, which is September to February each year.

The Heartease pumping station has a maximum pumping capacity of 1,350 imperial gallons per minute. The well at this pumping station is approximately 300 feet deep and comprises mainly fine gravel and coarse sand with some boulders and silt. The water that is pumped from the Heartease well is filtered prior to distribution to remove excess sediment. The trapped sediments are sporadically removed then periodically flushed.

The Norris pumping station has a maximum pumping capacity of 850 imperial gallons per minute. This well is located in a low-lying area approximately 100 meters from a currently dry tributary of the Yallahs River – the Colliere River. Observations indicated that the pumping station sits on a flood prone site.

#### *4.5.1.7 Water Quality*

Water quality analysis was done under the ACP project for which 9 sampling locations were established as illustrated in Figure 4.15. Water samples were analysed for the following 22 parameters:

1. Faecal Coliform
2. Nitrates
3. Orthophosphates
4. Total Suspended Solids
5. Chloride
6. Pesticides
7. Copper
8. Zinc
9. Boron
10. Manganese
11. Iron
12. Magnesium
13. Sodium
14. Calcium
15. Salinity
16. Dissolved Oxygen
17. pH
18. Conductivity
19. Potassium
20. Biochemical Oxygen Demand
21. Oil & Grease
22. Chemical Oxygen Demand

Based on the data obtained over three (3) consecutive months of sampling and analysis, Chemical Oxygen Demand (COD) remained below the method detection limit (MDL) and there was absence of pesticides at all 9 sites. Chloride and conductivity were the only test parameters that had values that were above the NRCA Ambient (Fresh) Water Guidelines of 20ppm and 600µS/cm respectively at least once for the Yallahs Agro Park. Salinity trends remained consistent over the sampling period although samples taken from the western bank had the highest values. On average, the entire surface water system within the Agro Park can be described as a freshwater system with mean salinity value at 0.27ppt (<0.5ppt) (ESL, 2018)

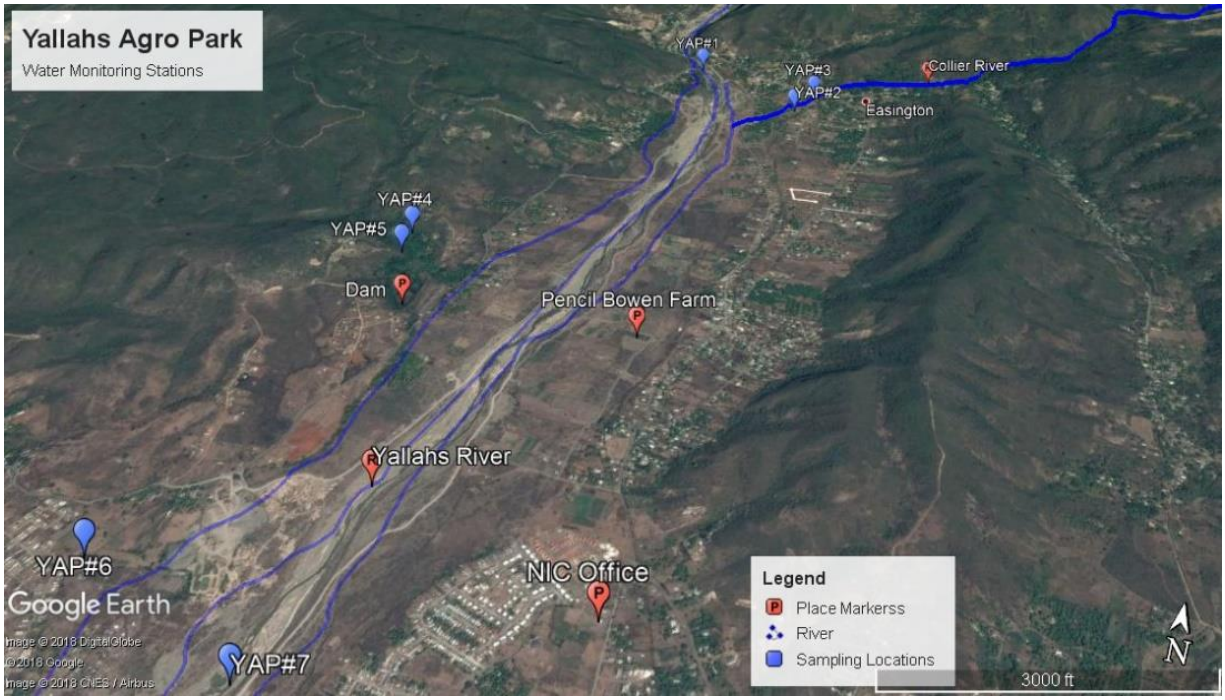



*Figure 4.15: Google Earth Image of Sampling Locations at the Yallahs Agro Park, January – March 2018*

### 4.5.2 Ecological Setting

Natural vegetation within the Yallahs Agro Park has been cleared to accommodate residential development and farming activities. However, west of the park, there are dry limestone forests and sections of the Port Royal Mountains while to the east of the Yallahs River lies the Queensbury Ridge and Yallahs Hill (Figure 4.16). Vegetation along the hillsides and throughout the forests include lowland semi-deciduous and other disturbed evergreen wooded trees while the flat areas are occupied by mixed herbaceous/shrubland, subsistence plantations of sugar and banana, pockets of other cultivated cash crops and grasslands (Evelyn and Camirand, 2003; FAO, 2008). In these areas, deforestation and soil erosion, including landslides is a growing problem. This is mainly because agriculture and other activities are not regulated, and conservation is not ensured leading to agricultural encroachment. As such, rehabilitation of the watersheds has become a high priority to ensure preservation of natural vegetation to maintain biodiversity (FAO, 2008).

*Figure 4.16: Dry Limestone Forest on Hillsides bordering the Yallahs Agro Park*

The growth of secondary vegetation was observed in the river channel along with some reed grasses where standing water existed. Based on the diversion of water from the Yallahs River to Kingston and the sandy porous nature of the soil, the river channel is largely dry in the flood plain. Heavy flooding is associated with rainfall events.

*Figure 4.17: Vegetation in the Yallahs River Channel*

### 4.5.3 Social Setting

YAP includes major communities: Easington and Norris to the north, Heartease and Phillipsfield to the east, Spring Bank to the west and Albion and Poor Man's Corner to the south, with the latter two being west and east of the Yallahs River respectively (Figure 4.1). The STATIN best fit enumeration district (ED) data was not available within the short time frame for the project and so estimates of population and infrastructure have been gleaned from the Albion Community Profile prepared by the Social Development Community (SDC).

#### *4.5.3.1 Demography*

The area was reported to have a population of 2,592 with approximately 720 households. The overall population comprises almost equal males and females. Of note, however, is significantly more aging females (65 years and over) and more male youths (0-24). 47.5% of the total population fall within the working age group (25 to 64).

52.8% of the households are headed by males with only 38.6% being headed by persons without academic qualification and 22.9% led by unemployed individuals (SDC, 2009). All the land within the Yallahs Agro Park is owned by the farmers who also live on the land they cultivate.

*Table 4.4: Age-Sex Distribution of the Albion Community in the Yallahs Agro Park. (Source: SDC, 2009)*

| Age Cohort | Male | Female | Average |
|---|---|---|---|
| 0-14 | 16.2 | 13.1 | 14.65 |
| 15 - 24 | 10.8 | 8.5 | 9.65 |
| 25 - 29 | 3.9 | 3.9 | 3.9 |
| 30 - 64 | 19.1 | 20.6 | 19.85 |
| 65+ | 1.2 | 2.7 | 1.95 |
| TOTAL | 51.2 | 48.8 | 50 |

#### *4.5.3.2 Housing*

67% of houses are made from blocks, 18% wood, and 9% from concrete. 61% own the land on which they live and consist of mainly farmers while 12.5% lived on family owned land. 76.4% owned the houses in which they live.

*Figure 4.18: Sample Housing Stock in Yallah Agro Park*

The site visit gave an indication that the various residential communities are growing as several new houses were observed to be under construction. Figure 4.18 shows a sample of the housing stock.

#### *4.5.3.3 Social Infrastructure*

59.7% of residents receive private water piped into dwelling and 15.3% receive public water piped into dwelling. 95.4% of residents use electricity for lighting (SDC, 2009).

All of residents have access to telephone services, 66.7% were cellular phones 31.9% have both land line and cellular phone and 1.4% land line only (SDC, 2009).

Garbage is collected by the National Solid Waste Management Authority (NSWMA) for 83.3% of households, while 30.3% households burn their garbage (ibid).

Approximately 50% of households used sewer/water not linked to a main sewer and only 26.4% used sewer/water linked to a sewer. Few (6%) households share toilet facilities (ibid).

#### *4.5.3.4 Existing Social Issues*

The main community issues faced include poor road conditions for lower class roads leading off the Yallahs Main Road, high levels of youth (15-24 yrs) unemployment, high levels of high school dropouts, high levels of adult (25years and over) unemployment and poor parenting (ibid).

# 5 Spring Plain and Ebony Park Agro Parks

## 5.1 Location

The Spring Plain Agro Park (SPAP) lies in the Milk River Watershed Management Unit in the parish of Clarendon. The agro park is located on flat land, and specifically the floodplain of the Milk River (Figure 5.2). The Milk River is a second order non-perennial river, which separates the two adjacent parks. West of the river is the Spring Plain Agro Park and to the east, the Ebony Park Agro Park (EPAP). Although registered as two separate entities they are both managed by the same Agro Park Manager.

The lands in the Spring Plain and Ebony Park Agro Parks are owned by the Government of Jamaica and leased to farmers for cultivation. The main include pumpkin, sweet potatoes, melons, capsicums (pepper/ chillies), onions, cassava and sugar cane (Figure 5.1).

*Figure 5.1: Farms in the Spring Plain Agro Park*

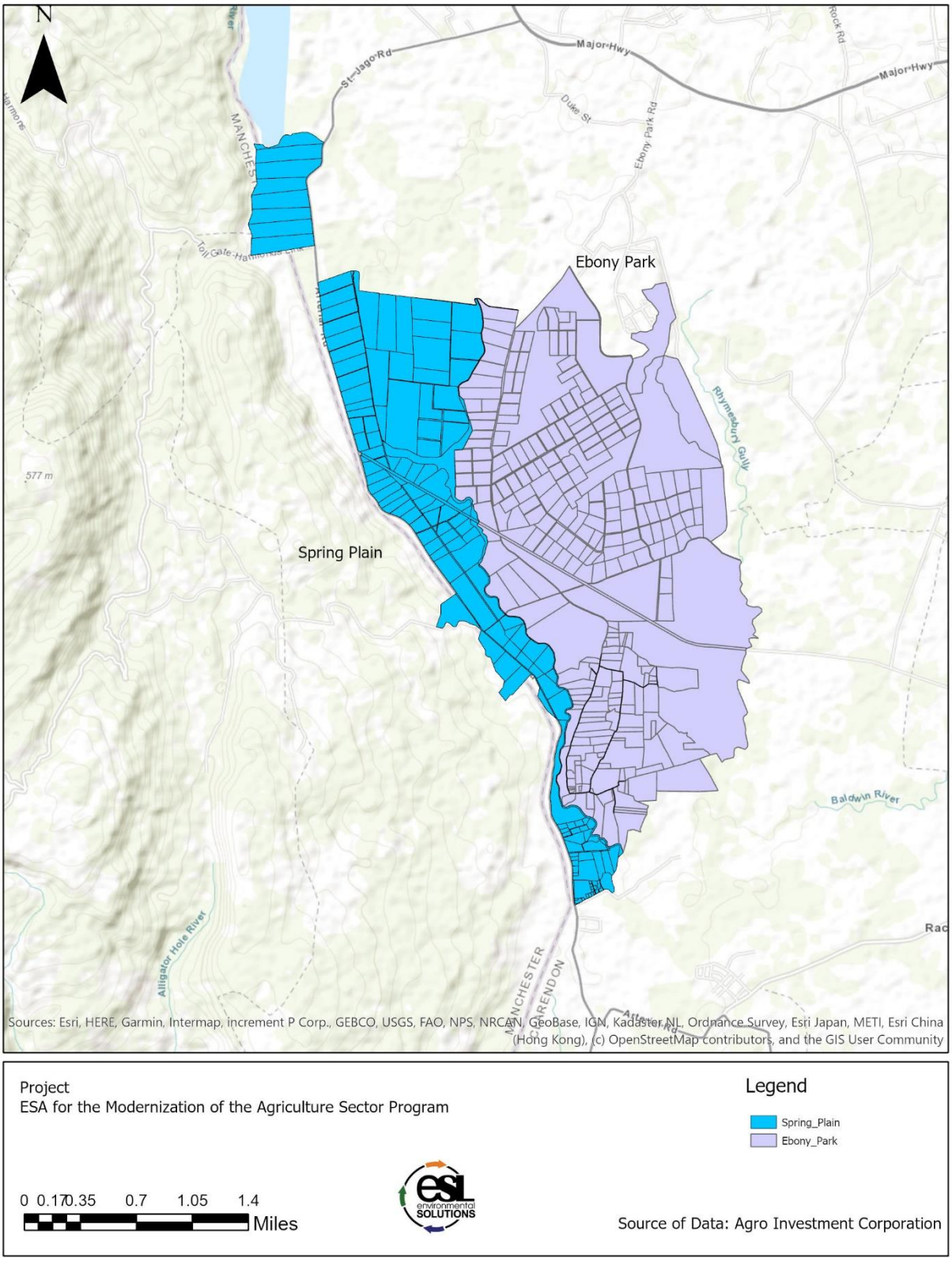



*Figure 5.2: Spring Plain and Ebony Park Agro Parks in Clarendon*

## 5.2 Farmers in the Agro Park

The farmed lot sizes in the SPAP range from 5 acres to 200 acres with a total of 25 lessee farmers. The farmed lot sizes in EPAP are much smaller than in SPAG, lots are 5 acres and less per farmer and there are 78 lessees.

Under the previous ACP project, the Spring Plain Farmers Association was established. On record, there are 19 members, 16% of whom are women. Stakeholder consultations reveal that the group is not very active and as a result attempts were made to join with the more vibrant Ebony Park Agricultural Cooperative that was also established, but this move was unsuccessful. The latter Cooperative has 21 members, and 10% are women.

Approximately 62 daily labourers support these farmers. The live in the surrounding communities of Spring Plain, Milk River, Carf Wheel and Gravel Hill District. Despite the limited number of female farm owners or lessees, many women were observed in the field during the site visits. It is possible that the percentages of female labour involvement is much higher than farm ownership.

Under the previous ACP project, MICAF incorporated an initiative to encourage youth in agriculture by dedicating over 100 acres of land for young farmers. A few young persons acquired lots to farm but several challenges prevented a greater uptake. In the same period, the Red Stripe Jamaica Brewery in Kingston launched their Project Grow, which is the production cassava as a locally grown substitute for previously imported starch in their malt, beer and stout beverages (Red Stripe, 2019). Stakeholder consultations indicated that the Rural Sociologist from the ACP project made recommendations for the involvement of Red Stripe on the SPAG and as such 100 acres of land was leased to Red Stripe for the production of cassava. Embedded in Project Grow is the generation of employment through training and certification of young Jamaicans in good agricultural practices. The workers on the Red Stripe lands are over 50% youths.

Farmers report that praedial larceny was one of the main challenges in these two agro parks. Additionally, during periods of heavy rainfall, flooding occurs resulting in significant losses.

Anecdotal evidence suggests that high temperatures in the area have limited the range of crops. The heat has also impacted the labourers in the field and acts as a deterrent for some persons to work under the conditions. There are issues with securing equipment for land preparation and mechanical harvesters are not used on farms. No cooling mechanism is available on farms or in the nearby Produce Handing Facility.

Some farmers in the Spring Plain and Ebony Park Agro Parks do their own marketing. Others have, with the assistance of the AIC, maximized on strategic market linkages with: Carliston Bammies, Progressive Supermarkets, Lees Food Fair, Magnolia, Rainforest, the RIU chain of hotels, as well as food chains in the US and UK.

## 5.3 Infrastructure

The main road to the SPAP is paved. The area benefitted from the road improvements under a previous project by the Tourism Enhancement Fund (TEF) to upgrade the Milk River Bath attraction located south of the Agro Park. To access some of the interior lots and the EPAP, dirt farm roads were present and in fair condition (Figure 5.4).

Even though the Milk River and its tributaries run through the park, the source of irrigation water is via pumping wells.

## 5.4 Spring Plain and Ebony Park Produce Handling Facilities

Both Spring Plain and Ebony Park have Produce Handling Facilities that are of a similar construction to that in the Yallahs Agro Park. The facilities are located on either side of the Milk River ~2200m apart, with Ebony Park's Facility being North East of the Spring Plain Facility (Figure 5.3).

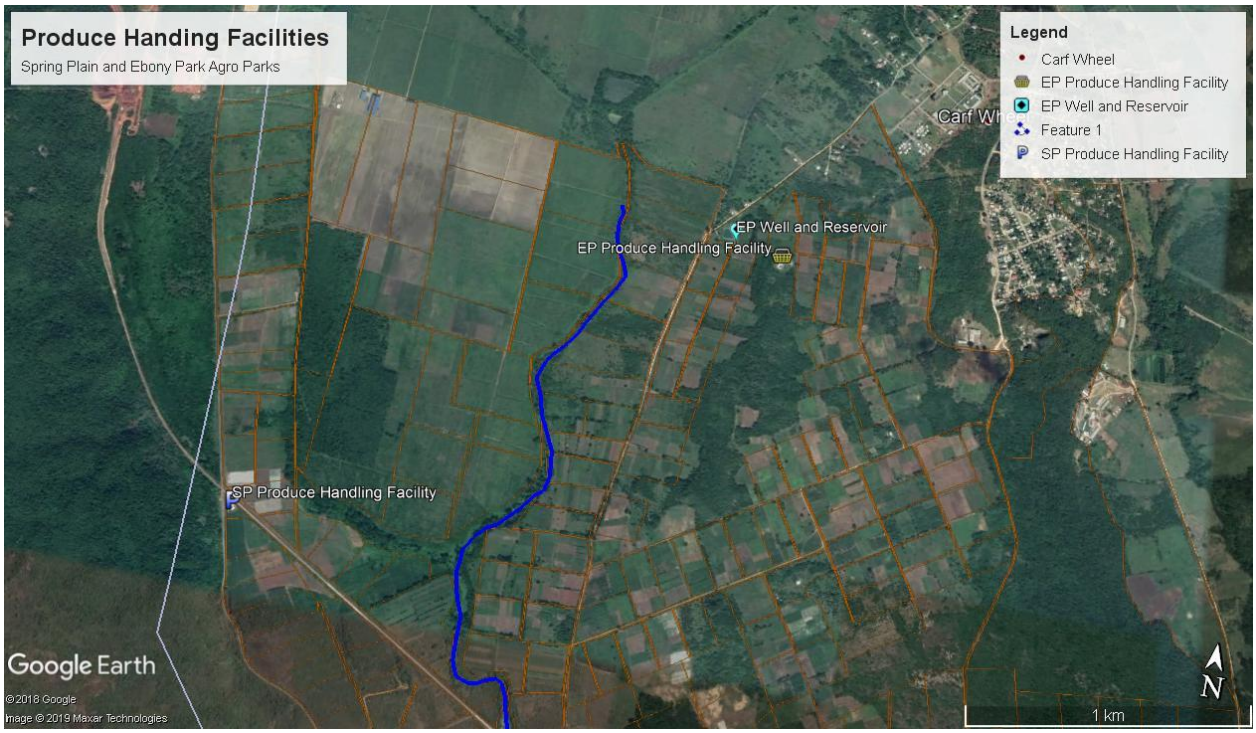



*Figure 5.3 Location of Spring Plain and Ebony Park Packaging Facilities*


*Figure 5.4 Spring Plain Produce Handling Facility*

*Figure 5.5: Inside the Spring Plain Agro Park Produce Handling Facility*

Like the Yallahs Agro Park Packaging Facility, a wastewater treatment system includes a septic tank, reed bed and soak away pit; no tertiary treatment was identified. It was stated that the relevant permits were obtained from NEPA but no signs were observed.

*Figure 5.6: Septic tank at SPAP (left); Reed Bed at SPAP (right)*

## 5.5 Existing Environmental and Social Setting

### 5.5.1 Physical Setting

#### *5.5.1.1 Geology*

The Geology at the Spring Plain Agro Park consists mainly of the Mid Miocene to Oligocene Newport Formation overlain by younger Upper Miocene to recently deposited alluvium (Figure 5.7). The New Port Formation is characterized by white or pale-coloured wackestones and mudstones with some subsidiary packstones (Mitchell, 2016). The Alluvium was deposited from the larger Rio Minho River and the smaller Milk River.

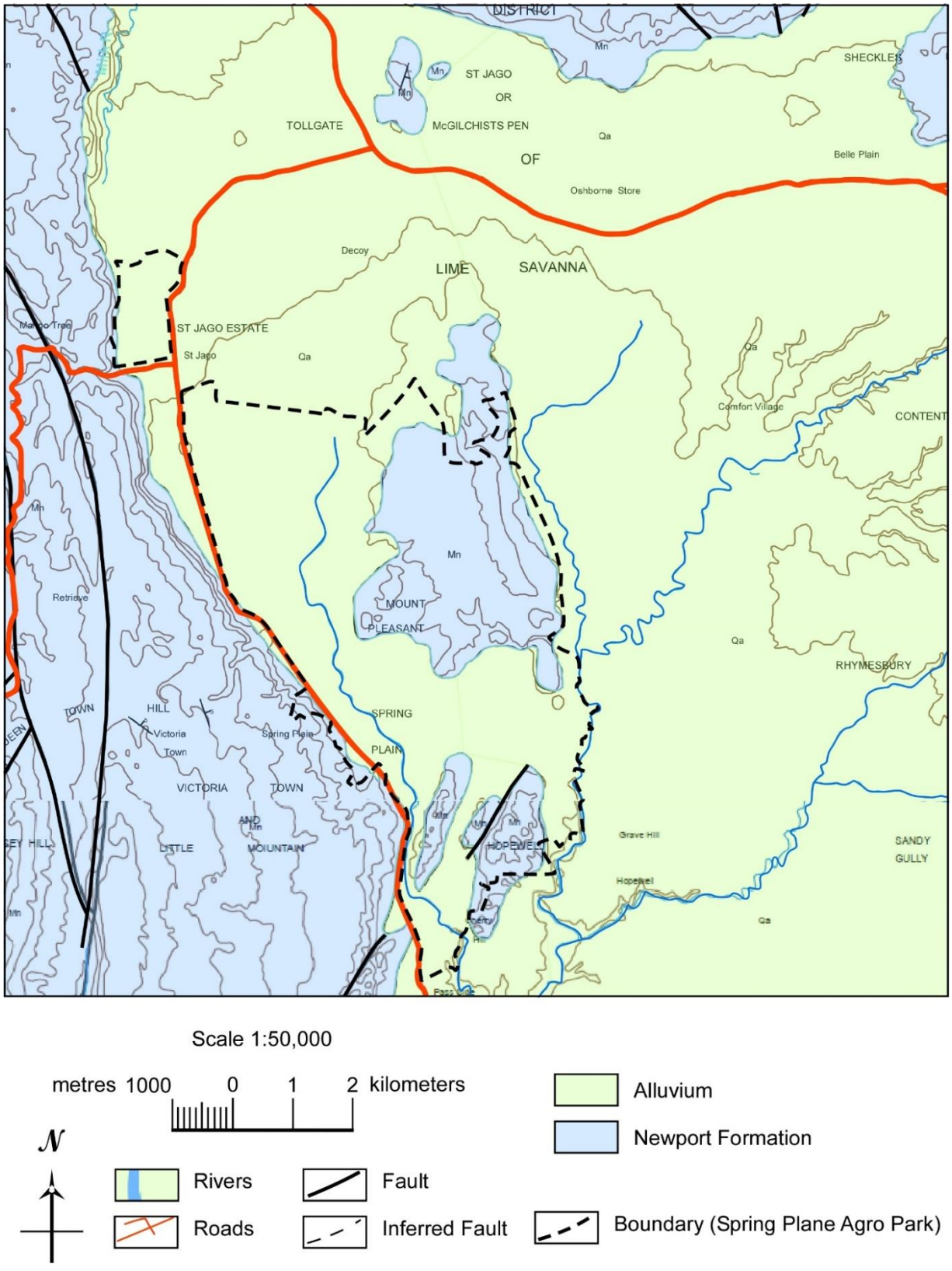



*Figure 5.7: Geology Map around the Spring Plane Agro Park (modified from: (Mines and Geology Division))*

### *5.5.1.2 Topography, Hydrology & Drainage*

The topography at the Spring Plain Agro Park is generally flat ranging from a low of 28 msl to 50 msl with a gentle gradient from the south to the North. The plains are bounded by the Mocho Mountains

to the north, Mount Oliphant to the west and south-west and to the south-east by Mount Pleasant (Figure 5.8).

Spring Plains falls within the Milk River Watershed Management Unit; and is part of the Rio Minho Hydrological Basin. There are several water wells in the area which were drilled to the underlying limestone aquifer. The main use for the water from these well was irrigation, however, it is unsure how many of these wells are still in operation. The main drainage feature in the area is the Milk River (Figure 5.8).

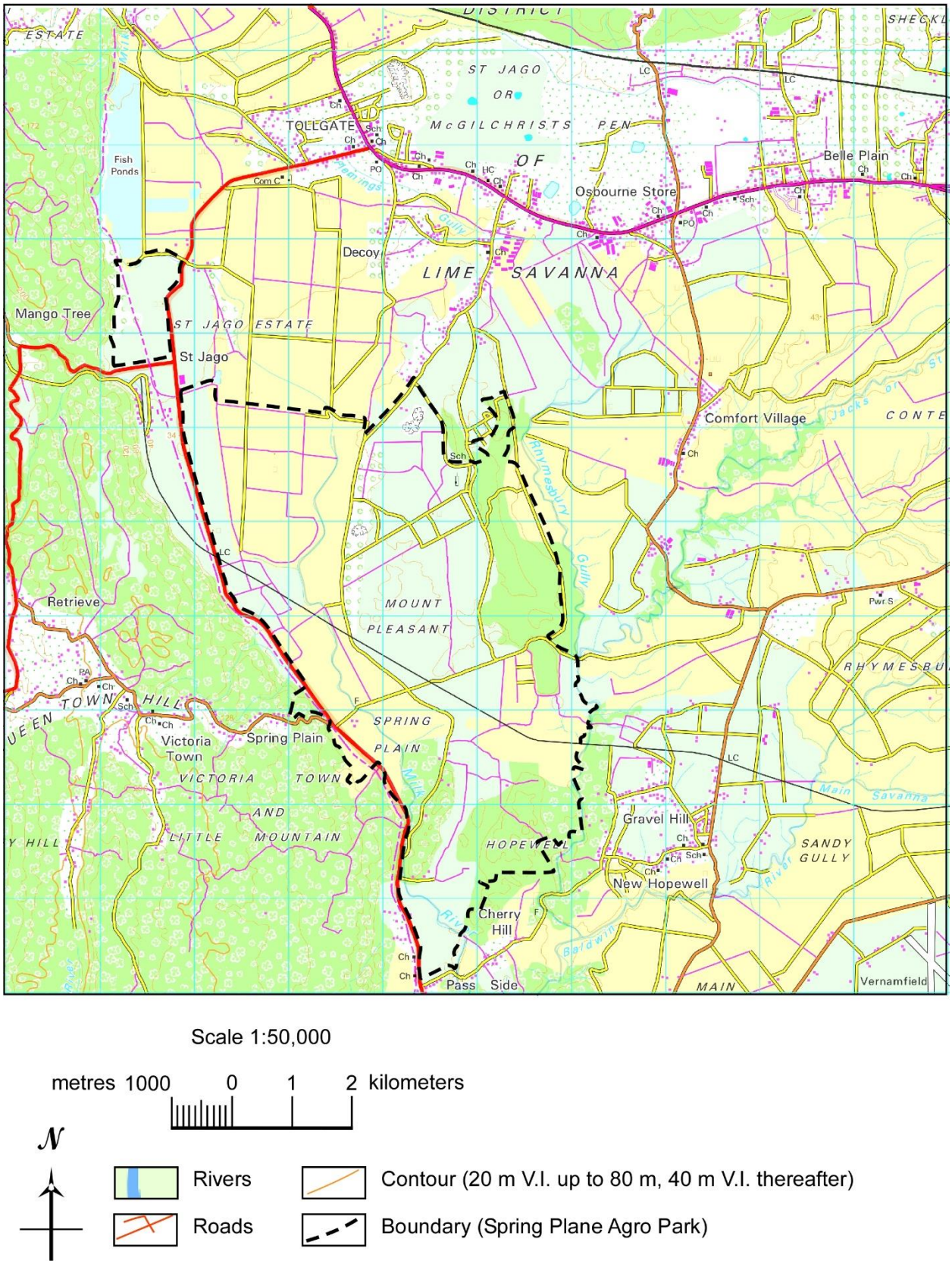



*Figure 5.8: Topographic Map showing location of the Sprinf Plain Agro Park (Black Broken Line). Exert from the Jamaica 1:50,000 (Metric Edition), Sheet 16 (National Land Agency, 2010)).*

### *5.5.1.3 Climate and Climate Change Projections*

The climate surrounding the Spring Plain Agro Park is consistent with that experienced throughout south western Clarendon. Average mean monthly temperatures range between 24.3°C and 26.9°C with average annual temperatures of 25.8 °C. With an average of 27.2 °C, August is considered the warmest month.

Typically, the driest month is January, with an average of 40 mm, and the wettest, October, averaging 242 mm, however, rainfall is, at times, sporadic. Summers are usually rainier compared to other periods of the year with an average 1,273 mm of precipitation falling annually. Between the driest and wettest months, the difference in precipitation is 202 mm and throughout the year, temperatures vary by 2.9°C (Climate data, 2012; CSGM, 2017).

Figure 5.10 illustrates the fact that the SPAP and EBAP are located in one of the diest areas in Jamaica.

*Table 5.1: Table showing mean monthly temperature (°C) and rainfall (millimetres) received by Milk River near Spring Plain Agro Park. (Source: Meteorological Service Jamaica)*

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. Temperature (°C) | 24.3 | 24.5 | 24.9 | 25.5 | 26.2 | 26.8 | 26.9 | 27.2 | 26.9 | 26.3 | 25.8 | 24.9 |
| Min. Temperature (°C) | 20.7 | 20.7 | 21.1 | 21.8 | 22.9 | 23.6 | 23.3 | 23.4 | 23.3 | 22.8 | 22.3 | 21.4 |
| Max. Temperature (°C) | 28 | 28.3 | 28.7 | 29.3 | 29.6 | 30 | 30.6 | 31 | 30.6 | 29.9 | 29.4 | 28.5 |
| Avg. Temperature (°F) | 75.7 | 76.1 | 76.8 | 77.9 | 79.2 | 80.2 | 80.4 | 81.0 | 80.4 | 79.3 | 78.4 | 76.8 |
| Min. Temperature (°F) | 69.3 | 69.3 | 70.0 | 71.2 | 73.2 | 74.5 | 73.9 | 74.1 | 73.9 | 73.0 | 72.1 | 70.5 |
| Max. Temperature (°F) | 82.4 | 82.9 | 83.7 | 84.7 | 85.3 | 86.0 | 87.1 | 87.8 | 87.1 | 85.8 | 84.9 | 83.3 |
| Precipitation / Rainfall (mm) | 40 | 48 | 53 | 86 | 143 | 95 | 78 | 139 | 171 | 242 | 112 | 66 |

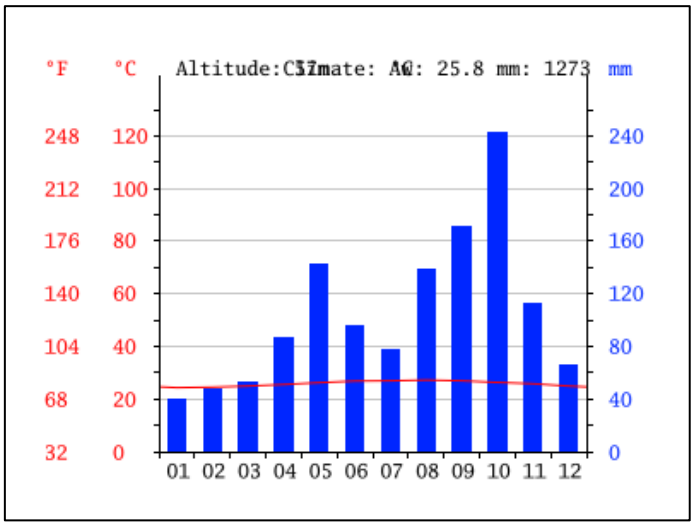



*Figure 5.9: Mean Monthly Rainfall (mm) and Temperature (°C) experienced at Milk River near the Spring Plain Agro Park. (Source: Climate-Data.org 1982-2012)*

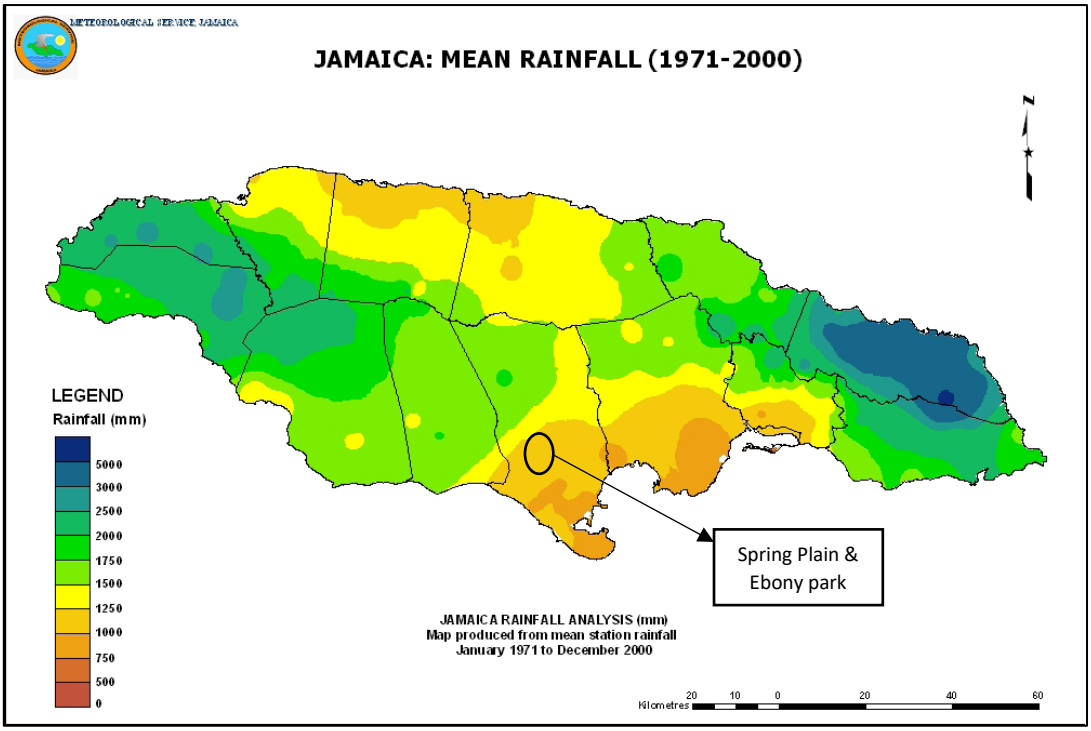



*Figure 5.10: Distribution of mean annual rainfall for Jamaica (in millimetres). Averaging period is 1971-2000. (Source: Meteorological Service of Jamaica)*

As indicated in Section 4.1.2.3 above global and regional climate change projections for temperature suggests a continued increase in temperatures. Projected absolute changes in mean temperature by season and for annual average (°C) for the 2020's, 2030's, 2050's and 2080's relative to the 1961-1990 baseline are presented in Figure 4.6.

*Table 5.2:Temperature Projections for the Rainfall Zone within which the Spring Plain and Ebony Park Agro Parks fall*

| Table 31: Coasts (Zone 4) | | | | |
|---|---|---|---|---|
| | 2020's | 2030's | 2050's | 2080's |
| NDJ | 1.17 – 1.40 | 1.20 – 2.18 | 1.63 – 2.89 | 2.21 – 3.54 |
| FMA | 1.19 – 1.27 | 1.35 – 2.02 | 1.93 – 2.83 | 2.62 – 3.49 |
| MJJ | 1.14 – 1.22 | 1.67 – 2.49 | 2.47 – 3.32 | 3.20 – 3.95 |
| ASO | 1.22 – 1.37 | 1.71 – 2.63 | 2.42 – 3.17 | 3.04 – 3.81 |
| | | | | |
| ANNUAL | 1.18 – 1.31 | 1.48 – 2.83 | 2.11 – 2.98 | 2.76 – 3.62 |

### *5.5.1.4 Natural Hazards*

#### 5.5.1.4.1 Drought

Drought conditions are brought about by reduced rainfall in drier months. Drought conditions have impacted farmers in this agro park significantly because the lack of water has increased the number of crops lost (Gleaner, 2014).

#### 5.5.1.4.2 Flooding

Heavy rains in the area often lead to flooding within the Spring Plain Agro Park. This is typical of the Milk River floodplain. Additionally, most roads along the Milk River do not have adequate drainage in place to allow for discharge of flood waters, resulting in flooding of major roadways, bank slips and erosion. Flood prone areas in the region of the river spreads to both sides of the river as the water

levels increase (PIOJ, 2017). More often than not, these occurrences set back production by at least three months or result in the loss of cash crops which were to be harvested due to waterlogged soils. Additionally, farmers also experience damage and loss of irrigation infrastructure (pipes, sprinklers, stakes, and tubing), farm tools and equipment as well as losses related to delayed earnings (PIOJ, 2017).

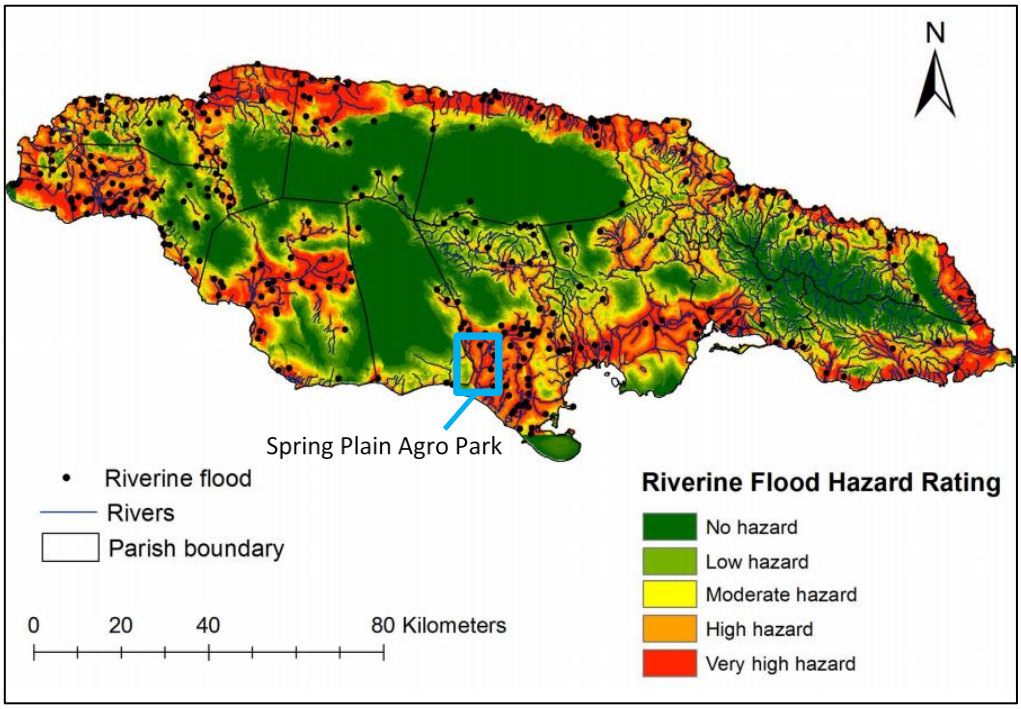



*Figure 5.11: Riverine Flood Hazard Ratings across Jamaica with Spring Plain Agro Park highlighted in blue. Map indicates high to very high flood risk along the Milk River. (Source: Nandi et al., 2016)*

#### 5.5.1.4.3 Tropical Cyclones

Tropical Storm Nicole and Hurricanes Dennis and Wilma are some of the more recent and notable storms which have caused flooding in Clarendon and affected crops in Spring Plain (Table 5.3).

*Table 5.3: Hurricanes and Tropical Storms which have impacted agriculture and livelihoods in Clarendon*

| Hurricane | Year |
|---|---|
| **Hurricane Ivan** | 2004 |
| **Hurricane Dennis** | 2005 |
| **Hurricane Wilma** | 2005 |
| **Hurricane Dean** | 2007 |
| **Tropical Storm Nicole** | 2008 |

#### 5.5.1.4.4 Earthquakes, Liquefaction and Landslides

The Geological Map (Figure 5.7) around the Spring Plain Agro Park shows small faults in the general area. However, major faults are present to the west of the Agro Park. These faults trend NW-SE, E-W and NE-SW. The NW-SE faults (Spur Tree Fault) are typical across the rift zones across Jamaica and these may be associated with the Montpelier-Newmarket Subsurface Rift. Minor earthquakes have been recorded along these faults in the past.

The Agro Park is located about 90 km from the most active seismic zone in Jamaica, The Plantain Garden Fault in the Blue Mountains Block, modelling for a 100year return period earthquake event shows that the area will earthquake intensities up to VII on the Modified Mercalli Scale (Figure 3 8). The area can experience liquefaction as the geology at the Agro Park is mostly alluvium.

Landslides may also occur on the hills to the west and these may be earthquake induced or rainfall induced. Large landslides may block roads and access to nearby communities as well as affect the western sections of the Agro Park.

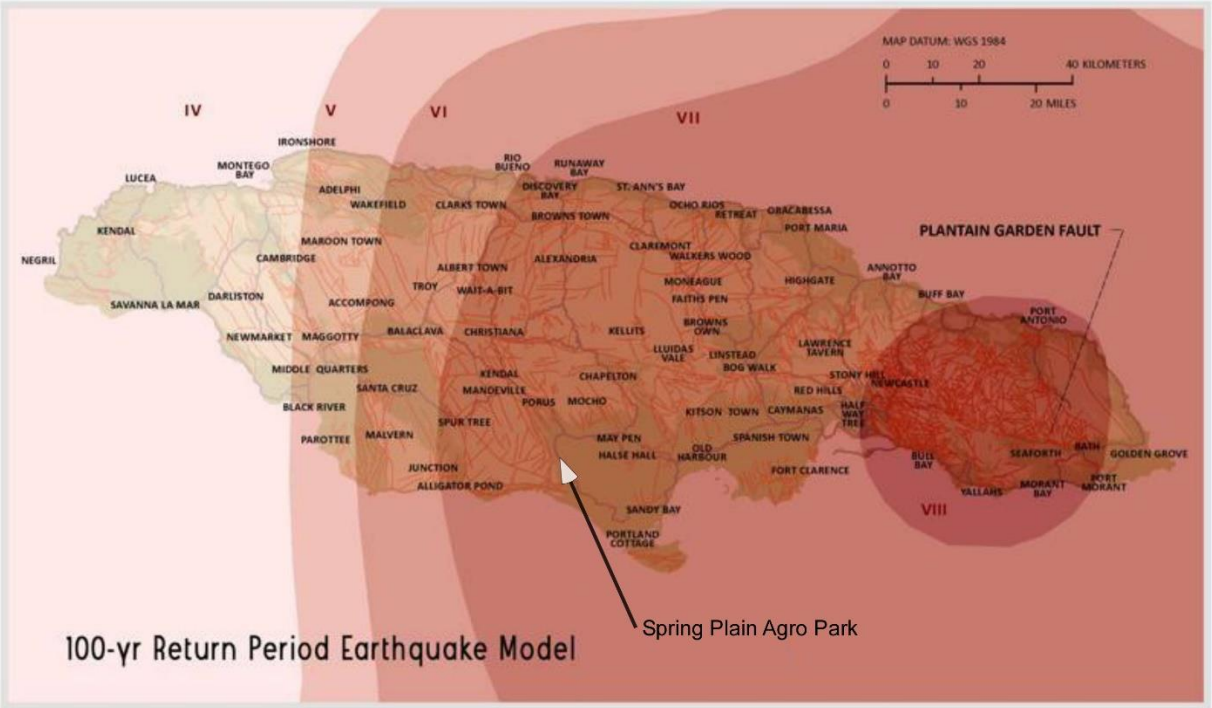



*Figure 5.12: Map showing modelled earthquake intensity on a Modified Mercalli Intensity Scale for a the Plantain Garden Fault and the location of the Spring Plain Agro Park (MGI & Earthquake Unit, UWI, 2010)*

#### *5.5.1.5 Water Supply*

Five operational pumping stations are located in these Agro Parks; however, only four are currently used for irrigation. The pumping stations at Jungle West (capacity 318m$^3$/hr) and Spring Plain (capacity 862m$^3$/hr) are the newest pumping stations, the St. Jago (capacity 1050 m$^3$/hr) and Armon's (386m$^3$/hr) wells are located across from each other. The Armon's well is not used to provide irrigation water to the Agro Parks and as such is not represented in this report. The Ebony Park well with a maximum flow rate of 380m$^3$/hr has a unique set up when compared to the other four pumping stations.

Groundwater at Ebony is pumped into a reservoir. The water is then pumped from the reservoir to a sump then through a system of filters and into the pressured distribution lines to the farmers. Fish are placed in the reservoir to prevent the breeding of mosquitoes. Solar panels are also located at the Ebony Park pumping station to reduce overhead expenses by offsetting the cost of electricity supplied by the Jamaica Public Service (JPS) Company.

Similar to the Yallahs Agro Park, water is supplied to farmers using pressurized pipes with crops being irrigated by either the drip lines or sprinklers based on demand. The water level in the wells are monitored approximately every six (6) months by the WRA with routine testing of the wells done twice per year. The NIC also has the requisite permits from the WRA for the abstraction of water using these wells.

Water quality was monitored at the sampling locations illustrated in Figure 5.13.

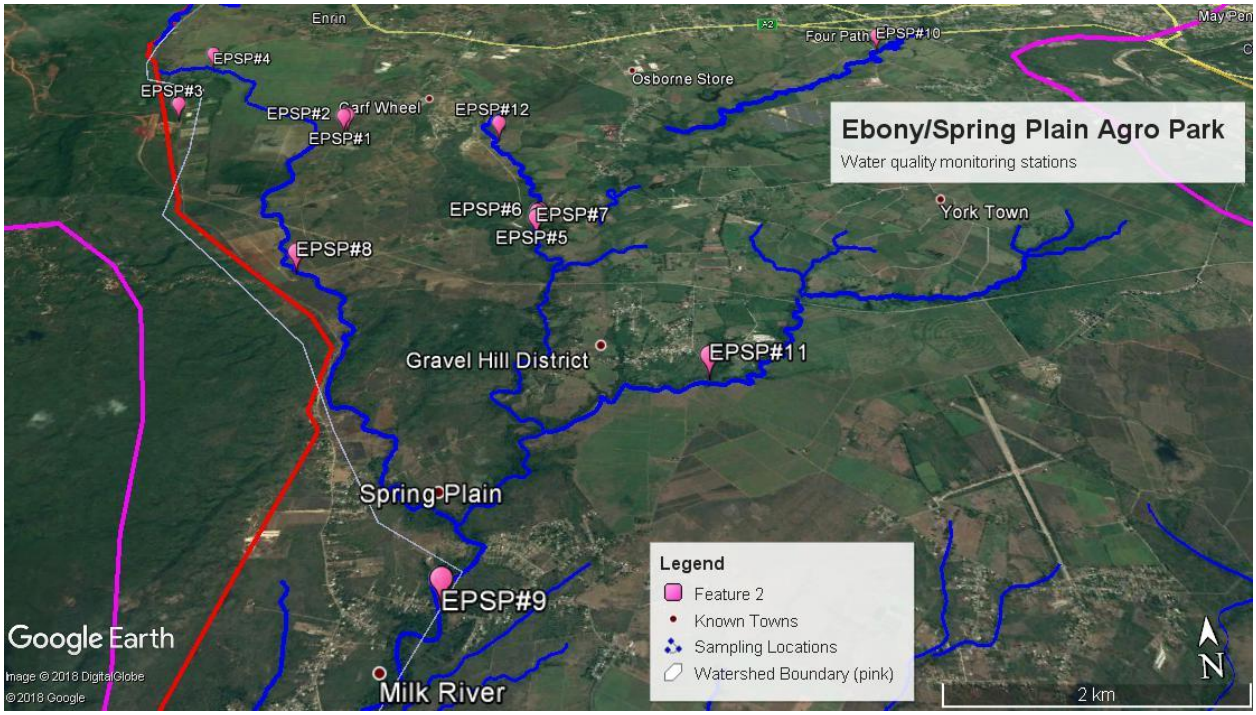



*Figure 5.13: Established Water Quality Monitoring Stations in the Ebony/Spring Plain Agro Park, January – March 2018*

Based on the data obtained from the monitoring of water quality, Chemical Oxygen Demand (COD) was undetected for all sites and there was absence of pesticides at all sites as well. Biochemical Oxygen Demand (BOD), Chloride and conductivity was above the NRCA Ambient (Fresh) Water Guidelines (ESL, 2018).

Of all the sites monitored, Main Savannah (EPSP #11) consistently had the highest salinity, chloride and conductivity values (Figure 5.14).

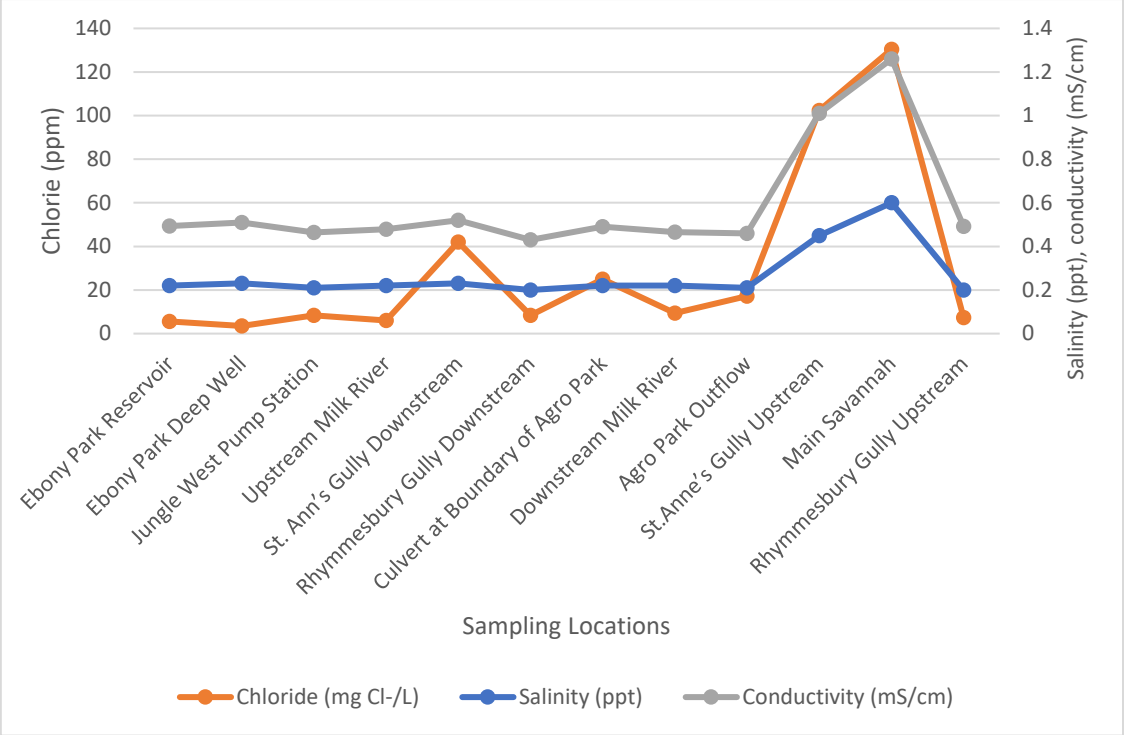



*Figure 5.14: Variation in Salinity, Chloride and Conductivity within the Ebony/Spring Plain Agro Park water Samples collected March 13, 2018 (ESL, 2018)*

Major rock salt ion ($Mg^{2+}$, $Ca^{2+}$, $K^{+}$, $Na^{+}$) concentrations except for potassium were significantly higher for water samples collected at Main Savannah samples. The concentration of $Mg^{2+}$, $Ca^{2+}$, $Na^{+}$ may be due to saline intrusion or dissolution of the underlying limestone rocks (Mitchell, 2013 and ESL, 2017).

Potassium values varied at the Rhymmesbury Gully sites (EPSP #6 – Upstream and EPSP#12 – Downstream) indicating possible impact from the agricultural activities. This water body flows through the area of the agro park that has the highest proportion of the active farms (the flow of water is contiguos to the Ebony Heart Academy).

Faecal coliform (FC) levels were highest for all surface water samples when compared to groundwater sources. The FC levels in the Ebony Park Reservoir fluctuated over the monitoring period but this organism was detected in all the samples collected during the monitoring period indicating this water source is impacted by faecal matter and may pose a significant health risk. Samples testing positive for FC are non-compliant with potable water standards. The Ebony Park Reservoir needs to be protected from the elements to ensure continued protection against public health threats as this is used for irrigation purposes within the Agro Park. Also, treatment of this water source may become necessary based on specific crop and market requirements.

The other major concern noted for this Agro Park is at that the upstream samples for Rhymesbury and St. Anne's Gully had consistently higher phosphate levels than the ones downstream indicating the presence of a source for this nutrient likely from sewage, surface run off from agricultural lands etc. The lower phosphate levels in the samples downstream may be due to assimilation of this nutrient by the biota living in the gullies and/ or dilution due to incoming flows from other water inputs. It should be noted, however, that during the dry season the concentration of these phosphates may not fluctuate much along the length of the gullies.

### 5.5.2 Ecological Setting

Natural vegetation within the Spring Plain Agro Park has been disturbed to accommodate agriculture and the development of residential communities with the exception of some areas of non-arable land toward the east of the Ebony Park Agro Park (Figure 5.15).

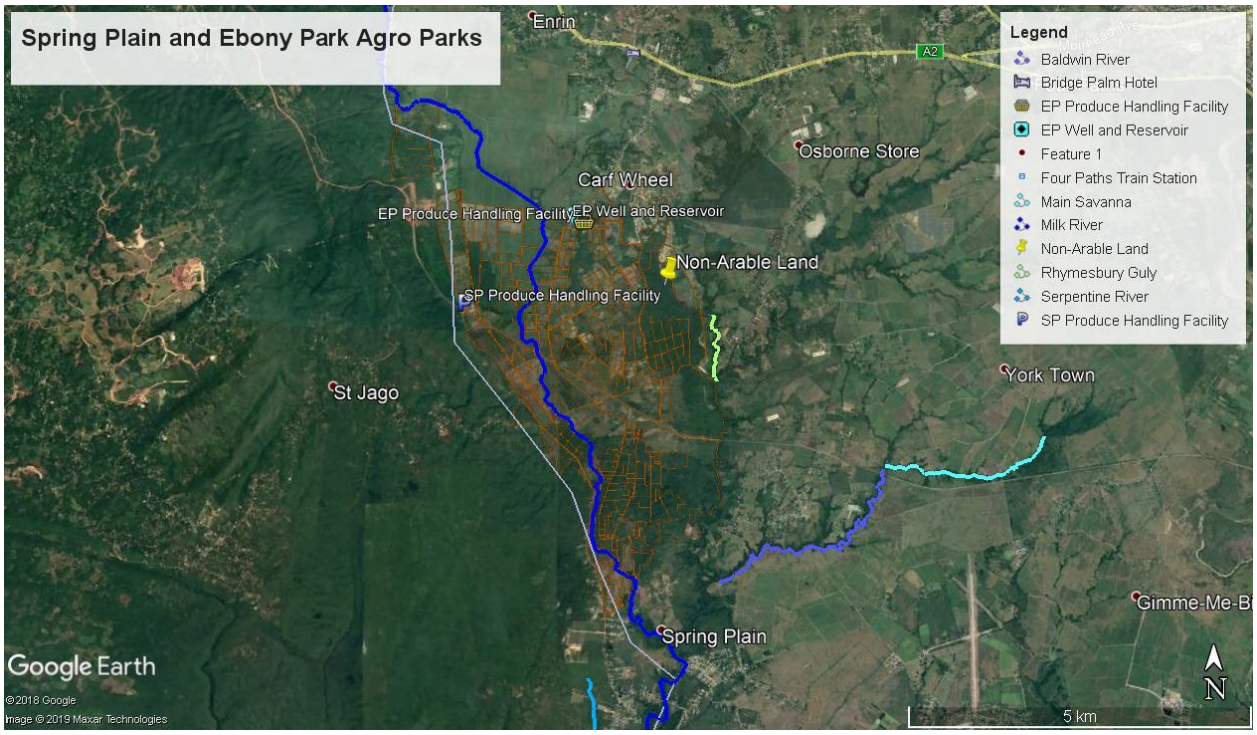



*Figure 5.15: Spring Plain and Ebony Park Agro Parks*

Immediately west of the Spring Plain Agro Park lies an extensive mountain range of Manchester while eastward is distinctly different with the extensive flat lands of the Vere Plains. Surrounding the park are semi deciduous forests and mixed planted/cultivated woody and herbaceous crops (Figure 5.16). The agro parks are cultivated with various crops as already listed in Section 4.2.1 above, some sugarcane and pasture lands for cows and goats. Annual abstraction of the river can reach 400 million cubic metres, which is primarily used in agriculture, and domestic water supply.

*Figure 5.16: Semi Deciduous Forest West of the Spring Plain Agro Park*

The only freshwater habitat within the park is the Milk River along with several small streams and natural ponds. There are also some irrigation canals in the area. The rivers and streams have dense vegetation typical of a riparian environment including large trees on sections of their banks. This vegetation is important for protecting the integrity of the banks, reducing soil erosion and capturing sediments. The rivers include complex habitats that support a variety of fish and invertebrates. They also function as possible migration routes for various species including pond turtles. Wildlife abundances are relatively low in much of the park, possibly due to the high levels of long-term disturbance and land use changes caused by human activity. Birds are numerous, but the species encountered were common, widespread and typical of disturbed habitats.

### 5.5.3 Social Setting

The Spring Plain Agro Park is located in the Spring Plain District, one of 12 districts located within the Milk River Community/ Development Area. This community is located in Clarendon and along the border of Clarendon and Manchester.

#### *5.5.3.1 Demography*

The estimated population size for the area is 3,931 with approximately 936 households. 59% of the households are headed by males with only 26% headed by persons without academic qualification but 56% are led by unemployed individuals. Farmers and labourers reside in the surrounding community. The population in the Milk River Community/Development Area is predominantly male 56%. The majority of the population falls within the age ranges of under 15, and 30-64 years; with 27% between the ages of 15-29 and 8% in the group of 65 and over (Social Development Commission, 2018) (Table 5.4).

*Table 5.4: Age-Sex Percent Distribution of the communities surrounding the Spring Plain Agro Park. Source: Social Development Commission, 2018*

| Age Cohort | Male | Female | Average |
|---|---|---|---|
| 0-14 | 14 | 14 | 14 |
| 15 - 24 | 14 | 7 | 10.5 |
| 25 - 29 | 6 | 5 | 5.5 |
| 30 - 64 | 19 | 14 | 16.5 |
| 65+ | 3 | 4 | 3.5 |
| TOTAL | 56 | 44 | 50 |

#### *5.5.3.2 Housing Stock*

The Spring Plain is located within the south-central rural area of Jamaica. 75% of the houses were constructed from concrete and block and 10% from wood while another 10% was constructed from concrete and block. 56% own the land on which they live.

#### *5.5.3.3 Social Infrastructure*

44% of residents receive public water piped into their yard, while 35% receive public water piped into their dwelling (SDC, 2009). This is because although some residents may purchase water from the National Water Commission (NWC) or private trucking companies. Other residents utilize water from rivers and streams, private catchment, and public standpipes.

82% of residents use electricity for lighting. Telephone services are utilized by all residents, 87% of which utilize cellular phones only (ibid).

Solid waste is collected by the National Solid Waste Management Authority (NSWMA) for 68% of households but in some cases, residents still use non-environmentally friendly garbage disposal methods such as burning and dumping (ibid).

Electricity and cooking gas are accessible to all communities associated with the agro park but some residents continue to use traditional fuels such as kerosene and charcoal.

Potable water supply from the NWC is described as poor and unreliable, which has led to dependence in many areas on latrines (56%) and shared toilet facilities (13%) which do not link to official sewage collection systems (ibid).

#### *5.5.3.4 Existing Social Issues and Livelihoods*

Main community issues include high levels of adult (25years and over) unemployment, high levels of youth (14-24 yrs) unemployment, poor roads, poor parenting, high levels of high school drop-outs and limited access to training and employment (ibid). Local communities depend on a number of land use practices in the Milk River watershed to support their livelihoods like agriculture. Small and large scale farms raise livestock, as well as producing crops as described in Section 4.2.1 above for both local sale and export.

# 6 New Forest/Duff House Agro Park

## 6.1 Location

The New Forest/Duff House (NFDH) Agro Park is located on the border of Manchester and St. Elizabeth *en route* to Little Ochi, a coastal town and fishing beach south of Gutters at the base of the Spur Tree Hills. This agro park lies in both the Black River and Alligator Hole Watershed Management Units.

The 680 acres of land in this Agro Park is privately owned. Most farmers live on the land that they plant while others reside in close proximity. Approximately 80% of this Agro Park is cultivated with the main crops being Escallion, thyme, sweet pepper, squash, callaloo, cauliflower, cucumber, melon, broccoli and tomatoes. There is one farmer using greenhouse technology in the area. The farmers in this area prefer to invest in 6 to 12 weeks crops as the return on expenditure is much faster.

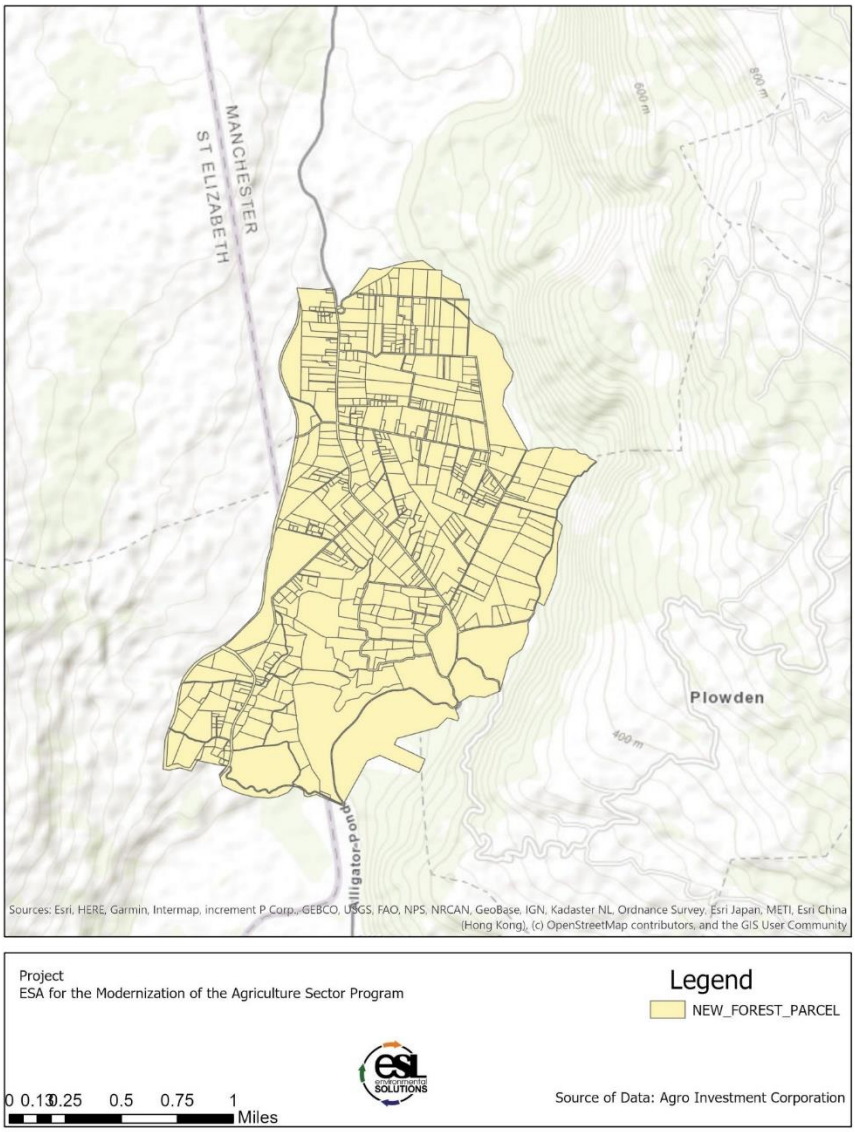



*Figure 6.1: New Forest/ Duff House Agro Park*

## 6.2 Farmers in the Agro Park

The farmers are registered and represented in the New Forest/Duff House Water Users Association. There are nine members listed on their register, 33% of whom are women. Seven of these farmers are Global G.A.P. certified of which 43% are women.

Farmers use mostly drip irrigation systems, with a few (approximately 10%) using sprinklers in the area. Grass mulching is prevalent and common to all farms as illustrated in Figure 6.2 below. The farmers in the area are very receptive to training and reports have shown that they have consistently increased yield through application of the knowledge gained during the training session.


*Figure 6.2: Irrigated Farms in New Forest/Duff House using Grass Mulching*

In the past farmers received credit from financial institutions and reports were that some persons did not repay their loan due to disagreement with the bank's terms. At times there are water shortages from the existing wells and farmers are scheduled to receive water to fill containers at particular times.

## 6.3 Infrastructure

The roads within the agro park are mostly paved and in very good condition; only a few roads toward the east close to mountain range are in poor condition.

The wells in the Agro Park are over 400 feet deep. Irrigation water is supplied by pumping and is metered to each farmer.

Anecdotal evidence suggests that an Agro Park is being set up in the Comma Pen area via CDB funding and 6 wells are being done following hydrological assessments. Reports were that there were unusual issues with water supply from existing wells in New Forest/Duff House.

## 6.4 Complete Packaging House in the NFDH Agro Park

The New Forest Agro Park and the Duff House Agro Park each have separate produce handling facilities. However, the vision for the area is that there will be need for greater processing of goods for export market and so a Complete Grading Processing and Packaging facility was constructed to serve the two locations (Figure 6.3). Farmers are required to submit a Business Plan before they can use this comprehensive facility.

*Figure 6.3 Complete Packing House in the NFDH Agro Park*

A wastewater treatment system is constructed and comprises of a septic tank, reed bed and soak away pit; no tertiary treatment was identified. All the packing facilities at each Agro Park have a similar wastewater treatment system, though the one located in NFDH seems to be the most adequately constructed (Figure 6.4 and Figure 6.5). It was stated that the relevant permits were obtained from NEPA, though no signs were observed.

*Figure 6.4: Septic Tank at NFDH Packing Facility*

*Figure 6.5: Reed bed (without reeds) at NFDH Packing Facility*

Like the other Agro Parks, there was no visible waste stream from the wastewater treatment plants. This is due largely to the very low uptake in usage of the packing facilities.

## 6.5 Existing Environmental and Social Setting

### 6.5.1 Physical Setting

#### *6.5.1.1 Geology*

The Geology at the New Forest/Duff House Agro Park is similar to the geology at Spring Plain Agro Park. It consists of the same Mid Miocene to Oligocene Newport Formation. The younger Alluvium (Upper Miocene to Recent) occurs just south of the New Forest/Duff House Agro Park site (Figure 6.6). These lands lie primarily on shallow water limestone deposits, with bauxite as the topsoil.

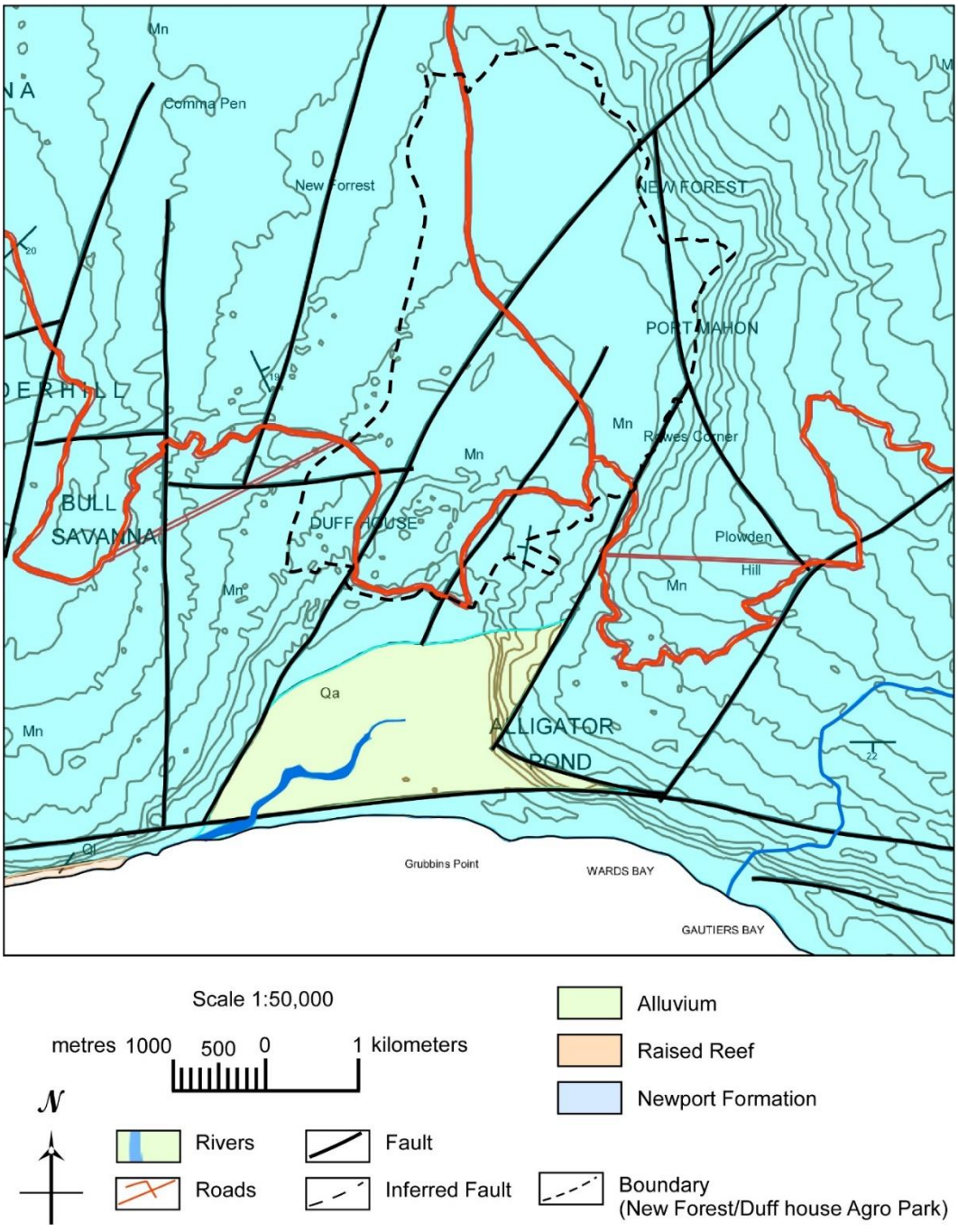



*Figure 6.6: Geology Map around the New Forest/Duff House Agro Park (modified from: (Mines and Geology Division))*

### *6.5.1.2 Topography, Hydrology & Drainage*

The topography at the New Forest/Duff House Agro Park is generally between 100 m and 155 m above sea level with a gentle gradient to the south (Figure 6.7).

New Forest/ Duff house falls within the Bull Savanna Sub-Watershed Management Unit and is part of the Back-River Watershed Management Unit which falls within the Black River Hydrological Basin. Several water wells are in the area which are drilled into the underlying limestone aquifer. The main use for the water from these wells is irrigation. The main drainage feature in the area is Alligator Pond River which is south of the Agro Park site.

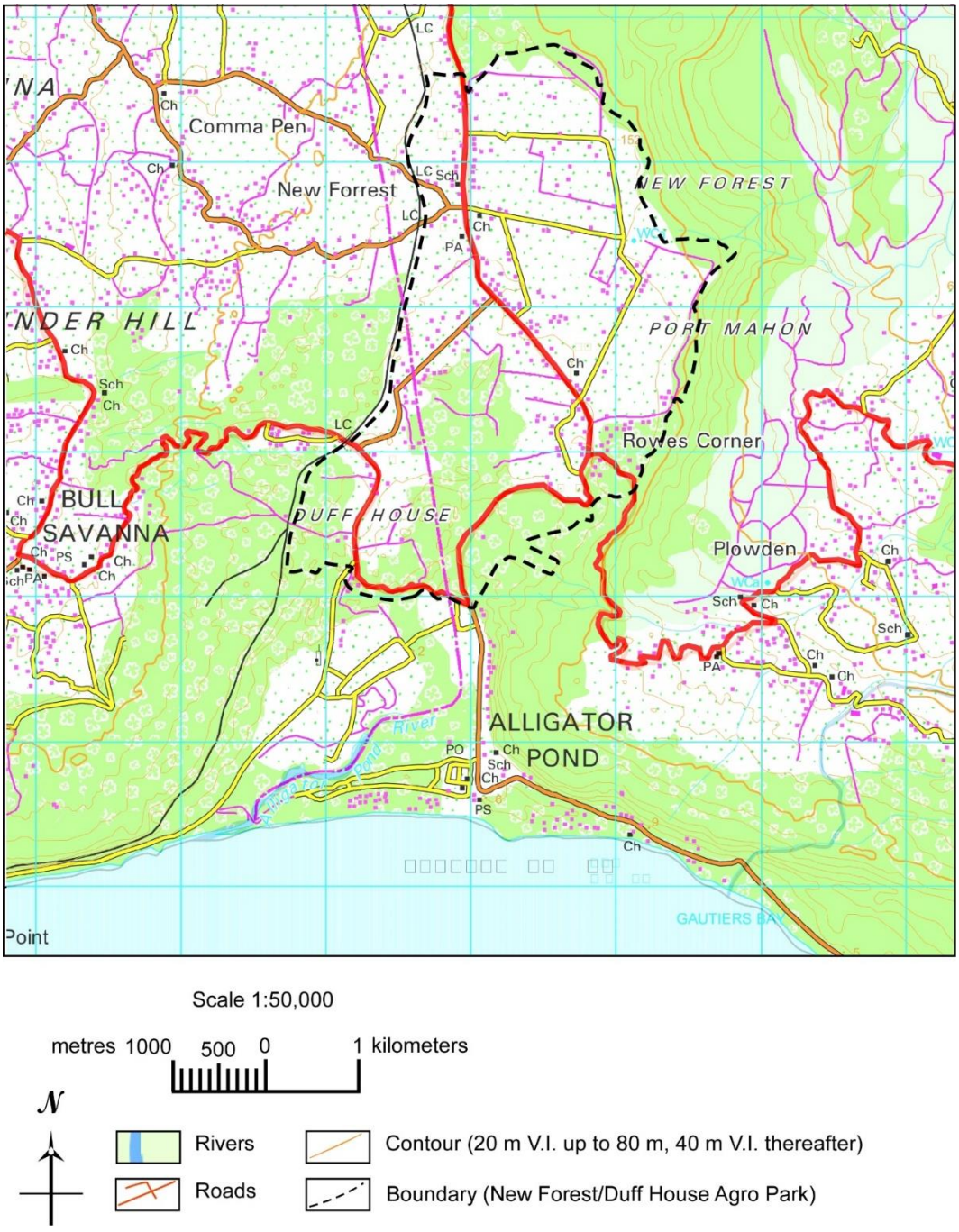



*Figure 6.7: Topographic Map showing location of the New Forest/Duff House Agro Park (Black Broken Line). Extract from the Jamaica 1:50,000 (Metric Edition), Sheet 18 (National Land Agency, 2010)).*

### *6.5.1.3 Climate and Climate Change Projections*

The climate surrounding the New Forest/Duff House Agro Park is consistent with that experienced throughout southeastern St. Elizabeth. Average mean monthly temperatures range between 24.9°C and 27.6°C with average annual temperatures of 26.4°C. With an average of 27.6 °C, August is considered the warmest month. Typically, the driest month is January, with an average of 32 mm, and the wettest, October, averaging 217 mm. Summers are usually rainier compared to other periods of the year with an average 1,161 mm of precipitation falling annually. Between the driest and wettest months, the difference in precipitation is 185 mm and throughout the year, temperatures vary by 2.7°C (Climate data, 2012; State of the Jamaican Climate, 2015).

*Table 6.1: Table showing mean monthly temperature (°C) and rainfall (millimetres) received by Alligator Pond near New Forest/Duff House Agro Park. (Source: Meteorological Service Jamaica)*

| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. Temperature (°C) | 24.9 | 24.9 | 25.3 | 26 | 26.8 | 27.2 | 27.5 | 27.6 | 27.4 | 26.9 | 26.3 | 25.6 |
| Min. Temperature (°C) | 21.4 | 21.2 | 21.6 | 22.4 | 23.5 | 24.1 | 23.9 | 23.9 | 23.9 | 23.4 | 22.8 | 22.1 |
| Max. Temperature (°C) | 28.5 | 28.7 | 29.1 | 29.7 | 30.1 | 30.4 | 31.1 | 31.4 | 31 | 30.4 | 29.9 | 29.1 |
| Avg. Temperature (°F) | 76.8 | 76.8 | 77.5 | 78.8 | 80.2 | 81.0 | 81.5 | 81.7 | 81.3 | 80.4 | 79.3 | 78.1 |
| Min. Temperature (°F) | 70.5 | 70.2 | 70.9 | 72.3 | 74.3 | 75.4 | 75.0 | 75.0 | 75.0 | 74.1 | 73.0 | 71.8 |
| Max. Temperature (°F) | 83.3 | 83.7 | 84.4 | 85.5 | 86.2 | 86.7 | 88.0 | 88.5 | 87.8 | 86.7 | 85.8 | 84.4 |
| Precipitation / Rainfall (mm) | 32 | 45 | 44 | 82 | 117 | 79 | 68 | 125 | 155 | 217 | 109 | 88 |

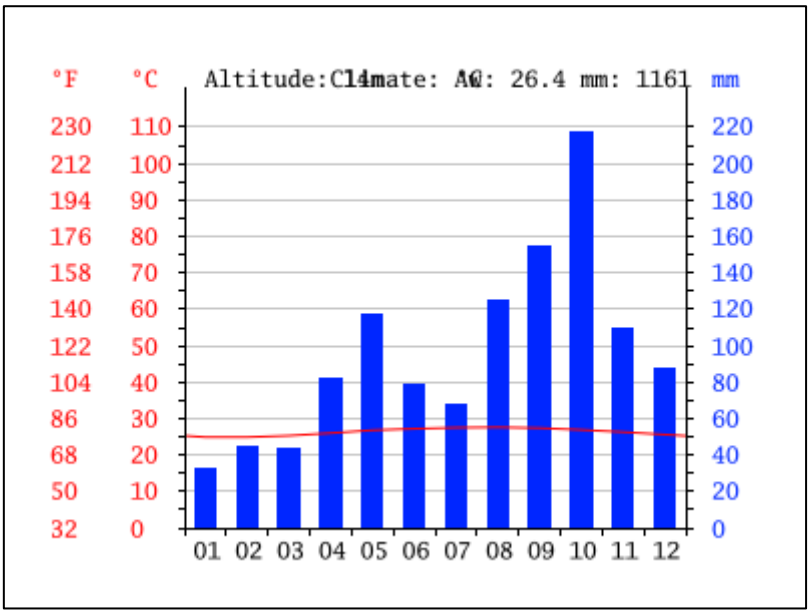



*Figure 6.8: Mean Monthly Rainfall (mm) and Temperature (°C) experienced in Alligator Pond near New Forest/Duff House Agro Park. (Source: Climate-Data.org 1982-2012)*

As indicated in Sections 4.1.2.3 above, irrespective of the model used or scenario examined, Jamaica continues the warming trend seen in the historical data through to the end of the century (CGSM,

2017). Projected changes in mean temperature for the western end of the island where New Forest and Duff House are located shows consistent increases in temperature.

*Table 6.2: Projected Absolute Changes in Mean Temperature by Season for Western Jamaica (CSGM, 2019)*

| Table 30: West (Zone 3) | | | | |
|---|---|---|---|---|
| | 2020's | 2030's | 2050's | 2080's |
| NDJ | 1.23 – 1.41 | 2.06 – 2.22 | 2.59 – 2.85 | 3.10 – 3.58 |
| FMA | 0.99 – 1.28 | 1.96 – 2.10 | 2.47 – 2.86 | 3.04 – 3.63 |
| MJJ | 1.14 – 1.25 | 1.98 – 2.24 | 2.77 – 3.08 | 3.27 – 3.76 |
| ASO | 1.29 – 1.38 | 2.14 – 2.40 | 2.88 – 3.10 | 3.53 – 3.80 |
| | | | | |
| ANNUAL | 1.23 – 1.32 | 2.04 – 2.79 | 2.77 – 2.96 | 3.40 – 3.69 |

Extreme events inclusive of droughts, sporadic high intensity rainfall events, high intensity tropical cycloes are projected to increase with climate change. The frequency of these extreme events has implications for freshwater availability. With a rise in the occurrence of extreme events, freshwater may be less available, or it may be contaminated (CSGM, 2017).

#### *6.5.1.4 Natural Hazards*

##### 6.5.1.4.1 Drought

The New Forest/Duff House Agro Park suffers from massive droughts at drier periods throughout the year, crippling farmers who struggle to find water for crops. Stemming from this are periodic bush fires. January to August is the drought period. Strong winds also contribute to drought in the area. This limits farmers to escallion, the only crop likely to survive in any weather, although too much rain affects the crop. During droughts they use domestic water for farming which is costly (PIOJ, 2017).

##### 6.5.1.4.2 Hurricanes

The impacts of hurricanes like Charley, Emily, Ivan and Tropical Storm Nicole have caused flooding, loss of livestock and crops, and left the area marooned in the past.

*Table 6.3: Hurricanes and Tropical Storms which have impacted agriculture and livelihoods in St. Elizabeth*

| Tropical Cyclone | Year |
|---|---|
| **Hurricane Ivan** | 2004 |
| **Hurricane Charley** | 2004 |
| **Hurricane Emily** | 2005 |
| **Tropical Storm Nicole** | 2008 |

##### 6.5.1.4.3 Flooding

Unlike the other agro parks, there are no rivers running through the New Forest/Duff House Agro Park. However, with extreme rainfall events, flooding has impacted the livelihood of farmers and community members in the surrounding areas.

#### *6.5.1.5 Earthquakes, Liquefaction and Landslides*

The New Forest/Duff House Agro park is located in an area with both major and minor faults (Figure 4.13 and Figure 6.6). The major faults trend NW-SE, E-W and NE-SW. The NW-SE faults (Spur Tree Fault) are typical across the rift zones across Jamaica and these may be associated with the Montpelier-Newmarket Subsurface Rift. Minor earthquakes have been recorded along these faults in the past.

Although the Agro Park is located over 100 km from the most active seismic zone in Jamaica, The Plantain Garden Fault in the Blue Mountains Block, modelling for a 100year return period earthquake event shows that the area will earthquake intensities between VI and VII on the Modified Mercalli Scale (Figure 6.9). The area is not prone to liquefaction due to the geology.

The steep hills to the east may be prone to earthquake induced landslides which may block roads and access to nearby communities. Large landslides may also affect the eastern sections of the Agro Park.

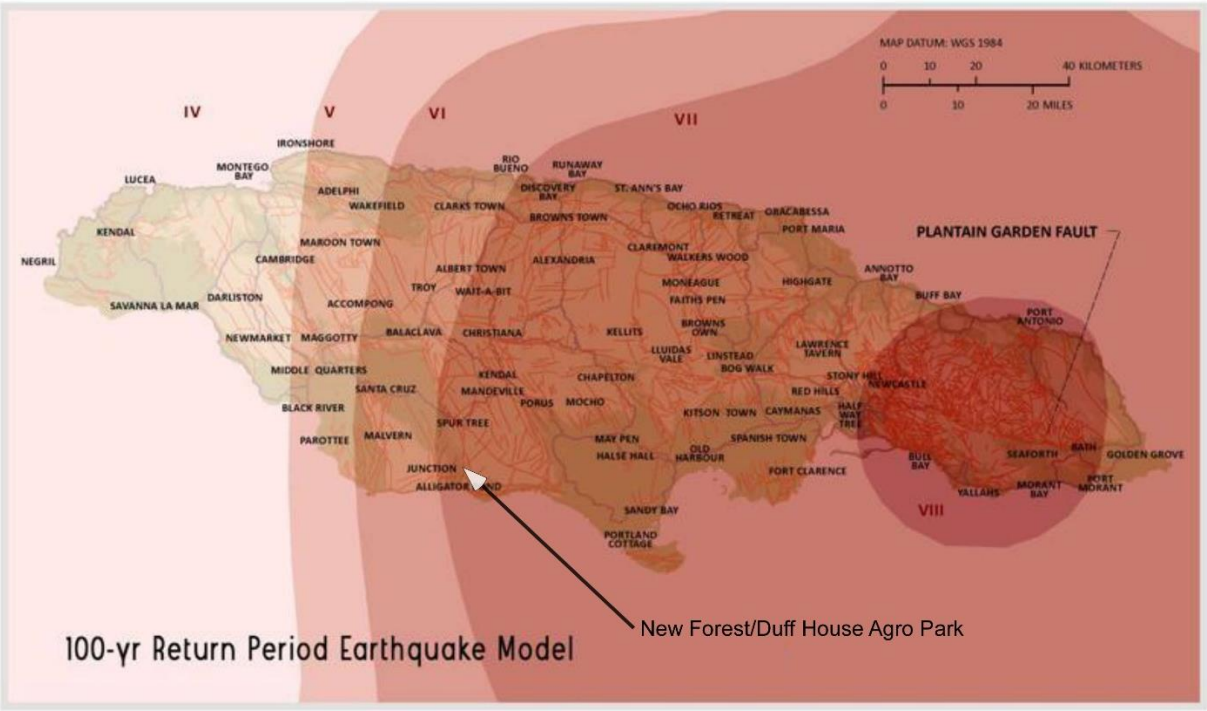



*Figure 6.9: Map showing modelled earthquake intensity on a Modified Mercalli Intensity Scale for a the Plantain Garden Fault and the location of the New Forest/Duff House Agro Park (MGI & Earthquake Unit, UWI, 2010).*

### *6.5.1.6 Water Supply*

Currently, four (4) of the six (6) wells in this Agro Park are operational. The Lane Well requires a pump, and the Rowe's corner well is abandoned due to saline intrusion. Water is supplied to farmers in the parks using pressurized pipes. Crops are irrigated using either the drip or spray method and as with the previously discussed parks, the water is supplied to the farmers based on their demand.

The water level in the well are monitored approximately every six (6) months by the WRA with routine testing of the wells done twice per year and the results submitted to the WRA. The NIC also has the requisite permits from the WRA for the operation of the wells and the extraction of water from them.

Chloride and conductivity had values being above the NRCA Ambient (Fresh) Water Guidelines at least once during the 3-month monitoring period in 2018. And, as with SPAP and YAP, COD and pesticides were undetected in all water samples collected as well as BOD.

One of the major concerns for water quality in this Agro park was saline intrusion, particularly for the western side of the Agro park (New Forest Pumping Station, Line 8, Line 41 and Line 44) where rock salt ion concentrations were significantly greater than the eastern side (Figure 6.10) and the water was determined to be brackish (ESL, 2018)

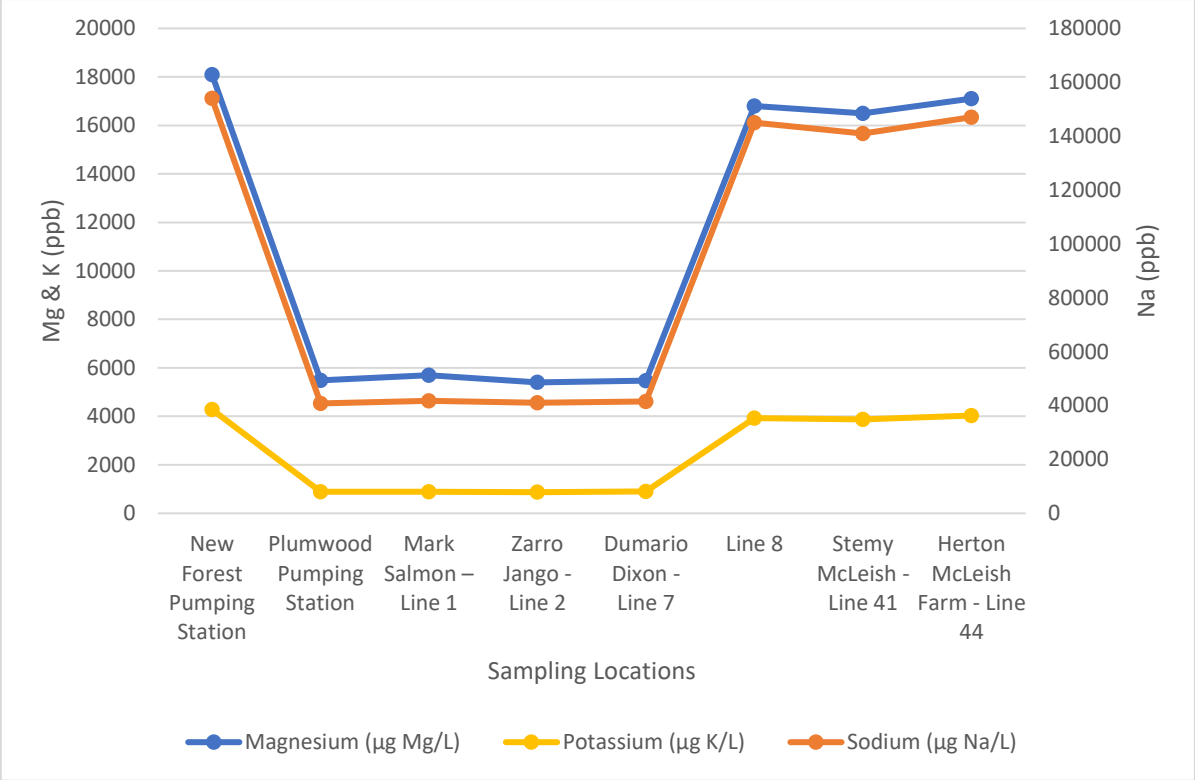



*Figure 6.10: Variation in major rock salt ion concentration in the NFDH Agro Park, March 14, 2018*

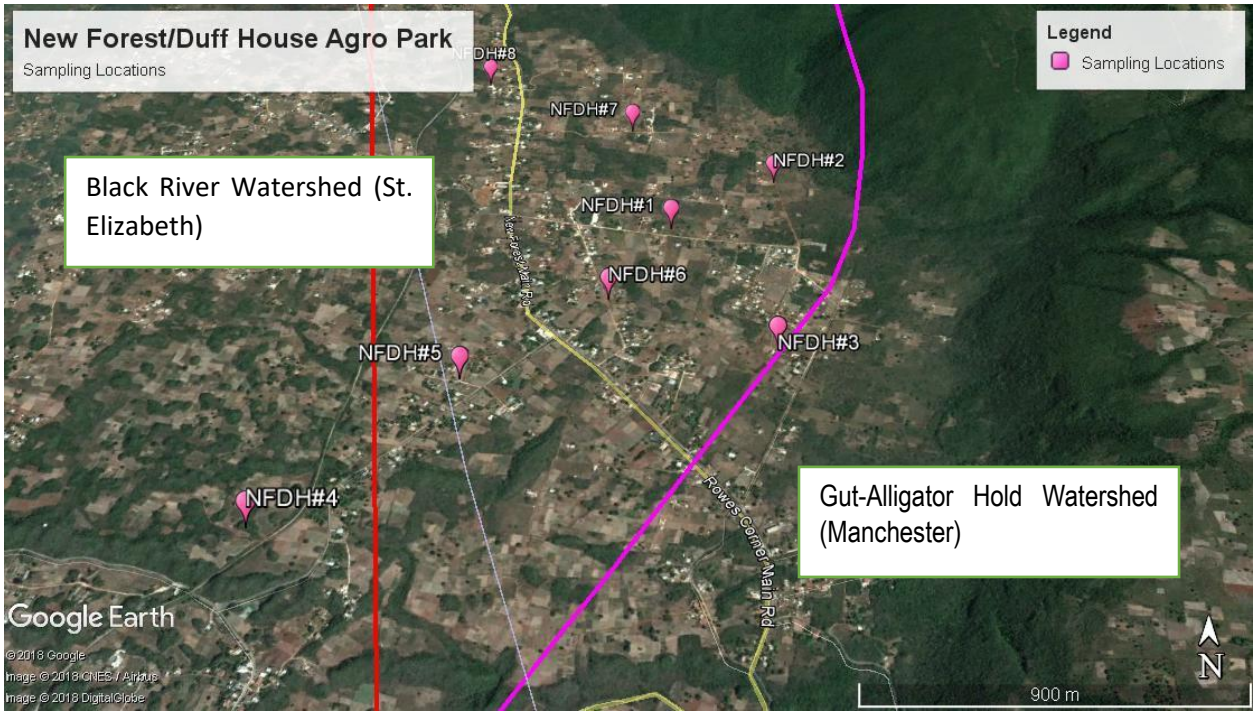



*Figure 6.11: Location of NFDH Agro Park showing Water Quality Monitoring Stations in the NFDH-AP January 18, 2018*

### 6.5.2 Ecological Setting

The New Forest/Duff House Agro Park between 100-200m above sealevel and is bounded on the east by the Spur Tree Fault System along the base of the Manchester Plateau and the flatter more undulating land of St. Elizabeth, sloping south from Lititz, ending at Alligator Pond in the south. Most of the area that makes up the New Forest/Duff House Agro Park is intensive or extensive farmland or

brush/scrub (Figure 6.12). It also includes some of the forested western slopes of the mountains that make up part of a forest ring. The slopes consist of lowland semi-deciduous forests and based on site assessments these areas are largely in-tact. In the New Forest/Duff House Agro Park farming area, the soil is very healthy (Figure 6.15 and Figure 6.15). Crops include melon, escallion, thyme, sweet pepper, cucumber, cabbage, tomato and cauliflower, the most popular being escallion and thyme. The New Forest/Duff House Agro Park consists of very few pockets of natural forests with low ecological impact. There is no nearby surface water as it is located in an area where there are no aquicludes or aquitards (MPDC, 2003).

*Figure 6.12: Slope consisting of Shrubland adjacent farmland in Duff House*

*Figure 6.13: Semi-deciduous forests on mountain range surrounding farmland in New Forest*

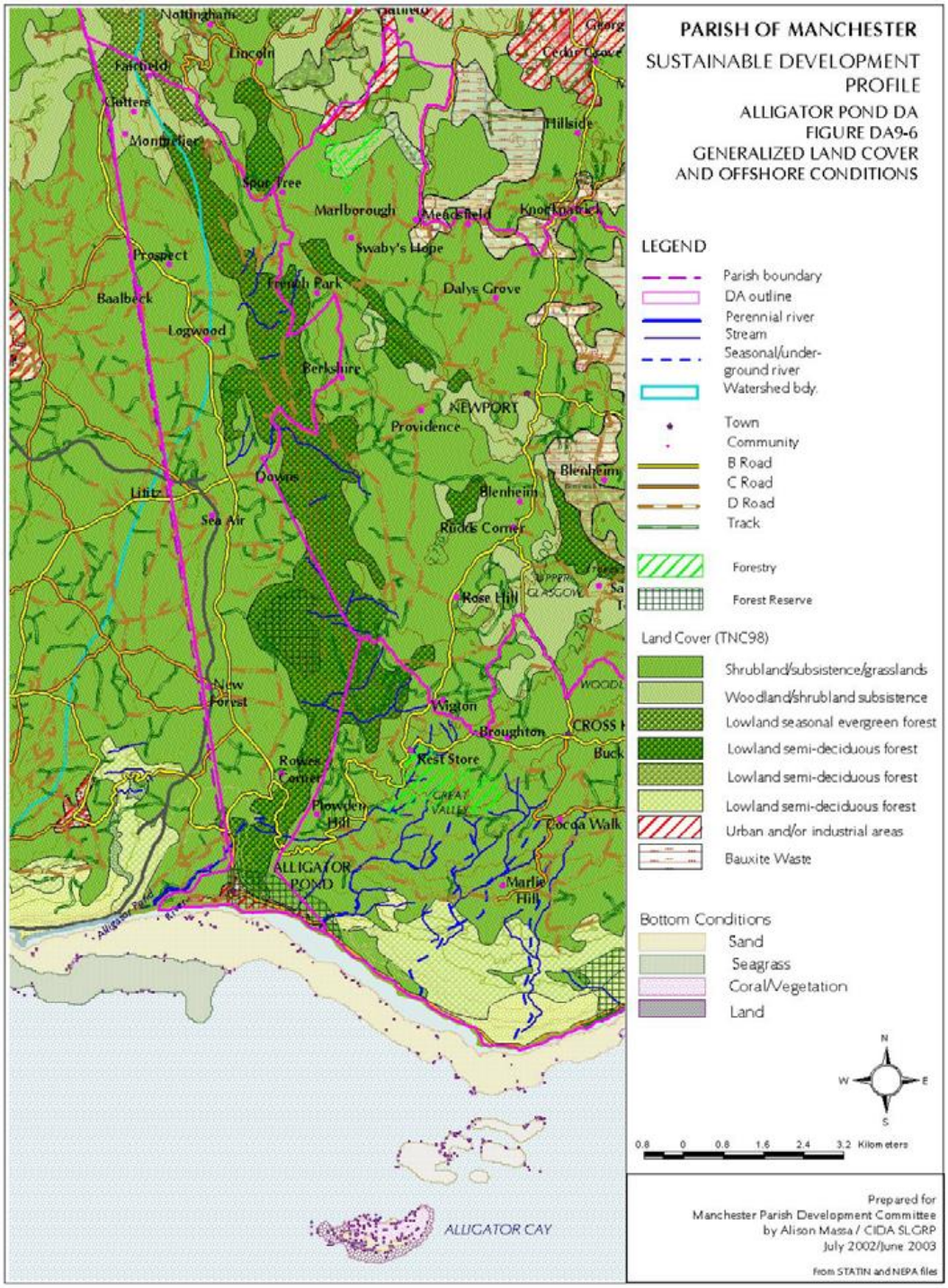



*Figure 6.14: Sustainable Development Profile for the Alligator Pond Development Area*

### 6.5.3 Social Setting

The New Forest/Duff House Agro Park is situated along the border of St. Elizabeth and Manchester.

#### *6.5.3.1 Demography*

The estimated population size for the area is 2,851 with approximately 731 households arranged in nucleated developments around the New Forest/Duff House Agro Park. 66% of the households are headed by males with a staggering 62.4% headed by persons without academic qualification nevertheless, only 17% are led by unemployed individuals (SDC, 2009). Like the Yallahs Agro Park, all of the farmed land within the New Forest/Duff House Agro Park is privately owned.

The St. Elizabeth parish population was a very young one in 1982, with 66% of the population being ≤24 years of age and 3% being ≥65 years. By 1991, 58% of the population was ≤24 years, while the ≥65 age group had increased to 5% of the population. The number of females declined by 1991 to 85 females for every 100 males (STATIN, 2011). In recent years the ratio of men to women in each age group have narrowed (SDC, 2009) (Table 6.4).

*Table 6.4: Age-Sex Percent Distribution of the communities surrounding the New Forest/Duff House Agro Park. (Source: SDC, 2009)*

| Age Cohort | Male | Female | Average |
|---|---|---|---|
| 0-14 | 13.6 | 11.8 | 12.7 |
| 15 - 24 | 7.9 | 9.6 | 8.75 |
| 25 - 29 | 11.4 | 10.7 | 11.05 |
| 30 - 64 | 8.6 | 11.3 | 9.95 |
| 65+ | 8 | 7.4 | 7.7 |
| TOTAL | 49.5 | 50.8 | 50.15 |

### *6.5.3.2 Housing*

Up until 2001, the parish of St. Elizabeth had over 90% of housing units detached and roughly 90% of the dwellings had zinc roofs. The remainder had concrete or wooden roofs. 40% had concrete floors, 30% had wooden floors, and the remainder had a combination. 50% of units had walls constructed from concrete, 35% from wood and the remainder from zinc (STATIN, 2011).

Currently, the community's profile indicates that 97% of the dwellings were constructed from concrete and blocks. 87% of persons own the land on which they live, 2% live on rented land and 11% live for free (SDC, 2009).

*Figure 6.15: Sample of Housing Stock in New Forest/Duff House*

The site assessment gave evidence of a growing community as several houses were being constructed. Figure 6.15 shows a sample of the housing stock with surrounding farms.

#### *6.5.3.3 Social Infrastructure*

68% of residents have private catchments and purchase water and 96% of residents use electricity for lighting. Telephone services are utilized by all residents. Of this amount, 21% utilize both landline and cellular phones (SDC, 2009).

Solid waste is collected by NSWMA Garbage from 55% of households. Water linked to a main sewer system and soak away is utilized by 40% of households. 15% of dwellings had access to piped water via drums and tanks in their yards, while the rest used a public standpipe. However, pipes tend to run dry in periods of drought (STATIN Jamaica, 2011; SDC, 2009).

#### *6.5.3.4 Existing Social Issues*

Major community challenges experienced by persons in surrounding areas include poor roads, low water pressure or no water supply, poor representation by elected political leaders, low skill levels, high levels of adult unemployment. Prospective citizens expressed concern about the rates of high school dropouts and teen pregnancy, which they see as causes of unemployment (SDC, 2009).

# 7 Agricultural Marketing Corporation (AMC) Complex

## 7.1 Site and Situation

The Agro Investment Corporation's (AIC) processing plant is located at 188 Spanish Town Road, Kingston. The facility was built in 1961 and sits on nine (9) acres of land. The yard of the facility is paved or filled with gravel and the buildings on site a concrete with zinc roofs (Figure 7.1).

*Figure 7.1: Agro Investment Corporation's AMC Complex*

*Figure 7.2: Deteriorated Building on the AMC Complex*

The physically appearance of the building (peeling paint, flaking walls, leaks, mould growth, joint pulling apart and numerous cracks) suggest a lack of maintenance due (Figure 7.2. The facility has twenty-eight (28) packing house or warehouses of which seven (7) are currently in use. The activities of the tenants currently using the facilities include are as follows:

- Agro Processing Units (5)
- Herbs and Teas (1)
- Dry food storage (1)
- The facility currently has forty-two (42) employees.

Electricity and water are currently supplied to the facility by the Jamaica Public Service (JPS) and National Water Commission (NWC) respectively. The facility currently stores eight thousand (8,000) gallons of potable water in 1000 gallons plastic tanks as seen in the figure below. In cases where the NWC supply is not reliable the tanks a filled by a private contractor, DT Construction Limited. The operators of the facility do not have any evidence of the source for the trucked water they receive from this contractor.

Solid waste is collected in skips which are removed from the complex on an average of twice weekly (Tuesdays and Thursdays) by the National Solid Waste Authority (NSWA).


*Figure 7.3: Potable Water Storage Tanks and Distributing System (left); Skip for solid waste (right); Drain for Trade Effluent (right)*

Sewage is handled by the National Water Commission (NWC). Sections of the facility (close to dry goods storage area) are sporadically flooded with sewage. When this occurs, the NWC is contacted to rectify the issue. All trade effluent from the facility is collected in concrete drains which leads to a soakaway on the property (Figure 7.3).

The operators of the facility are in the process of procuring a Consultant to assist with the development of an Emergency Response Plan. Several labelled assembly points were noted on the property. The fire department has however visited the facility in 2018 and has conducted training with some staff members. The existing system for fire suppression lacks maintenance and is in disrepair (Figure 7.4).

*Figure 7.4: Missing Fire Hose*

There are several bait stations for rodents on the property (Figure 7.5. These are checked once monthly by the contractor Hypro Pest Control Limited.

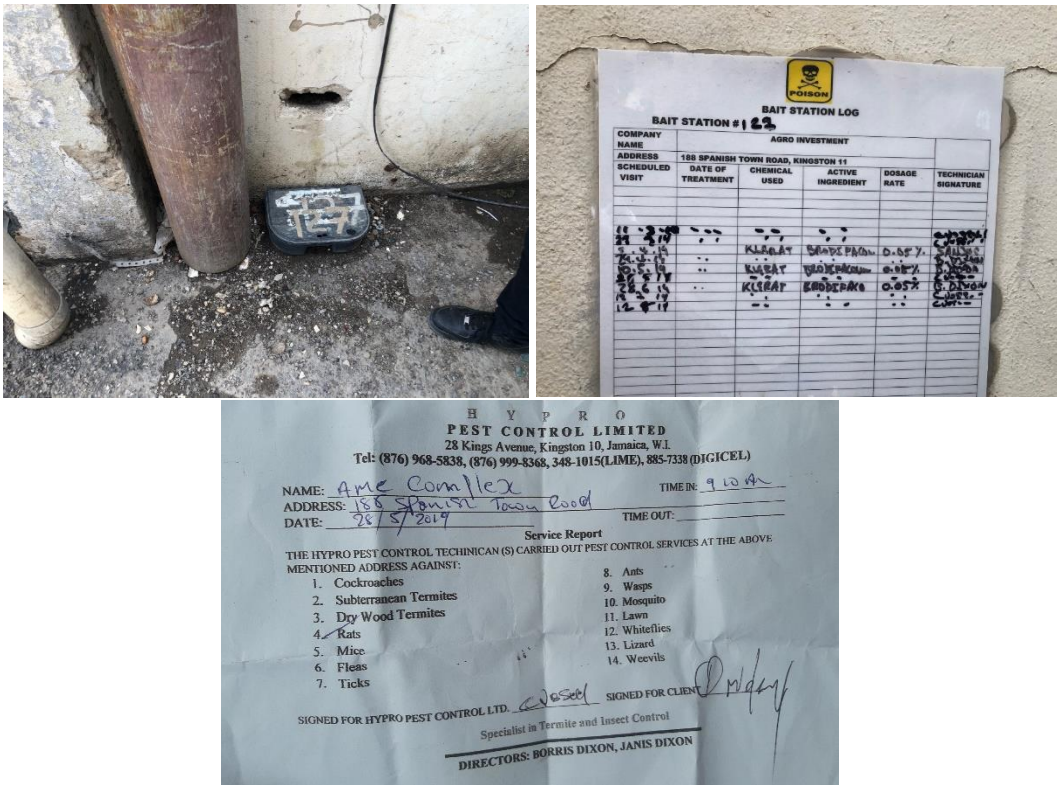



*Figure 7.5: Bait Station on Property (left); Log for bait Station (right); Evidence of Contractors Visit (bottom)*

Pigeons living in the roof are a serious concern for the operators of the facility (Figure 7.6). Several attempts have been made to remove these birds without success.

*Figure 7.6: Pigeon droppings inside the packing house*

The Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF) is currently in dialogue with the Life Science Department of the University of the West Indies for a permanent solution to the Pigeon problem. The facility is audited by the Public Health Department sporadically or when they are called in by the Client.

## 7.2 Description of Operations

The AMC complex offers space to agro-processors for the cleaning, packaging and storage of their products. The facility is located approximately one-kilometer North of the Kingston Freeport Terminal

and Kingston Wharves. There are 22 customers of the AMC Complex as at April 30, 2019. Produce processed at the facility (some seasonal) includes the following:

- Dasheen
- Yam
- Sweet Potato
- Mangoes
- Pepper
- Papya
- Guinep
- Naseberry

*Figure 7.7: Tenants Using the AMC Complex*

The list of tenants of the AMC complex is presented in Appendix IV. Tenants of the complex are provided with metered water and electricity. However, each tenant is responsible to source their own water when the NWC supply is off. All approved tenants are responsible for retrofitting their rented space to suit their needs, this includes installing meshed screens, wash sinks and pest management. Tenants are audited on a regular basis by teams from the Food Storage and Prevention of Infestation (MICAF) to ensure pest management practices are conforming to regulatory standards. This includes ensuring only approved chemical are used for pest control. The reports from these audits are not shared with the operators of the facility.

The facility also has six (6) cold storage areas (chillers) but none are currently in operation due to maintenance and other issues. Tenants are therefore required to use cold storage via renting refrigerated containers.

Solid waste storage and removal is provided by AIC.

# 8 Relevant Policy, Legislation and Regulations and Key Institutions

In Jamaica, there are fifty-two (52) statutes that have direct or indirect jurisdiction over matters of the environment. These range from public health to physical planning and land use with many instances of overlapping responsibilities among Ministries. The enactment of the Natural Resources Conservation Authority Act of 1991 (NRCA Act), began the process of rationalization and prioritization of these statutes. This Act binds the Crown as well as the people; therefore, enforcement can be applied to Public Sector entities as well as private citizens.

The following legislation, policies and plans were deemed most relevant to the development and operation of agro-parks in Jamaica. The aim of these developments is to facilitate import substitution, enhance the agricultural supply chain, deepen industrial linkages and increase food security in alignment with the goals and outcomes set forth in Jamaica's National Development Plan – Vision 2030.

## 8.1 Policies and Plans

Table 8.1 below presents several policies and plans relevant to the Modernisation of the Agriculture Sector Program.

*Table 8.1: Relevant Policies and Plans*

| Policy/Plan | Relevance to the Project |
|---|---|
| National Development Plan – Vision 2030 | Jamaica's long-term National Development Plan which aims to put the country in a position to achieve developed country status by 2030. It is based on a comprehensive vision: "Jamaica, the place of choice to live, work, raise families, and do business"<br>• Outcome # 12 – Internationally Competitive Industry Structures<br>• Outcome # 13 – Sustainable Management and Use of Environmental and Natural Resources<br>• Outcome # 15 – Sustainable Urban and Rural Development<br>• Agriculture Sector Plan |
| National Land Policy, 1996 | The goals and objectives of this Policy are to ensure the sustainable, productive and equitable development, use and management of the country's natural resources. |
| National Food Safety Policy, 2013 | To advance the national food safety and security systems in Jamaica based on the implementation of national and international standards aimed at safeguarding human, animal, plant and environmental health and the facilitation of trade through the application of science-based principles |
| National Plant Health Policy, 2011 | To establish a coordinated, sustainable and international compliant plant health system that enhances Jamaica's plant health status, thus fostering consumer, plant and environmental health and food security. |
| National Seed Policy and Action Plan, 2016 – 2025 | To establish a sustainable seed system that ensures a consistent and reliable supply of clean, affordable and accessible seed in support of agricultural production, productivity, food security and biodiversity. |
| Agricultural Land Utilization Policy | This policy has been developed in response to the national imperative to guide proper administration and management of land for sustainable use that will foster agricultural growth, encourage opportunities for investment and income generation, satisfy the demand for lands for agricultural production, re-generate livelihoods for farming communities, and promote overall economic development of the country. *The Policy was approved by way of Cabinet Decision No. 25/11 dated 13 June 2011 pending adjustments that is now being addressed.* |

## 8.2 Legislation and Regulations

Table 8.2 below several legislation and regulations relevant to the Modernisation of the Agriculture Sector Program.

*Table 8.2 Relevant Legislation and Regulations*

| Legislation and Regulations | Relevance to Project |
|---|---|
| Natural Resources Conservation Authority Act, 1991 | Responsible for environmental management; governs all pollution activities within Jamaica, the EIA regulatory framework (where this is applicable) is governed by the NRCA Act.<br><br>NRCA's powers and responsibilities include among others:<br>• Establishing and enforcing pollution control and waste management standards and regulations;<br>• Monitoring and enforcing environmental laws and regulations, especially those included in the NRCA, Beach Control, Watershed Protection, and Wildlife Protection Acts. |
| The Natural Resources Conservation (Permits and Licences) (Amendment) Regulations, 2015 | These regulations, developed in 2013, require the application for the grant of a permit to undertake an enterprise, construction or development of a prescribed description or category in a prescribed area as set out in Form 1 in the First Schedule. |
| The Natural Resources Conservation (Wastewater and Sludge) Regulations, 2013 | Jamaica has prepared and enacted regulations governing the quality of the effluent discharged from facilities to public sewers and surface water systems. The regulation requires that the facility meet the outlined trade effluent and sewage quality standards set by the NRCA. The requisite permits and licenses are required for the installation and operation of sewage treatment facilities and wastewater treatment systems |
| National Solid Waste Management Act, 2001 | This Act provides for the regulation and management of solid wastes. It establishes the National Solid Waste Management Authority (NSWMA) for matters connected therewith or incidental thereto. |
| Disaster Risk Management Act, 2015 | The Disaster Preparedness and Emergency Act established the Office of Disaster Preparedness and Emergency Management (ODPEM) which is responsible for carrying out the provisions of the Act. |
| Wildlife Protection Act, 1945 (Amendment 2001) | Section 6 of The Wild Life Protection Act (1945) states that "No person shall hunt any protected animal or protected bird. Every person who contravenes the provisions of subsection (1) shall be guilty of an offence against this Act |
| The Forest Act, 1996 | Addresses the sustainable management of forests on lands in the possession of the Crown and vests management responsibility in the Conservator of Forests. |
| Town & Country Planning Act, 1958 | Regulates land-based developments. The Act establishes area-specific standards for land use, density and zoning. Section 5 of the Town and Country Planning Act authorizes the Town and Country Planning Authority to prepare, after consultation with any local authority, the provisional development orders required for any land in the urban or rural areas, to control the development of land in the prescribed area.<br>Relevant Development Orders for:<br>• St. Thomas<br>• Clarendon |

| Legislation and Regulations | Relevance to Project |
|---|---|
| | • St. Elizabeth<br>• Manchester |
| Water Resources Act, 1996 | The Water Resources Act established the Water Resources Authority (WRA). This Authority is mandated to regulate, allocate, conserve and manage the water resources of the island. |
| Watersheds Protection Act, 1963 | This Act provides for the protection of watersheds to include areas adjoining watersheds and the conservation of water resources for Jamaica. |
| Public Health Act, 1976 | This Act establishes the Central Health Committee with the local bodies being resident under the Parish Council of respective parishes. The Public Health (air, soil and water pollution) Regulations 1976 aim at controlling, reducing, removing or preventing air, soil and water pollution in all possible forms. |
| Food Storage and Prevention of Infestation Act, 1958 (Amendment 1973) | An act to make provision for the storage of food and for the prevention of loss of food by infestation, and for related purposes. The development of the AMC Complex as a main quarantine facility for produce export must supersede the requirements of this Act. |
| Pesticides Act (1975) and Regulations (1996, 1999 and 2004) | The Act and its Regulation regulates the registration, importation, storage, retailing and manufacturing of pesticide formulations. The Act also establishes the Pesticides Control Authority which has responsibility for registering pesticides; licensing persons to import or manufacture registered pesticides; authorizing persons to sell restricted pesticides; registering premises in which a restricted pesticide may be sold; licensing pest control. |
| Plants Quarantine Act (1994) and Regulations (1999 and 2005 | Makes provision for the effective control of the importation of plants, plant products and articles which pose a threat of introduction to Jamaica, any injurious plant pest, as well as the course of action to be taken when these are discovered within the island. The Act contains two regulations, namely, The Plants (Importation) Control (Amendment) Regulations, 2005 and Citrus Plant (Certification) Regulation (1999). |
| Protection of Plant Genetic Resources for Food and Agriculture Act, 2013 | To facilitate Jamaica's compliance with its obligations under International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA). The Act permits for access to any listed plant genetic resource for utilization or conservation for the purpose of research, breeding, or training for food and agriculture |
| The Agriculture Produce Act, 1926 | An act to consolidate and amend the laws relating to agricultural produce. |

### 8.2.1 Summary – Relevance to Development and Operation of Agro-Parks and a Quarantine Facility for Goods Export

The below table presents a summary of the relevant legislation and regulation within the context of the development and operation of agro-parks and a quarantine facility for goods export, based the information outlined in the previous section. The categories presented are not exhaustive, however, represent core commonalities across agro-parks.

*Table 8.3 Relevant Legislation and Regulation for the development and operation of agro-parks and quarantine facility for goods export in Jamaica*

| LEGISLATION AND REGULATIONS | Land Purchase/ Lease | Land Zoning/ Development | Building Construction | Well Construction | Vegetation Clearance | Farming/ Food Storage/ Packaging | Irrigation | Wastewater Management | Solid Waste Management | Seed Importation | Hazardous Chemical Storage | Worker Health and Safety |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Resources Conservation Authority Act, 1991 | | | | ■ | ■ | | | ■ | ■ | | ■ | |
| The Natural Resources Conservation (Permits and Licences) (Amendment) Regulations, 2015 | | | | ■ | | | | ■ | ■ | | ■ | |
| The Natural Resources Conservation (Wastewater and Sludge) Regulations, 2013 | | | | | | | | ■ | | | | |
| National Solid Waste Management Act, 2001 | | | ■ | | | | | | ■ | | ■ | |
| Disaster Risk Management Act (2015) | | | | | | | | | | | | ■ |
| Wildlife Protection Act | | | ■ | | ■ | | | | | | | |
| The Forest Act (1996) - | ■ | | | | | | | | | | | |

| LEGISLATION AND REGULATIONS | Land Purchase/ Lease | Land Zoning/ Development | Building Construction | Well Construction | Vegetation Clearance | Farming/ Food Storage/ Packaging | Irrigation | Wastewater Management | Solid Waste Management | Seed Importation | Hazardous Chemical Storage | Worker Health and Safety |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Town & Country Planning Act | | | | | | | | | | | | |
| Water Resources Act (1996) | | | | | | | | | | | | |
| Watersheds Protection Act (1963) | | | | | | | | | | | | |
| Public Health Act (1976) | | | | | | | | | | | | |
| Food Storage and Prevention of Infestation Act (1958) Amendment (1973) | | | | | | | | | | | | |
| Pesticides Act (1975) and Regulations (1996, 1999 and 2004) | | | | | | | | | | | | |
| Plants Quarantine Act (1994) and Regulations (1999 and 2005 | | | | | | | | | | | | |
| Protection of Plant Genetic Resources for Food and Agriculture Act (2013) | | | | | | | | | | | | |
| The Agriculture Produce Act (1926) | | | | | | | | | | | | |

## 8.3 International Treaties and Protocols

- **International Treaty on Plant Genetic Resources for Food and Agriculture** - The objectives of this Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security.
- **Convention on Biological Diversity** - The Convention on Biological Diversity (CBD) is the foremost international convention obliging its contracting parties to take action on invasive alien species and was adopted in 1992.
- **Cartagena Protocol on Biodiversity** - The Cartagena Protocol on Biosafety to the Convention on Biological Diversity is an international treaty governing the movements of living modified organisms (LMOs) resulting from modern biotechnology from one country to another.
- **The 2030 Agenda** -. the 2030 Agenda is a Global Pact unanimously agreed to by the 193 Member States of the United Nations to take bold and transformative steps to shift the world onto a sustainable and resilient path, while leaving no on behind. The 17 Sustainable Development Goals (SDGs) and 169 targets of this Agenda builds on existing global agreements (see links below) and is the successor to the Millennium Development Goals (MDGs).
- **Global Good Agricultural Practices** - Good agricultural practices are "practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products". Good agricultural practices (GAP) codes, standards and regulations are guidelines which have been developed in recent years by the food industry, producers' organizations, governments and NGOs, aiming to codify agricultural practices at farm level for a range of commodities.

## 8.4 Relevant IDB Safeguards and Operational Policies

### 8.4.1 OP- 703 Environmental and Safeguards Compliance

This Policy consists of a set of directives that will guide the Bank's work towards environmental sustainability through mainstreaming environmental considerations into social and economic development objectives. It commits the Bank to safeguard the environmental quality of all operations and to introduce socially and environmentally responsible practices in its own facilities.

The Policy has two sets of directives

- Environmental Mainstreaming
- Safeguarding Directives

Projects are classified in categories (A, B and C); this Project is classified as Category "B" meaning operations are likely to cause mostly local and short-term negative environmental and associated social impacts and for which effective mitigation measures are readily available. Section B.6 of the Policy requires that as part of the overall preparation design process, an environmental and social analysis be undertaken, according to and focusing on specific issues identified in the screening process. Another important stipulation/ requirement of the Bank and espoused by section B.6 is the need to conduct consultation with the affected parties and stakeholders and to take their views into consideration. Category B projects require at least one round of public consultation.

Sections B.10 and B.11, state that Bank financed operations should avoid adverse impacts to the environment and human health and safety particularly as it relates to hazardous substances and Pollution

Prevention. Relevant measures should be undertaken as may be appropriate to prevent and reduce impacts. Several of Jamaica's laws and policies address the issues relevant to this policy, namely the Natural Resources Conservation Authority Act, 1991

Table 8.4 which follows outlines the other relevant IDB operational policies and the Jamaican legislation/ policies that addresses these policies.

*Table 8.4 Summary of the IDB's Operation Policies and the relevant Jamaican legislation/ policies*

| **IDB Operation Policy** | **Summary** | **Jamaican legislation/ policy** |
|---|---|---|
| OP-761- Gender Equality in Development | This policy seeks to strengthen the Bank's response to the goals and commitments of its member countries in Latin America and the Caribbean to promote gender equality and the empowerment of women. In order to achieve this objective, the Policy on Gender Equality integrates a gender perspective that seeks equal conditions and opportunities for women and men to reach their social, economic, political, and cultural potential. | National Policy for Gender Equality in Jamaica, 2011<br><br>The Vision 2030 Jamaica National Development Plan |
| OP-102- Access to Information | Through implementation of this policy the Bank seeks to demonstrate its transparent use of public funds, and by deepening its engagement with stakeholders, to improve the quality of its operations and knowledge and capacity building activities.<br><br>It supports the conduct of public consultations to ensure that public access to pertinent project information is not withheld from the stakeholders. | The Access to Information Act, 2002<br><br>*No legislation for stakeholder consultations. It is only a requirement under the EIA process of the National Environment and Planning Agency.* |
| OP- 704- Disaster Risk Management | This policy provides two lines of action addressing: (i) the prevention and mitigation of disasters that occur as a result of natural hazards, through programming and proactive project work at regional, national and local levels; and (ii) post disaster response to the impacts of natural hazard events, and physical damage (such as structural collapse and explosions) resulting from technological accidents or other types of disasters resulting from human activity. | Disaster Risk Management Act, 2015 |

| IDB Operation Policy | Summary | Jamaican legislation/ policy |
|---|---|---|
| *IDB – Agriculture and Natural Resources Management Sector Framework Document | The main challenges in the region and problems that the bank wishes to address in the sector include:<br>• Agricultural productivity lagging behind its potential<br>• Natural resource utilization facing sustainability challenges due to weaknesses in governance and the correct use of management tools.<br>• Agriculture and natural resources are highly vulnerable, in particular to the impact of climate change, natural disasters, and yield and price volatility<br>• Agricultural growth not benefitting rural populations equally in Latin America and the Caribbean | Protection of Plant Genetic Resources for Food and Agriculture Act, 2013<br><br>The Agriculture Produce Act, 1926<br><br>Draft Agricultural Land Utilization Policy<br><br>*Dated Agriculture Produce Act.* Draft *Agricultural Land Utilization Policy to be made operation through the development of an Action Plan* |

**Not an Operational Policy be very relevant to developing and implementing MASP*

#### *8.4.1.1 Gaps*

On gap that exists between the Jamaican legislation/ policies and the IDB Operational Policies relate to stakeholder consultation. Stakeholder consultation is a requirement in the EIA process for the National Environment and Planning Agency (NEPA). However, outside of this there are no other specific requirements for consultations when a project is being undertaken. Nonetheless, stakeholder consultations are considered a key success factor for development projects and have therefore been utilised for this consultancy as further elaborated in the sections below.

Another is the dated Agriculture Produce Act (1926) and need for the newly developed Agricultural Land Utilization Policy to be made operational through the development of an Action Plan.

## 8.5 Key Institutions

### 8.5.1 Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF)

The Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF) has been charged with the responsibility of driving the integration of the production of primary agricultural produce along all the stages of the supply chain through to value added and facilitating full commercialization of outputs of the agriculture, manufacturing, and service sectors. The agencies that fall under MICAF are:

- Department of Co-operatives and Friendly Societies (DCFS)
- Micro Investment Development Agency Limited (MIDA)
- Jamaica Promotions Corporation (JAMPRO)
- Jamaica National Agency for Accreditation- JANAAC
- Jamaica Intellectual Property Office (JIPO)
- Jamaica Business Development Corporation (JBDC)
- Fair Trading Commission (FTC)

- Consumer Affairs Commission (CAC)
- Companies Office of Jamaica
- Bureau of Standards Jamaica (BSJ)
- Anti-Dumping and Subsidies Commission
- Cannabis Licensing Authority
- Food Storage and Prevention of Infestation Division
- Hazardous Substances Regulatory Authority
- Jamaica 4-H Clubs
- Jamaica Agricultural Society
- Jamaica Dairy Development Board
- National Compliance and Regulatory Authority
- National Export-Import Bank of Jamaica (EXIM)
- Office of the Government Trustee
- Rural Agricultural Development Authority
- SCJ Holdings Ltd.
- Sugar Industry Authority
- The Banana Board
- Trade Board Limited

The Ministry has a stated vision that by 2030, Jamaica will have an innovative, inclusive, sustainable and internationally competitive agriculture industry. To achieve this, some of the Ministry's expected outcomes include:

- increased contribution of local agriculture industries to the country's GDP
- A high standard of quality on agriculture products and services
- Reduced improper usage of agricultural lands in Jamaica
- Reduction in praedial larceny, theft from agriculture and other agriculture related issues

Within MICAF, the Technical Services directorate responsible for directing and coordinating technical activities has a mission to transform and modernize the agriculture sector. The Directorate makes recommendations for the adoption of policies, strategies, goals and plans that promote research and development programmes; agricultural health and food safety, trade facilitation, as well as conservation of biodiversity are central to the Directorate's activities.

#### *8.5.1.1 Agro Investment Corporation*

Agro-Investment Corporation (Agro-Invest) is an agricultural investment facilitation entity arising from the closure of Agricultural Support Services Productive Projects (ASSP) and the need for a revitalization of the Agricultural Development Corporation (ADC). On June 1, 2009, a name change from The Agricultural Development Corporation Act to the Agro-Investment Corporation Act was passed, which led to the creation of Agro-Invest. The entity is the agri-business facilitation arm of the Government of Jamaica's Ministry of Industry, Commerce, Agriculture and Fisheries responsible for stimulating, facilitating and developing agriculture. They focus on agricultural investment promotion and facilitation, project development and market development.

The products they offer range from agro park and agricultural land leases to processing facilities, cold storage, warehousing and logistical support to new and existing agro-producers. One of the functions of

Agro-Invest is to identify possibilities for development and expansion of agri-business industries and sub-sectors. They have since identified a need for further strategic development of the following industries: hot pepper, honey, pineapple (and other fruits), castor bean, breadfruit, mangoes, papaya, west indian sea island cotton, cassava, sweet potato, small ruminants (sheep & goats) and cattle.

To date the AIC has created several market linkages for farmers on the various Agro Parks. This is listed in Table 8.5 below.

*Table 8.5: Creation of Market Linkages*

| No. | Contract | Crop(s) |
|---|---|---|
| 1. | Ashman producers | Pepper |
| 2. | Tijule | Pepper, Cassava, Escallion and Sorrel |
| 3. | Spur tree | Pepper |
| 4. | Grace | pepper |
| 5. | Sankard | Pumpkin |
| 6. | Carleston | cassava |
| 7. | Red stripe | Cassava |
| 8. | Imagination Farms | Sorrel |
| 9. | Shoppers Fair | Pumpkin and Pepper |
| 10. | Trought Hall | Dasheen |
| 11 | J&F Import and Export | Dasheen |

#### *8.5.1.2 National Irrigation Commission*

The National Irrigation Commission (NIC) is the executive agency within the Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF) responsible for managing, operating, maintaining and expanding existing (and future) irrigation schemes and systems established by Government of Jamaica or the private sector. A key function of the NIC is to manage its water resources as efficiently and effectively as possible, especially as droughts are becoming more common and prolonged. Furthermore, Vision 2030 Jamaica requires agriculture and other key sectors to develop capacity in hazard risk reduction and adaptation to climate change (Outcome 14). One response of the NIC has been to strengthen On-Farm Water Management Units (OFWMUs) at 10 irrigation schemes (Figure xx). The OFWMUs are designed to plan, direct and implement on-farm water management and drainage techniques and optimise scarce water resources through the introduction of new water saving techniques, technologies and training. Drip and sprinkler irrigation, introduction of drought resistant crops, mulching of soils to retain moisture, catchment ponds and application of fertigation are examples of these new techniques and technologies that have been established through the OFWMUs.

*Table 8.6: Infrastructure managed by NIC (Source: State of the Jamaica Climate, 2013)*

| Name of Irrigation Scheme | Pump Stations | Wells | Canals | Pipes (km.) |
|---|---|---|---|---|
| Rio Cobre | 18 | 22 | 26 | 31.01 |
| St. Dorothy | 8 | 7 | 28 | - |
| Yallahs | 3 | 3 | - | 15.21 |
| Mid Clarendon | 32 | 32 | 153 | 36.10 |
| Duff House/New Forest | 2 | 4 | - | 26.00 |
| Hounslow | 5 | 5 | - | 41.40 |
| Beacon Little Park | 3 | 3 | - | 27.83 |
| Seven Rivers | - | - | - | 2.96 |
| Colbeck | 1 | 1 | - | 5.13 |
| Braco | 1 | - | - | 8.60 |
| **Total** | **73** | **77** | **207** | **194.24** |

#### *8.5.1.3 Capacity Challenges*

Stakeholder consultants revealed that despite the hand-over of the agro parks to the AIC for long-term management, funding has been a major challenge. Once a programme is complete the activities within the agro-parks are significantly reduced. For example, during a funded programme, there is a schedule for training at regular intervals. The programme is able to fund training on good agricultural practices in relation to pest, disease, crop production and management via the setting up of tents on the agro parks for farmer field school training and tapping into resources from SRC, UWI, the HEART Academy Ebony Park and Fersan a private sector company.

Once the programme ends, training is only held upon request and are very few. A major challenge is that while the AIC pays Agro Park Managers training is relied on from the RADA extension officers who are overstretched. Currently, there is 1 extension office to 2,500 farmers which is a major limiting factor.

In addition, any improvement required in the agro park cannot be address as funds are unavailable. It was noted that land is leases for J$10,000 per acre within the agro parks but this is not a significant sum of money to maintain operations. For example marchineery and cold storage have been identified as a need for the agro parks but this remains unaddressed.

### 8.5.2 Water Resources Authority

The Water Resources Authority (WRA), established by the Water Resources Act (1995), is the statutory body of the Government of Jamaica (GoJ) responsible for regulating the abstraction and use of Jamaica's water resources. Their stated mission is "*To ensure sustainability of Jamaica's water resources through continual assessment and proper management, promotion of conservation and protection, and optimal development of these resources. To ensure rational and equitable allocation of the nation's water resources and to reduce conflicts among water users*."

The Act stipulates the functions of the WRA including, *inter alia,* all licencing for the abstraction of surface and underground water; environmental monitoring and impact assessments; water resource inventory, forecasting and planning (including for domestic, irrigation, industrial and tourism sectors). The Agency's main activities comprise hydrological data collection and analysis; and monitoring the quantity and quality of Jamaica's fresh water supply from 10 main hydrological basins, within which there are 26 Watershed Management Units (WMUs). The Agency currently operates within the portfolio of the Ministry of

Economic Growth and Job Creation (MEGJC). Any drilling of wells and extraction of water from wells need to be permitted by the WRA.

### 8.5.3 National Environment and Planning Agency

The NEPA is the main government agency with the primary responsibility of managing the environment. Their mission *is "To promote sustainable development by ensuring protection of the environment and orderly development in Jamaica through highly motivated staff performing at the highest standard"*. It was founded to carry out the technical (functional) and administrative mandate of three statutory bodies *"the Natural Resources & Conservation, Authority (NRCA), the Town & Country Planning Authority (TCPA), and the Land Development & Utilisation Commission (LDUC)"*:

- Conservation & Protection (Natural Resources Management)
- Environmental Management
- Spatial Planning
- Compliance & Enforcement
- Applications Management
- Public Education
- Policy and Research
- Legal Services & Standards Management (NEPA, 2014)

The Agency is responsible for managing all aspects of the Permit & Licence System (P&L). P&L is the mechanism to ensure that all Jamaican facilities (developments), within the prescribed categories, meet required standards in order to minimize negative environmental effects, including Environmental Impact Assessment (EIA) where appropriate. The NEPA's roles include receiving and screening permit applications for environmental issues (including natural hazards), determining whether an EIA will be required and, if so, managing the process including consultation with government and other stakeholders. Section 9 of the NRCA Act requires the Authority to consult "any agency or department of Government exercising functions in connection with the environment."

The NEPA operates under the following Acts:

- Executive Agencies Act;
- The Natural Resources Conservation Authority Act;
- The Town and Country Planning Act, 1958;
- The Land Development and Utilization Act, 1966;
- The Beach Control Act, 1956;
- The Watersheds Protection Act, 1963; and
- The Wild Life Protection Act, 1945
- Endangered Species (Protection, Conservation and Regulation of Trade) Act, 2000

# 9 Potential Program Impacts and Recommended Mitigation Measures

This Section presents the overall impact assessment and recommended mitigation measures to guide the development and implementation of the MASP. Because of the commonalities among the agro parks, the impacts and mitigation associated with the agro parks and the AMC complex within the context of MASP are presented in a single table - Table 9.1 so as to focus on key issues and minimize repetition.

*Table 9.1:Impacts, Proposed Mitigation Measures, Management Plans and Responsible Party for the Activities of the Modernisation of the Agriculture Sector Program*

| RISKS | POTENTIAL IMPACTS | PROPOSED MITIGATION MEASURES | MANAGEMENT PLANS REQUIRED | MONITORING FREQUENCY | RESPONSIBLE PARTY |
|---|---|---|---|---|---|
| **Physical** | | | | | |
| **Soil degradation and siltation of waterways** | Loss of productive soil<br>Reduced capacity of drainage ways | Reforestation of degraded slopes<br>• Installation of check dams and other siltation control measures | Environmental and Social Management Plan<br>Erosion Control and Forest Restoration Plan | Quarterly and immediately following flood events | MICAF for establishing Drainage Works<br>Agro Park Manager for Monitoring and implementing management plan |
| **Flooding** | Loss of crops and farm equipment<br>Damage and disruption of farm and supporting infrastructure<br>Disruption of social infrastructure | Effect mechanisms to minimize the lateral spread of floodwaters and reduce the time it takes for flood waters to recede.<br>Place berms/gabion baskets alongside river banks in floodways<br>Retain existing riparian vegetation and replace as feasible<br>Design on-site stormwater drainage systems to handle in excess of 25-year return period | Environmental and Social Management Plan<br>Early Warning System for flood Risk | Rainy season<br>Monitor weather forecast.at national and regional level | MICAF for establishing Drainage and Flood control/management Works |

| RISKS | POTENTIAL IMPACTS | PROPOSED MITIGATION MEASURES | MANAGEMENT PLANS REQUIRED | MONITORING FREQUENCY | RESPONSIBLE PARTY |
|---|---|---|---|---|---|
| **Agricultural Runoff** | Contamination of surface and groundwater with nutrients and potassium from fertilizer as well as pesticides | Periodic monitoring of water quality along with visual inspection of any receiving water bodies<br><br>Implement of pesticide and fertiliser management protocols (this is especially critical in the rainy season when surface runoff is a lot more likely). | Environmental and Social Management Plan (Water Quality) | Monthly and/or as stipulated in Environmental Permit | Agro Park Manager NEPA, WRA<br><br>Agro Park Manager and Agro Investment Corporation |
| **Improperly treated wastewater** | Contamination of groundwater and surface water<br><br>Public Health Issues | Ensure sewage treatment systems are designed fit for purpose and meet the requirement of the regulatory agency.<br><br>Ensure conveyor systems for sewage and trade effluent are intact and there are no leakages. | Environmental and Social Management Plan (Waste Management) | Twice monthly or as stipulated by environmental permit | Agro Park Manager |
| **Over-extraction of groundwater from wells** | Saline Intrusion | Monitor groundwater level and quality periodically | Environmental and Social Management Plan (Water Quality) | Monthly or as stipulated by abstraction license | Agro Park Manager, WRA |

| RISKS | POTENTIAL IMPACTS | PROPOSED MITIGATION MEASURES | MANAGEMENT PLANS REQUIRED | MONITORING FREQUENCY | RESPONSIBLE PARTY |
|---|---|---|---|---|---|
| **Environmental and public health issues related to hearing or respiratory illnesses of farm workers and nearby residents** | With the introduction of heavy machinery into the daily operations of the Agro parks, noise and particulate matter levels may increase above favourable levels and result in environmental and public health issues. | Conduct baseline studies to establish monitoring guidelines and conduct an on-site assessment during operation to confirm long-term needs for monitoring particulate matter and noise. | Not currently applicable but as the agro-park is developed may be required based on case by case evaluation | Depends on outcome of evaluation or NEPA permit | If required Site/Park Manager or Environmental Officer, NEPA |
| **Hazardous Spills** | The mechanisation of any of the facilities may require the storage of petroleum products to support the activity. Should this be done negative environmental impacts e.g. soil contamination, spills into nearby waterways | Develop and implement a Hazardous material storage and handling (inclusive of disposal) protocols | Environmental and Social Management Plan (Waste Management) | Weekly (more frequently depending on activities) | Agro Park Manger and Maintenance Manager |
| **Ecological** | | | | | |
| **Disturbance of Natural Ecological Balance (Nutrient Cycling, Pollination etc.)** | The removal of natural vegetation cover for agriculture or other uses can compromise the ecological function of the area. Reduction in biodiversity can disrupt ecological processes like nutrient cycling and pollination. This reduces habitat foraging areas and natural pest and nutrient | Currently, within the agro-parks, non-arable land, neighbouring hillsides and a few other undeveloped lands still serve to maintain the biodiversity and provide ecological services in the immediate areas.<br><br>It is recommended that all hillsides, all non-arable land and some of the other areas | Not Applicable | Not Applicable | MICAF to Use Mitigation Measure as a Guide in developing MASP |

| RISKS | POTENTIAL IMPACTS | PROPOSED MITIGATION MEASURES | MANAGEMENT PLANS REQUIRED | MONITORING FREQUENCY | RESPONSIBLE PARTY |
|---|---|---|---|---|---|
| | balance resulting in the need for farmers to use pesticides and fertilizers to make up for the imbalance. | under natural vegetation should remain in their natural state to maintain the biodiversity and ecological balance. This will be of significant ecological benefit to the existing neighbouring farms namely, pollination, a corridor for diverse fauna inclusive of natural predators for pests and nutrient balance. This will truly establish the Agro-Parks as Agro-Ecological Zones (AEZ) | | | |
| **Social** | | | | | |
| **Losses due to Variable unpredictable extreme weather - temperature, rainfall, humidity** | Loss of crops and associated income due to extreme events - drought, floods, wind | Pay keen attention to Tropical Cyclone of Flash Flood warning advisories<br><br>Reap crops where possible upon the warning of an impending Tropical Cyclone event.<br><br>Research and apply drought tolerant crops<br><br>Lobby for agricultural/crop insurance | Environmental and Social Management Plan<br><br>Disaster Risk Management Plan | Before Tropical Cyclone of Flash Flood | Farmers to implement on farms measures<br><br>Independent Consultant under MASP |

| RISKS | POTENTIAL IMPACTS | PROPOSED MITIGATION MEASURES | MANAGEMENT PLANS REQUIRED | MONITORING FREQUENCY | RESPONSIBLE PARTY |
|---|---|---|---|---|---|
| | Extreme temperatures can lead to growths in agricultural pest populations e.g. increase in the population of Beet Army Pest Worm, an agricultural pest which thrives in harsh conditions wreaking havoc on escallion and onion crops. | Training of farmers in pest management measures. | Farm Management Plan (Pest Management) | Frequency to be determined with Agronomist of MASP Programme | Third party or MICAF<br><br>Farmers to implement on farms measures |
| **Water shortages due to heightened evapotranspiration and reduced or compromised rainfall, and polluted sources** | Compromised agricultural output<br>Inability to meet market/customer demand.<br><br>Loss of income | Training of farmers to use mulching mechanisms to retain soil water and minimize water consumption.<br><br>Utilization of more drip irrigation measures as opposed to sprinkler mechanisms to minimize evaporation, wastage and leaching of nutrients.<br><br>Citrus and root crops highly sensitive to changes in temperature and precipitation and so planting of drought tolerant crops in areas where drought is a chronic problem. | Farm Management Plan (Water management and Sanitation) | Frequency to be determined with Agronomist of MASP Programme | Third party or MICAF<br><br>Farmers to implement on farms measures |
| **Environmental and public health issues related to** | With the introduction of heavy machinery into the daily operations of the Agro | Conduct baseline studies to establish monitoring guidelines and conduct an on- | Not currently applicable but as the agro-park is | Depends on outcome of | If required Site/Park Manager or |

| RISKS | POTENTIAL IMPACTS | PROPOSED MITIGATION MEASURES | MANAGEMENT PLANS REQUIRED | MONITORING FREQUENCY | RESPONSIBLE PARTY |
|---|---|---|---|---|---|
| **hearing or respiratory illnesses of farm workers and nearby residents** | parks, noise and particulate matter levels may increase above favourable levels and result in environmental and public health issues. | site assessment during operation to confirm long-term needs for monitoring particulate matter and noise. | developed may be required based on case by case evaluation | evaluation or NEPA permit | Environmental Officer, NEPA |
| **Health and Safety issues during renovation** | The users of the AMC Complex will likely be negative impacted by renovation activities if the area is not properly marked with signs and barrier to prevent access incidents.<br><br>If workers are not properly trained and equipped with the correct equipment injuries could occur. | The contractor must have a health and safety policy that is known and understood by all workers. It must also be visible to the workers on site.<br><br>Renovation areas should be clearly demarcated with safety signs and barriers to prevent possible incidents.<br><br>Workers should be properly equipped with health and safety equipment and trained in the proper use of construction equipment.<br><br>All workers must be trained in the proper use of all health and safety equipment.<br><br>All workers must be trained in the proper handling and management/ disposal of all types of waste. | Environmental and Social Management Plan (Health and Safety Management Plan) | Daily Inspections | Implementing Agency (MICAF)<br>Contractor<br><br>AIC<br><br>AMC Complex Property Manager |

| RISKS | POTENTIAL IMPACTS | PROPOSED MITIGATION MEASURES | MANAGEMENT PLANS REQUIRED | MONITORING FREQUENCY | RESPONSIBLE PARTY |
|---|---|---|---|---|---|
| | | The Contractor's EHS Manager shall maintain a register of all EHS related incidents that have occurred as a result of the activities associated with the contract.<br><br>EHS incidents that should be recorded include fires, accidents, spills of hazardous materials that contaminate soil or water resources, stop-order notices issued by NEPA, the Municipal Corporation or any other relevant agency, non- compliance with this EMP.<br><br>Each EHS related incident will be investigated by the Contractors' EHS officer and an incident report forwarded to the contractor. An incident report will be presented within five working days;<br><br>EHS incident reports will include as a minimum, a description of the incident, actions taken to contain any | | | |

| RISKS | POTENTIAL IMPACTS | PROPOSED MITIGATION MEASURES | MANAGEMENT PLANS REQUIRED | MONITORING FREQUENCY | RESPONSIBLE PARTY |
|---|---|---|---|---|---|
| | | damage to the environment, personnel or the public, and the corrective actions to repair/remediate any damage;<br><br>All construction equipment and machinery shall be maintained in a good state of repair throughout the construction period<br><br>Equipment maintenance will be carried out on an impermeable surface<br><br>Leakage from equipment will be prevented by regular inspection and repair<br><br>Areas under renovation should be clearly demarcated.<br><br>Emergency medical supplies must be available and easily accessible in the case of an incident.<br><br>In the event that the onsite medical supplies are not adequate, the incident needs | | | |

| RISKS | POTENTIAL IMPACTS | PROPOSED MITIGATION MEASURES | MANAGEMENT PLANS REQUIRED | MONITORING FREQUENCY | RESPONSIBLE PARTY |
|---|---|---|---|---|---|
| | | to be escalated to the hospital.<br><br>In the event that a worker is exposed to hazardous material they should immediately be taken for medical attention. | | | |
| **Improperly Trained Staff** | Environmental, public health and food safety Issues | Ensure all Agro park users are trained by qualified personnel and that training are documented.<br>Evaluation of training records by external auditors | Environmental and Social Management Plan<br><br>Farm Management Plan (Train the Trainers and Food Safety) | Annual audits | Agro Park Manager, Third Party |
| **Poor solid waste disposal** | Solid waste generated from the operations are expected to be mostly organic in nature, if left on the site over extended period (especially without adequate containment mechanisms), the leachates can contaminate groundwater in the area | Proper facilities for storage (ensure inaccessibility by pests, location should prevent leaks and facilitate easy cleaning). Removal should be timely and documented | Environmental and Social Management Plan | Weekly (more frequently based on use of facilities) | Agro Park Manager and or Facilities Manager |
| **Vulnerable groups such as females** | The vulnerable population, in particular females and youth can miss out on gainful employment is | Develop gender and youth targeted empowerment initiatives for agriculture | Gender Equality Action Plan | Monthly | Sociologist/Consultant |

| RISKS | POTENTIAL IMPACTS | PROPOSED MITIGATION MEASURES | MANAGEMENT PLANS REQUIRED | MONITORING FREQUENCY | RESPONSIBLE PARTY |
|---|---|---|---|---|---|
| **and youths remain unemployment** | targeted initiatives are not tied to MASP implementation. | | | | MICAF to implement under MASP |

# 10 Conclusion

In conclusion, based on the findings of the environmental and social assessment, it is the professional opinion of the Consultants that the project, is not likely to result in significant negative environmental impacts. Where there are potential direct negative impacts these are mostly short term, reversible and can be mitigated. Once mitigated the potentially negative physical and ecological impacts highlighted above are significantly minimized.

On the other hand, the project is expected to result in significant positive social impacts as training and employment of persons within the agricultural sector continues, this is especially positive as the gender equality and youth employment and empowerment are continually fostered through specific initiatives.

# SECTION 2

# ENVRIONMENTAL AND SOCIAL MANAGEMENT PLAN

# 11 Environmental and Social Management Plan

This Section presents the Environmental and Social Management Plan (ESMP), which follows on the identification of the potential environmental and social impacts and proposed mitigation actions (Section 10) for the MASP. Specific Environmental Management Plans (EMPs) have been developed to be utilised by Contractors or Agro Park Managers or Quarantine Complex Managers commissioned for the implementation of MASP and will form the basis of site-specific management plans that will need to be prepared before the programme is implemented.

The following plans are anticipated for the identified environmental aspects and risks to the Project:

1. Environmental and Social Management Plan (ESMP)
    a. Water Quality Management
    b. Waste Management
    c. Health and Safety
2. Farm Management Plan
    a. Pest Management
    b. Water Management and Sanitation
    c. Train the Trainers
    d. Food Safety
3. Disaster Risk Management Plan
4. Erosion Control and Forest Restoration Plan
5. Early Warning System for flood Risk
6. Gender Equality Action Plan

ESL under this project, has developed the ESMP outlined below. It is recommended that the other plans be developed prior to implementation of MASP.

## 11.1 Water Quality Management Plan

Monitoring of water quality for all abstraction wells and downstream surface water sources should be implemented to ensure water resources are not negatively impacted by the Agro Park activities. The parameters to be monitored should consider ambient water quality guidelines in addition to others for environmental health protection. The sampling protocol used should meet, at a minimum, the Ministry of Health & Wellness (MoHW) Environmental Health Laboratory Sampling and Field Measurements Protocol.

### 11.1.1 Monitoring Standard

Parameters suggested in Table 11.1 for the monitoring program are based on the guidelines for ambient freshwater quality stipulated by NEPA along with others required for public health protection. The Table is further elaborated in Appendix V providing the relevance of each parameter identified.

*Table 11.1: Suggested Water Quality Monitoring Parameters*

| PARAMETERS (UNITS) | NRCA AMBIENT WATER QUALITY STANDARD |
|---|---|
| Faecal Coliform (MPN/100ml) | - |
| Nitrate as Nitrogen (mg $NO_3^-$/L) | 0.1 – 7.5 |
| Phosphate (mg $PO_4^{3-}$/L) | - |
| Total Suspended Solids (mg/L) | 0.01 – 0.8 |

| PARAMETERS (UNITS) | NRCA AMBIENT WATER QUALITY STANDARD |
|---|---|
| Chloride (mg $Cl^-$/L) | 5.0 – 20.0- |
| Salinity (ppt) | - |
| Alkalinity (mg $CaCO_3$/L) | - |
| pH (pH units) | 7.00 – 8.40 |
| Conductivity (mS/cm) | 0.15 – 0.6 |
| Biochemical Oxygen Demand (mg $O_2$/L) | 0.8 – 1.7 |
| Dissolved Oxygen (mg $O_2$/L) | - |
| Chemical Oxygen Demand (mg $O_2$/L) | - |
| Pesticide Screen | - |
| Copper (µg Cu/L) | - |
| Zinc (µg Zn/L) | - |
| Boron (µg B/L) | - |
| Manganese (µg Mn/L) | - |
| Iron (µg Fe/ L) | - |
| Magnesium (µg Mg/L) | 3600 – 27000 |
| Sodium (µg Na/L) | 4500 – 12000 |
| Calcium (µg Ca/L) | 40000 – 101000 |
| Potassium (µg K/L) | 740 – 5000 |
| Hardness (mg $CaCO_3$/L) | 127.0 – 381.0 |

### 11.1.2 Monitoring Equipment, Stations and Frequency

Water quality monitoring for protection of environmental health will be according to the stipulations of the environmental license issued by NEPA. Monitoring of well water will be stipulated by the WRA in the relevant abstraction licenses.

Once effluent is being discharged from the wastewater treatment systems, monitoring of these effluents will also become necessary. If sewage is mixed with the wastewater from the washing of produce, then the final effluent should be chlorinated prior to discharge

### 11.1.3 Management and Mitigation Measures

Once parameters are determined to be non-compliant with the regulatory stipulations or process requirements, corrective actions should be taken to bring the parameters back into compliance. Investigations into the cause(s) of the non-compliance should be done as soon as possible once results are obtained to ensure swift and adequate corrective measures are implemented.

### 11.1.4 Key Performance Indicators

Performance indicators will be used to assess the effectiveness of the implemented water monitoring programs. The assessment will be done in the form of planned or impromptu audits conducted by the

Agro park manager and team. Areas which will be assessed and used as performance indicators will include:

1. The performance of communication mechanisms when non-compliant data are obtained. This will be accomplished through the review of records and data from monitoring exercises.
2. Water quality reports
3. Corrective action reports when non-compliant results are obtained. The effectiveness of implemented corrective actions should also be assessed.

### 11.1.5 Roles and Responsibilities

All samples collected during the monitoring exercise should be analyzed using verified/validated analytical methods at an EHU approved laboratory. The AIC and Agro park Managers should keep track of the stipulations in any NEPA and WRA permits and contract the appropriate services as necessary.

### 11.1.6 Data Analysis and Reporting

The Certificate of Analysis (CoA) obtained from the EHU approved laboratory should contain at least the following information:

1. Sample identification/information and description
2. Sample collection date and time
3. Sample submitting information (temperature and condition of sample, time and date of submission)
4. Analysis date
5. Test results with units of measurement
6. Test methods
7. Notes regarding anomalous tests results
8. Applicable standard
9. QA/QC documentation
10. Signature of authorized persons

The data obtained from the certificate of analysis will be analyzed, taking into consideration regulatory requirements and operational standards as well public/environmental health and safety. These reports will be prepared by the environmental specialists (internal or external) and submitted to the Agro park Manager who will then review and take necessary actions and report to the relevant regulatory agencies according in the reporting frequency in their License.

The schematic of the reporting structure will therefore be as follows:

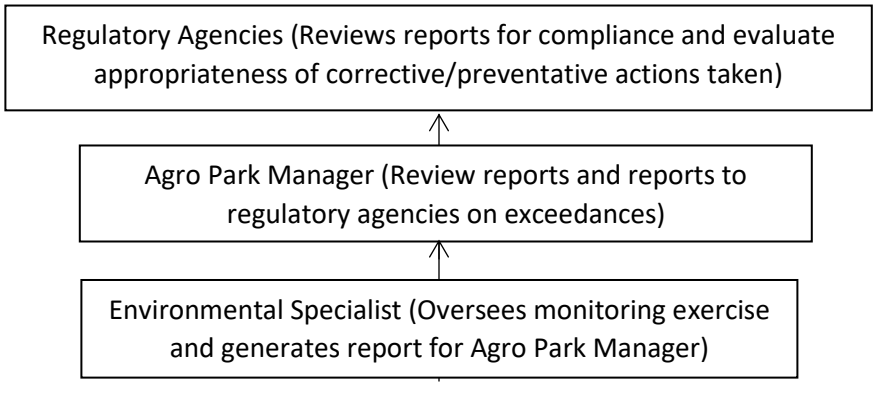



*Figure 11.1: Water Quality Reporting Structure*

## 11.2 Waste Management Plan

The administration and oversight of solid waste management is primarily to be carried out by the Property or Agro Park Manager. Below is the definition used in the management of solid waste:

**Solid (Non-Hazardous) Waste**

The International Finance Corporation (IFC) General Environment, Health and Safety (EHS) Guidelines define solid (non-hazardous) waste as generally any garbage refuse including domestic trash, inert construction/demolition materials, refuse such as scrap metal and empty containers. Solid waste that is likely to be generated in this project will primarily be organic agricultural waste.

**Hazardous Material/Waste**

The International Finance Corporation (IFC) General Environment, Health and Safety (EHS) Guidelines define hazardous waste as Substances that possess at least one of four characteristics; ignitability, corrosivity, reactivity, or toxicity - or appear on special lists.

The International Finance Corporation (IFC) General Environment, Health and Safety (EHS) Guidelines define hazardous material as materials that represent a risk to human health, property, or the environment due to their physical or chemical characteristics. They can be classified according to the hazard as explosives; compressed gases, including toxic or flammable gases; flammable liquids; flammable solids; oxidizing substances; toxic materials; radioactive material; and corrosive substances. Hazardous Material will primarily be pesticides and fertilizers as well as cleaning agents used in the various processing and packaging facilities.

### 11.2.1 Monitoring Frequency

At most locations, waste collection is conducted on a weekly basis and so monitoring of waste should be done weekly to ensure that all measures are being implemented and followed.

### 11.2.2 Management and Mitigation Measures

The Property or Agro Park Manager will ensure that the following mitigation measures are followed during operations so as to reduce the possible negative impacts of improper waste disposal and management:

- Potential hazardous material should be identified and stored in designated locations, ideally not in the same space as processing or packaging of produce.
- All non-hazardous waste generated should be disposed of using approved methods. Waste should only be collected by the NSWMA or an approved contractor by NSWMA. and transported to approved disposal facility.
- Burning or burying of any kind of waste is prohibited.
- Any hazardous material such as waste oil, asbestos containing material and contaminated soil should be disposed of via approved contractors in locations approved by NEPA. A special permit for removal and transportation is a requirement of NEPA.
- A schedule for collection of waste and disposal must be developed and never be dumped.
- Recycling of compost can be done where feasible.
- In the event of leaks/ spills they should be cleaned up immediately, NEPA/ ODPEM consulted and the waste disposed of at an approved dump site.

- Portable toilets, if used, must only be transported by approved contractors. NEPA permits may be required.
- Hazardous material should not be stored on site but in packaging facilities located within the Agro Park or offsite.
- Hazardous materials shall be stored in properly bunded areas to contain any leaks and drip trays shall be in place under all fuel bowsers;
- Workers handling hazardous waste (e.g. pesticides) should be properly equipped with PPE (masks, gloves, hard hat, hard boots, etc).
- Appropriate spill kits must be available in areas of proximity to watercourses and drains;
- All wastewater that is contaminated with hazardous substances shall be collected in a container, allowed to evaporate and the sludge disposed of as hazardous waste;
- All personnel shall be trained and educated during induction on the safe handling of hazardous substances.
- Sufficient weather and scavenger-proof bins (with lids to prevent the escape of litter) shall be provided and be accessible at all points where waste is generated;
- The project area should be kept clean and free of litter and no litter from the site shall be allowed to disperse to surrounding areas;
- All personnel shall be instructed to dispose of all wastes in a proper manner;
- During any renovation activities, all construction materials should be suitably stored and protected so that they do not become damaged and unusable;

### 11.2.3 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the solid waste management system:

*Table 11-2: Key Performance Indicators*

| No. | Key Performance Indicator | How will it be monitored and measured | Responsibility |
|---|---|---|---|
| 1 | No construction waste deposited in the main or farm roadways as well as nearby rivers or gullies | Location of a temporary storage site away from road, gully and walkway for construction waste | Ago Park or Property Manager of Contractor for renovation activities. Results to be presented to the Implementing Agency |
| 2 | No leakages or spills | Monitor possible spills. Inspection of the site by the Ago Park or Property Manager | Ago Park or Property Manager or Contractor for renovation activities. Results to be presented to the Implementing Agency |
| 3 | Limited sediment laden run-off during heavy rain | Monitor nearby/downstream wells and water bodies during operation for significant sediment deposits | Ago Park or Property Manager. Results to be presented to the Implementing Agency |
| 4 | Reuse of organic waste where possible as compost | Less organic waste being delivered to the disposal site | Farmers. Results to be presented to the Agro Park or |

| No. | Key Performance Indicator | How will it be monitored and measured | Responsibility |
|---|---|---|---|
| | | | Property Manager who reports to the Implementing Agency |
| 5 | Approved Contractors for renovation activities | Inspection of licenses and documentation | Contractor. Results to be presented to the Implementing Agency |

KPIs will be reviewed occasionally to determine areas for improvement. Specific KPIs will need to be developed for the Solid Waste Management aspect of Component 1.

## 11.3 Health and Safety Management

This section relates to both worker health and safety as well as other users of the AMC complex.

### 11.3.1 Monitoring Frequency

Monitoring will be carried out by the renovation Contractor daily to minimize possible incidents.

### 11.3.2 Management and Mitigation Measures

The Contractor will ensure that the following mitigation measures are followed during renovation so as to reduce the possible negative impacts of workers and users of the facility:

- The contractor must have a health and safety policy that is known and understood by all workers. It must also be visible to the workers on site.
- Construction areas should be clearly demarcated with safety signs and barriers to prevent possible incidents.
- Workers should be properly equipped with health and safety equipment and trained in the proper use of construction equipment.
- All workers must be trained in the proper use of all health and safety equipment.
- All workers must be trained in the proper handling and management/ disposal of all types of waste.
- The Contractor's EHS Officer shall maintain a register of all EHS related incidents that have occurred as a result of the activities associated with the contract. EHS incidents that should be recorded include fires, accidents, spills of hazardous materials that contaminate soil or water resources, stop-order notices issued by NEPA, the Municipal Corporation or any other relevant agency, non- compliance with this EMP.
- Each EHS related incident will be investigated by the Contractor's EHS Officer and an incident report forwarded to the contractor. An incident report will be presented within five working days;
- EHS incident reports will include as a minimum, a description of the incident, actions taken to contain any damage to the environment, personnel or the public, and the corrective actions to repair/remediate any damage;
- All renovation construction equipment and machinery shall be maintained in a good state of repair throughout the renovation period
- Equipment maintenance will be carried out on an impermeable surface

- Leakage from equipment will be prevented by regular inspection and repair
- Areas under renovation should be clearly demarcated.
- Emergency medical supplies must be available and easily accessible in the case of an incident.
- In the event that the onsite medical supplies are not adequate, the incident needs to be escalated to the hospital.
- In the event that a worker is exposed to hazardous material they should immediately be taken for medical attention.

### 11.3.3 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the health and safety management system.

*Table 11-3: Key Performance Indicators*

| No. | Key Performance Indicator | How will it be monitored and measured | Responsibility |
|---|---|---|---|
| 1 | Health and Safety Policy | Review and inspection of documentation | Contractor. Results to be presented to the Implementing Agency |
| 2 | Health and Safety Signs | Inspection of the site | Contractor. Results to be presented to the Implementing Agency |
| 3 | Training log and schedule | Review and inspection of documentation | Contractor. Results to be presented to the Implementing Agency |
| 4 | Register of all EHS related incidents | Review and inspection of documentation | Contractor. Results to be presented to the Implementing Agency |
| 5 | Equipment maintenance log and schedule | Review and inspection of documentation | Contractor. Results to be presented to the Implementing Agency |
| 6 | Emergency Kit | Inspection of site office | Contractor. Results to be presented to the Implementing Agency |

### 11.3.4 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that the health and safety management policy is clearly understood by all workers and that all mitigation measures are carried out and that monitoring reports are prepared.

It is the responsibility of the workers to ensure that they understand the health and safety requirements and that they abide by them.

The Implementing Agency is responsible for monitoring the contractor to ensure that monitoring is being undertaken and mitigation measures are being enforced.

### 11.3.5 Data Analysis and Reporting

If there are any violations, this will be reported immediately to the AIC and AMC Complex Property Manager to allow for management strategies to be changed according to the results.

# SECTION 3

# CONSULTATION PLAN AND GRIEVANCE MECHANISM

# 12 MASP Consultation Strategy and Plan

The purpose of this Consultation Strategy and Plan is to outline the measures to be used for stakeholder engagement, dissemination of project information and grievance management.

This strategy is critical to allow for two-way communication between the project proponent and the persons who are directly or indirectly impacted by the activities to be undertaken. These include communication with stakeholders who are both internal and external to project implementation.

This strategy will be utilised as a key element in all the proposed management, monitoring and mitigation measures outlined in this document.

The plan includes provisions for managing the following:

- Stakeholder mapping
- Consultation plan including time schedule
- Grievance modalities and mitigation procedures
- Reporting

Implementation of this strategy will be the responsibility of the Implementing Agency for the Project.

## 12.1 Stakeholder Identification and Analysis

All stakeholders are participants in the planned implementation of the project in one capacity or the other. Some have more direct and important roles than others.

This implied order of functional involvement has been summarised in this section:

**Medium Interest Stakeholders:**

Their roles may be based on a specific administrative mandate and capability/capacity which is a standard engagement for them (example: National Environment and Planning Agency (NEPA))

**Stakeholders with Important Interests:**

These stakeholders have important information or specific action-based deliverables that project implementation must rely on. The Stakeholder Consultation process will not qualify as robust if these entities are not consulted.

**Critical Stakeholders:**

These stakeholders are critical engines of project development both in relation to conceptual planning and actual resource deployment. This also includes affected parties who will be impacted by this program. These persons must be consulted.

*Table 12.1: Stakeholder Identification*

| **Stakeholders that have a Participatory Role in the Projects planned implementation** | **Participatory Role** | **Current Interest Focus** | **Current Interest Rating** |
|---|---|---|---|
| Ministry of Science, Energy and Technology (MSET) | Facilitating | Technology Input - Linkages with SRC for Training | **MEDIUM INTEREST STAKEHOLDERS** |
| The Ministry of Health | Facilitating & Procurement | Public Health Inspection of Facilities | |
| National Environment and Planning Agency | Regulatory | Environmental permits/ licences | |
| National Land Agency | Facilitating | Land ownership and titling | |
| Independent lawyer(s) | Procurement and Facilitating | Support Land ownership changes | |
| Jamaica National Heritage Trust | Regulatory | Guidance on changes to sites with key heritage features | |
| Mines and Geology Division | Regulatory | Facilitating the extraction of material from rivers or quarries | |
| JPSCo | Facilitating & Procurement | Electricity supply (AMC Complex only) | |
| Subcontractors | Facilitating & Procurement | The details of the involvement of these subcontractors is yet to be worked out. They will perform contracted functions whether on the renovation of the AMC complex or farm management, or as to be determined. | |
| Contract workers | Facilitating | These will likely comprise the workforce of the subcontractors. | |
| Equipment suppliers | Procurement | As likely determined by Sub contractors | |
| Contract service providers | Procurement and Facilitating | As likely determined by Sub contractors and Client | |
| **Facilitators of Project** | | | **STAKEHOLDERS WITH AN IMPORTANT INTEREST.** |
| National Irrigation Commission | Facilitating | Irrigation Water Supply | |
| National Land Agency | Facilitating | Land acquisition and titling | |
| National Water Commission | Facilitating & Procurement | Water supply (AMC Complex plus interfaces with existing networks in Agro Parks) | |
| Water Resources Authority | Regulatory | Licence for Well Drilling, Pumping and Monitoring | |

| Stakeholders that have a Participatory Role in the Projects planned implementation | Participatory Role | Current Interest Focus | Current Interest Rating |
|---|---|---|---|
| Dep of Cooperatives and Friendly Society | Facilitating | Supporting the registration and maintenance of Farmers Groups | |
| **Implementers - Stakeholders influencing Project** | | | **CRITICAL STAKEHOLDERS** |
| Ministry of Industry Commerce Agriculture and Fisheries | Implementing Agency | Overarching | |
| Agro Investment Corporation | Operations | Manage Operations of Agro Parks and AMC Complex | |
| Municipal Corporations | Facilitation & Planning | Local Government Inputs – Possible interactions with the Interagency Committee, Parish Disaster Committee, Parish Development committee | |
| National Works Agency | Procurement | Structural works | |
| Social Development Commission | Facilitating | Social Environment | |
| National Solid Waste Management Authority | Procurement & Facilitating | Waste Management | |
| Planning Institute of Jamaica | Facilitating | Project Planning and Funding | |
| **Affected Stakeholders** | | | |
| All Agro Park and Packaging facilities | Affected Community | Impacts negative or positive | |
| Communities surrounding all Agro Parks | Affected Community | Impacts negative or positive | |
| AMC Complex – Spanish Town Road | Surrounding Community | Impacts negative or positive | |
| **Stakeholders Able to Affect the Project** | | | |
| Jamaica Social Investment Fund | Procurement & Facilitating | Liaison with Existing Projects funded in the project area. | |
| Government of Jamaica/Adaptation Fund Programme (GOJ/. AFP) | Procurement & Facilitating | Liaison with Existing Projects funded in the project area. | |
| Inter-American Institute for Cooperation on Agriculture (Jamaica) | Procurement & Facilitating | Liaison with Existing Projects funded in the project area. | |
| RIU Group of Hotels | Market | Market for agricultural produce | |
| Grace Kennedy | Market | Market for agricultural produce | |
| Progressive | Market | Market for agricultural produce | |
| Lees Food Fair | Market | Market for agricultural produce | |
| Spur Tree Spices | Market | Market for agricultural produce | |

| **Stakeholders that have a Participatory Role in the Projects planned implementation** | **Participatory Role** | **Current Interest Focus** | **Current Interest Rating** |
|---|---|---|---|
| Chefs and Accountants | Market | Market for agricultural produce | |
| Everything Fresh | Market | Market for agricultural produce | |
| Jamaica's Finest | Market | Market for agricultural produce | |
| Hi Pro | Procurement | Provision of Seeds | |
| New Port Fersan | Procurement & Facilitating | Training<br>Provision of Pesticides and fertilizers | |
| American Airlines | Procurement & Facilitating | Facilitating Export within short timeframe | |
| Fly Jamaica | Procurement & Facilitating | Facilitating Internal movement of goods Montego Bay-Kingston | |
| Caribbean Airlines | Procurement & Facilitating | Facilitating Export within short timeframe | |
| Idel Brown | Procurement | Exporter - Market for agricultural produce | |
| Patsy Duncan | Procurement | Exporter - Market for agricultural produce | |
| Seaboard Shipping and Freight, | Procurement | Secure Fast transport of produce to UK | |
| Corrpak | Procurement | Packaging Material | |
| Jamaica Customs | Facilitating | Granting Export of Goods | |
| DHL | Procurement | Export Services | |

### 12.1.1 Stakeholder Analysis

The following table presents the mapped stakeholders and the level of engagement needed.

*Table 12.2: Mapping of Stakeholders*

| Stakeholders | Level of Engagement | Participation /Needs |
|---|---|---|
| **Stakeholders Agro park Workers and residents as well as surrounding communities** | Consult, Involve, Collaborate | Awareness - messages to inform stakeholder on activities<br><br>Two-way consultation to guide project understanding, and likely out turns of the ESA and associated Plans, also mitigation responses to negative impacts or on beneficial activities<br><br>Participation ranges across:<br><br>Regulatory bodies that provides guidelines to be followed, the requisite permits and monitoring.<br><br>Collaboration to ensure relevant agencies and authorities are engaged. |
| **Stakeholders that are involved in the Project's development and planned implementation, irrespective of current interest rating.** | Consult, Involve, Collaborate | |
| **Stakeholders who can influence Project Implementation** | Consult, Involve, Collaborate | Project understanding, and likely out turns of the ESA and associated Plans, also mitigation responses to negative impacts or on beneficial activities |
| ***Internal Stakeholders*** | | |
| Contractor | Transact, Consult, Involve | Training and sensitization on lender requirements for completing contracted work<br><br>Collaboration to ensure two-way communication regarding any issues, mitigation measures or positive impacts |
| Servicing company/ companies | Transact, Consult | |
| Renovation Contractors | Transact, Consult, Involve | |
| Services and facilities suppliers | Transact, Consult | |
| Security agencies | Transact, Consult | Collaboration regarding security issues or breaches. |
| ***Media Houses*** | Monitor Inform | To inform message for awareness |

## 12.2 Consultation Schedule

A schedule has been developed for the consultations intended to facilitate disclosure of information on the project (Appendix VI. It is anticipated that engagement will help to build and maintain over time a constructive relationship with all stakeholders.

### 12.2.1 Pre - MASP

The Table below illustrates the project consultation schedule presented for the pre-construction phase of the project and shows the various types of communication strategies recommended for each type of stakeholder identified.

*Table 12.3: Proposed Pre-MASP Consultation Schedule*

| PROJECT PHASE | STAKEHOLDER | TIMING | METHOD OF COMMUNICATION |
|---|---|---|---|
| ESA Phase | Property and Agro Park Manager, Workers and Users | At the start of project-site reconnaissance | Rapid interviews with select informants within sample agro parks to gain understanding of the main issues and to introduce them to the project. |
| | Key implementing Agencies and other interested stakeholders | Towards the end of the ESA, after the Draft Report has been reviewed and approved by the IDB. | Meeting to discuss findings of the assessments, to gain feedback and solicit buy-in. |
| Post ESA Phase | Key Institutions involved in the development and implementation of MASP:<br>• MICAF<br>• AIC<br>• NIC | After the submission Final ESA and ESMP | Focused meetings on their mandate, strengths and weaknesses to determine institutional recommendations to support implementation of MASP successfully<br><br>Focused meetings to fully develop MASP components and activities |
| Post ESA Phase | All Stakeholders in Table 12.1 | Once MASP has been properly defined | Stakeholder meeting to Launch the draft Program and solicit feedback |
| Post ESA Phase | All Stakeholders in Table 12.1 | Once MASP has been finalised and funding approved | Media Launch the MASP |

### 12.2.2 MASP – Operation

The table below shows the details for communication required during the execution of MASP. It outlines the communication needs, timing and method for the stakeholders relevant for each management plan.

*Table 12.1: Stakeholder Consultations during the Operation of MASP*

| # | Plan | Communication Needs | Timing | Method |
|---|---|---|---|---|
| 1 | Worker Health and Safety Plan during Renovation Activities | Training of employees about health and safety procedures and personal protective gear that need to be worn during renovation activities especially at the AMC Complex | Before and periodically during the renovation works | Training and sensitisation sessions with contract workers on site.<br>Bulletins on the notice board on site as reminders, safety signs. |
| 3 | Solid Waste Management Plan | Communication to solid waste collectors to receive and remove solid and hazardous waste offsite to appropriate off-site disposal.<br>Communication to workers about the procedures for handling and disposing of solid and hazardous waste material. | Prior to the start of renovation | Collectors to be advised via letter and telephone conversation.<br>Worker sensitisation sessions |
| 4 | Environmental and Social Management Plan | Training of Agro Park Managers and Property Managers | Prior to implementation of MASP | Training and sensitisation sessions<br>Documentation to be handed over to manager |
| 5 | Farm Management Plan | Training of Agro Park Managers, Farmers and Users | As prescribed by Farm Management Plan | Training and sensitisation sessions |

### 12.2.3 Reporting

The results of engagement activities conducted throughout the project must be presented. At the end of each phase/major milestone, the subsequent results can be appended. Engagement activity summaries should include the following information:

- Stakeholder engaged (name and contact details)
- Date and location of meeting (photo if possible)
- Topic of meeting
- Feedback received from stakeholder
- Answers from Implementing Agency

- If the Implementing Agency commits to something, the commitment should be recorded as part of a commitment register identifying a responsible entities/person, and a deadline as appropriate.

# 13 Grievance Mechanism

A grievance mechanism will have to be in place once the programme has been developed and execution has begun. This mechanism will allow for concerns/ complaints to be received by any stakeholder/party and to facilitate resolutions of the affected individuals. It will require the implementing agency, MICAF, to respond within a specified time. This mechanism offers the Implementing Agency and affected communities/ stakeholders an alternative to external dispute resolution processes.

It will be the responsibility of the Implementing Agency to update and modify this procedure or complaint mechanism as the full contours of the final project are known and agreed.

The grievance process outlined below covers component I and 2 activities. The Implementing Agency will receive complaints and facilitate the recording of concerns and grievances about the environmental and/or social performance of MASP. MICAF will need to facilitate a resolution of the affected communities, institutions or individuals. The grievance mechanism is scaled to the risks and adverse potential impacts of the project. It facilitates the prompt address of concerns using an understandable and transparent process that is appropriate based on the Jamaican scenario and readily accessible to all segments of the affected communities.

The mechanism is at no cost and is without retribution. The mechanism will not impede access to judicial or administrative remedies. The Implementing Agency will inform the affected communities and institutions about the mechanism during its stakeholder engagement process and as appropriate to safeguard the interests of the Project.

The recommended approach below is specific to internal stakeholders and external stakeholders.

## 13.1 Internal and External Stakeholders

Both internal and external stakeholders will place any complaint through the mechanism proposed. It should be allowed that complaints cannot only be received at the main MICAF office at Hope gardens but at each Agro Park and Facility being upgraded under the MASP through the Property Manager or Agro Park Manager.

**Step 1**

The process of accepting grievances is the first step which can take on varying levels of formality as outlined in the table below. The following section outlines the Grievance Collection Form that complainants will first need to complete. Grievance can be recorded at the temporary facility. Grievances can also be logged anonymously based on the nature of the problem.

*Table 13.1: Methods for Grievance Receipt, from Least to most formal*

| Level of Formalization | Examples |
|---|---|
| ***Least formal***: Oral complaints received face to face | Staff charged with collection of grievances writes down complaints at group or individual meetings, during field visits, or at designated locations. |

| Level of Formalization | Examples |
|---|---|
| ***Somewhat formalised***: Oral complaints received through remote-access methods | Staff accepts grievances through a designated telephone line. |
| ***More formalised***: Written compaints received face-to-face | Staff accepts written submissions from an individual or a group at groups or individual meetings, during site visits, or at designated locations. |
| ***Most formalised:*** Written complaints recevied through remote access me thods | Complaints come in via regular mail, internet, or grievance collection boxes (consider having multiple locations).<br><br>Complainants submit written grienvances to third parties (to be forwarded to the company or the thrid party designated to administer the company grievance mechanism |

While oral complaints are accepted from both internal and external stakeholders, a grievance collection form provided in the following section should be completed by the stakeholder following oral face to face or remote communication. This form will be made available at all sites slated for upgrading or development under MASP.

**Step 2**

The logging of complaints rests with the on-site Property or Agro-Park Manger. Following the logging of a complaint, the grievance will be addressed. A response must be prepared for the grievant.

Should the grievant not be satisfied with the response provided, they move on to step 3.

**Step 3**

Grievances that cannot be handled in Step 2 will be taken to the designated authority within Implementing Agency. A further root cause analysis should be done to identify another appropriate corrective action and complete the Grievance Monitoring Form in the following section.

The complainant will then be informed in writing the decision to correct the action within a forty (40) working day period.

**Step 4**

If the complainant does not feel that the grievance has been adequately addressed, they would go to court if the complainant so desires.

### 13.1.1 Grievance Collection Form

(Used by Stakeholder)

Case No. _____

Applicant's Name _____

□ I wish to submit complaint anonymously

□ I demand that my personal details not be disclosed without my consent

Address:_____

_____

Telephone: _____

Email: _____

Description of Comment/Complaint: *(Subject of case, when did it occur, location, who is involved, effects of situation)*

_____

_____

_____

_____

_____

Date of Incident: _____

□ One-time incident/complaint (date_____)

□ Happened more than once (indicate how many times: _____)

□ Ongoing (a currently existing problem)

According to the applicant, what measures would provide solution to the problem?

_____

_____

_____

_____

_____

_____

Signature: _____

Date: _____

Note: Please forward this form to: Office of the Implementing Agency
, Jamaica
Telephone: _____
Email:_____

### 13.1.2 Grievance Monitoring Form

(Used by Grievance Manager)
This Form is the responsibility of the Grievance Officer.
Case No. _____
Applicant's Name _____
Address:_____
_____
Telephone: _____
Email: _____

Complaint

_____
_____
_____
_____
_____
_____

Root Cause Analysis

- List all the possible contributing factors
- Identify most probable reason

_____
_____
_____
_____
_____

Corrective Action

_____
_____
_____
_____
_____

Preventative Action if problem can re-occur

_____
_____
_____
_____
_____

# 14 References

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# 15 Appendices

## 15.1 Appendix I – Details of Component II of the MASP

1. **Subcomponent 1: Development of a comprehensive framework for agricultural PPPs;**

The objective of this subcomponent is to develop an agricultural PPP framework that establishes the procedures, rules and institutional responsibilities related to the identification, evaluation, implementation and management of agricultural PPPs in Jamaica.

The framework will take into account existing GOJ PPP policies and institutions and will develop, in consultation with GOJ, specific PPP protocols for the agricultural sector; a typology of agricultural PPP models and practical guidance for selecting, funding and operationalizing agricultural PPPs.

The subcomponent will finance: (i) the engagement of one international and one local consultant to develop the framework in consultation with GOJ and other stakeholders; (ii) legal services to develop contractual models; (iii) technical workshops for GOJ staff in coordination with the DBJ; and (iv) a communications budget increase to awareness of the benefits of agricultural PPPs within the public and private sectors.

2. **Subcomponent 2: Market-driven agricultural PPPs to improve productivity and farm to market linkages**

This subcomponent will use a competitive process to identify at least four market-driven agricultural PPPs that will link smallholder farmers to markets through the establishment of commercial alliances with large buyers, with a preference for inclusive arrangements based on AEZs.

It will finance matching grants and technical assistance (TA) for smallholder farmers that will enable them to meet the quality, quantity and timeliness requirements of large buyers with established markets, through increases in capacity and productivity brought about through access to finance, technology, equipment and TA.

A central objective will be to learn about the conditions under which small farmers can be successful in such arrangements, to disseminate these throughout the sector and to generate more interest on the part of the smallholder farmers and buyers to engage in similar arrangements on AEZs.

To build these partnerships, TA grants will be provided to facilitate participatory stakeholder dialogue for the purposes of strengthening relationships, identifying solutions to problems within the supply chain, and selecting specific improvements that could increase productivity. These will be incorporated into a concept note to be submitted on behalf of the alliance by the large buyer.

Shortlisted applicants will be invited to submit a full proposal for which a TA grant will also be provided.

In the case of alliances based on AEZs, the application process will provide an opportunity to identify upgrades to public infrastructure on AEZs that could further improve the productivity of the alliance. These will be formally analysed, and if approved, may be funded by sub-component 3 (see below).

Applications will be judged on their potential to improve productivity and income, to apply new technologies including climate smart approaches, and to facilitate the greater participation in such arrangements of small farmers, including women and youth.

If a proposal is approved, farmers will be provided with matching grants that will contribute toward the cost of, amongst other things, training, equipment, new technology, improved post-harvest handling facilities, storage, lab testing, and input packages to enable farmers to better meet quality, quantity and timeliness standards and increase sales to large buyers.

Additional TA grants will also be available throughout the execution of the project to continue dialogue and problem solving within the alliance with a view to encouraging longer term, more trusting and productive commercial relationships in the sector.

3. **Subcomponent 3: Public infrastructure and services to support market-driven agricultural PPPs**

This subcomponent will finance: (i) the provision and improvement of public infrastructure on AEZs including roads, drainage, irrigation systems and buildings to enable, support and/or increase the productivity of approved market-driven PPPs; (ii) necessary technical studies including those related engineering and design; project feasibility, social and environmental analysis; and due diligence for the selection and contracting of private partners; and (iii) the procurement of approved machinery and equipment to be utilized by GOJ on a cost-recovery basis to mechanize agricultural tasks and increase farmer productivity on AEZs.

The subcomponent will also finance (iv) an expanded Farmer Field Training program.

4. **Subcomponent 4: Development of a pilot Productivity Innovation Fund**

This subcomponent will develop a pilot Productivity Innovation Fund (PIF) to stimulate applied research and development of technologies and/or processes or services with high potential to increase competitiveness and productivity within the Jamaican agricultural sector. The objective of the PIF will be to generate practical local knowledge that accelerates the commercialization, adoption and/or demonstration of innovative techniques or products on AEZs and within the wider Jamaican agricultural sector.

The PIF will make a minimum of three matching grant awards. The application process will consist of an initial and a full application stage. Applications by consortia consisting of private firms, educational institutions and farmers' organizations will be encouraged. TA may be offered to assist disadvantaged groups whose initial applications are approved for the full application stage.

The subcomponent will finance (i) the cost of establishing and administering the pilot fund; (ii) a communication budget; and (iii) the development and dissemination of knowledge tools such as case studies and impact reports.

5. **Subcomponent 5: Systems and tools to strengthen management and data collection in agro-economic zones.**

The objective of this subcomponent is assist the GOJ in strengthening the capacity of AIC in its management of AEZs, and in the collection of data that will provide clarity to GOJ about the economic impact of its AEZ investments.

The subcomponent will finance:

(i) a 5-year vision and strategy document for AEZs;

(ii) An operations, HR and management plan to formalize procedures and to determine the optimum mix of staffing and skills to affectively manage AEZs;

(iii) A study to identify the key opportunities for cost-recovery on AEZs;

(iv) The development of a master plan for AEZs including: a full digital inventory and catalogue of AEZ lands under AIC management; a database for the digital storage of key information pertaining to land leases on AEZs, including: lease contracts and all related payment information (in concert with the AIC property department); historical and real time data on crop production including acreages under production, yields and returns on investment (in concert with GOJ); historical and current data related to water tables and quality (in concert with NIC); a record of farmer capabilities and capacities; details of equipment, infrastructure and farming practices used on each lease holding; a schedule and budget for the maintenance of roads and other infrastructure on each AEZ; and an Infrastructure gap analysis (roads, irrigation, drainage, structures, electrical).

(v) training, staffing and equipment to improve the quality and regularity of data collection on AEZs (in coordination with MICAF's Agricultural Marketing Information Division).

## 15.2 Appendix II - List of Association and Members on Agro Park

| Name of Association | Position | Name and Sex |
|---|---|---|
| Yallahs Water Users Association | President: | Mr. Gregory Thomas (M) |
| | Vice President: | Mrs. Aldean Biggs-Scott (F) |
| | Secretary: | Ms. Pamelita Dann (876-303-1525) (F) |
| | Treasurer: | Ms. Carol Young (F) |
| | Public Relation Officer: | Mr. Eric Williams (876- 409-6500) (M) |
| | Marketing Officer: | Mr. Lawrence Lynch (M) |
| | Maintenance Manager: | Mr. Grandville Francis (M) |
| Ebony Park Agricultural Cooperative (EPAC) | President: | Anthony Grant (President 876-354-5111) (M) |
| | Members | Richard Watson (M)<br>Cornel Mcken (M)<br>Deon Hall (F)<br>Joseph Morrell (M)<br>Lorene Lindsay (F)<br>Dean Menzie (M)<br>Oliver Mair (M)<br>Howard Forbes (M)<br>Michael Hutchinson (M)<br>Winchroy Budhoo (M)<br>Denzil Dyer (M)<br>Linford Cooper (M)<br>Leonard Morgan (M)<br>Lascelles Richardson (M)<br>Ashton Hewitt (M)<br>Eric Blair (M)<br>Thomas Burton (M)<br>Naptali Morant (M)<br>Garry Larmond (M)<br>Milton Henry (M)<br>Merick Watson (M) |
| Spring Plain Farmer's Association | President: | Govinda Fisher (876-533-6330) (M) |
| | Vice President: | Bilton Forbes (M) |
| | Secretary: | Gary Nelson (M) |
| | Treasure: | Clinton Hutchinson (M) |
| | PRO: | Harold Corridice (M) |
| | Members | Esther Martin (F)<br>Sonia Mclean (F)<br>Rupert Barrett (M)<br>Norval Cameron (F)<br>Phillip Cristobol (M)<br>Herbert Drunnonds (M)<br>Simon Dyer (M) |

| Name of Association | Position | Name and Sex |
|---|---|---|
| | | Christopher Griffiths (M)<br>Costell King (M)<br>Leslie King (M)<br>Symore Morgan (M)<br>Stanley Heweitt (M)<br>Jason Miller (M)<br>Darvin Nichol (M) |
| New Forest/ Duff House Water Users Group | President: | Clinton Oscar (876) 403-6840 (M) |
| | Members | Jeff Stephenson (M)<br>Conrad Murray (M)<br>Carmeta Atkins (F)<br>Clinton Oscar (M)<br>Winston Oscar (M)<br>Suzette Rankine (F)<br>Conrad Murray (M)<br>Jennifer Ried Mcdonald (F) |

## 15.3 Appendix III – Global G.A.P. Certified Farms

| | Name of Farmer | | Crop Certified | Family |
|---|---|---|---|---|
| | **Yallahs Agro Park** | | | |
| 1 | Eric Williams | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| 2 | Gary Mclean | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| 3 | GrandVille | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| 4 | Leila Thomas | F | Capsicums (Pepper/ Chillies) | Solanaceae |
| 5 | Lawrence Lynch | M | Melons (Citrullus lanatus) | (cucurbitaceae) |
| 6 | Raman Rowe | M | Melons (Citrullus lanatus) | (cucurbitaceae) |
| 7 | Pamelitta Dann | F | Onions (Allium cepa) | Liliaceae |
| | **New Forest/Duff House** | | | |
| 1 | Carmeta Atkins | F | Melons (Citrullus lanatus) | cucurbitaceae |
| | | | Onions (Allium cepa) | Liliaceae |
| | | | Thyme (Herb) Thymus | Lamiaceae |
| 2 | Clinton Oscar | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| | | | Melons (Citrullus lanatus) | cucurbitaceae |
| | | | Onions (Allium cepa) | Liliaceae |
| | | | Thyme (Herb) Thymus | Lamiaceae |
| 3 | Conrad Murray | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| | | | Onions (Allium cepa) | Liliaceae |
| | | | Thyme (Herb) Thymus | Lamiaceae |
| 4 | Jeff Stephenson | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| | | | Melons (Citrullus lanatus) | cucurbitaceae |
| | | | Onions (Allium cepa) | Liliaceae |
| | | | Thyme (Herb) Thymus | Lamiaceae |
| 5 | Jennifer Ried | F | Onions (Allium cepa) | Liliaceae |
| | | | Thyme (Herb) Thymus | Lamiaceae |

| | **Name of Farmer** | | **Crop Certified** | **Family** |
|---|---|---|---|---|
| 6 | Suzette Rankine | F | Onions (Allium cepa) | Liliaceae |
| | | | Thyme (Herb) Thymus | Lamiaceae |
| 7 | Winston Oscar | M | Melons (Citrullus lanatus) | cucurbitaceae |
| | | | Onions (Allium cepa) | Liliaceae |
| | | | Thyme (Herb) Thymus | Lamiaceae |
| | **Plantain Garden River** | | | |
| 1 | Arthur Johnson | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| 2 | Charmaine Blair-Stewart | F | Pumpkins (Cucurbita) | Cucurbitaceae |
| 3 | Clarence Thompson | F | Capsicums (Pepper/ Chillies) | Solanaceae |
| 4 | Dennis Brown | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| 5 | Donald Shephard | M | Pumpkins (Cucurbita) | Cucurbitaceae |
| 6 | Gary McLean | M | Pumpkins (Cucurbita) | Cucurbitaceae |
| 7 | Janet Barrett-Mcintosh | F | Capsicums (Pepper/ Chillies) | Solanaceae |
| 8 | Keith Thomas | M | Pumpkins (Cucurbita) | Cucurbitaceae |
| 9 | Khani Thompson | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| 10 | Lance Gill | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| 11 | Lancelot Briscoe | M | Cassava Root (Yucca / Manioc) | Euphoriaceae |
| | | | Pumpkins (Cucurbita) | Cucurbitaceae |
| 12 | Nigel Levy | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| 13 | Patrick Solomon | M | Pumpkins (Cucurbita) | Cucurbitaceae |
| 14 | Wilton Field | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| | **Ebony Park/ Spring Plain** | | | |
| 1 | Anthony Grant | M | Sweet Potatoes (Ipomoea batatas) | Convolvulaceae |
| | | | Melons (Citrullus lanatus) | Cucurbitaceae |

| | **Name of Farmer** | | **Crop Certified** | **Family** |
|---|---|---|---|---|
| | | | Pumpkins (Citrullus lanatus) | Cucurbitaceae |
| | | | Onions (Allium cepa) | Liliaceae |
| | | | Capsicums (Pepper/ Chillies) | Solanaceae |
| 2 | Ashton Hewitt | M | Capsicums (Pepper/ Chillies) | Solanaceae |
| | | | Sweet Potatoes (Ipomoea batatas) | Convolvulaceae |
| | | | Onions (Allium cepa) | Liliaceae |
| 3 | Eric Blair | M | Sweet Potatoes (Ipomoea batatas) | Convolvulaceae |
| | | | Pumpkins (Citrullus lanatus) | Cucurbitaceae |
| 4 | Gary Coulton | M | Sweet Potatoes (Ipomoea batatas) | Convolvulaceae |
| | | | Melons (Citrullus lanatus) | Cucurbitaceae |
| | | | Pumpkins (Citrullus lanatus) | Cucurbitaceae |
| | | | Capsicums (Pepper/ Chillies) | Solanaceae |
| 5 | Lorene Lindsay | F | Sweet Potatoes (Ipomoea batatas) | Convolvulaceae |
| | | | Pumpkins (Citrullus lanatus) | Cucurbitaceae |
| 6 | Michael Hutchinson | M | Sweet Potatoes (Ipomoea batatas) | Convolvulaceae |
| | | | Pumpkins (Citrullus lanatus) | Cucurbitaceae |
| | | | Onions (Allium cepa) | Liliaceae |
| | | | Capsicums (Pepper/ Chillies) | Solanaceae |
| 7 | Napthali Morant | M | Sweet Potatoes (Ipomoea batatas) | Convolvulaceae |
| | | | Pumpkins (Citrullus lanatus) | Cucurbitaceae |
| 8 | Richard Watson | M | Sweet Potatoes (Ipomoea batatas) | Convolvulaceae |
| | | | Pumpkins (Citrullus lanatus) | Cucurbitaceae |

| | **Name of Farmer** | | **Crop Certified** | **Family** |
|---|---|---|---|---|
| | | | Onions (Allium cepa) | Liliaceae |
| 9 | Thomas Burton | M | Sweet Potatoes (Ipomoea batatas) | Convolvulaceae |
| | | | Pumpkins (Citrullus lanatus) | Cucurbitaceae |

## 15.4 Appendix IV - List of AMC Complex Customers (April 30, 2019)

1. Agri-Life Foundation Limited
2. Antillean Import Export
3. Cap Consulting Ltd.
4. Carita (Jamaica) Limited
5. Dr. Michael Whittingham
6. First Choice Export
7. Grace Food Processors (Canning)
8. Jamaica Export Trading Co. Ltd.
9. Liquid Traders Limited
10. Marsharpe Company Ltd.
11. MTAC Networking Management Ltd.
12. OSHERMS Consultants
13. Palmetto Exports Limited
14. Primrose Myers
15. Seacrest Trading Co. Ltd.
16. Spike Industries Ltd.
17. Sunland Distributors Ltd.
18. Tropical Foods Distributors Ltd.
19. Trout Hall Ltd.
20. Viomark Trading Ltd.
21. VIP Attractions
22. VKBH Customs Broking

## 15.5 Appendix V – Relevance of Suggested Water Quality Monitoring Parameters

**Table: Suggested Water Quality Monitoring Parameters**

| Parameters (units) | NRCA Ambient Water Quality Standard | Background and Relevance |
|---|---|---|
| **Faecal Coliform (MPN/100ml)** | - | Microorganisms are a part of all ecosystems. They assist ecosystem processes by breaking down organic matter and also act as food sources for higher organisms. They are also important to the biogeochemical cycles for example nitrogen and carbon cycles. Faecal coliform are subset of the family of *Enterobacteriaceae* and are used as water quality indicators, especially for potable water. These are very hardy, non-spore forming, gram negative, lactose fermenting rods which can survive as either obligate or facultative anaerobes. Faecal Coliform includes bacteria such as Escherichia coli (*E. coli*), as well as other types of Coliform bacteria that are naturally found in the soil. Faecal Coliform bacteria exist in the intestines of warm-blooded animals and humans, and are found in bodily waste, animal droppings, and naturally in soil. Most of the Faecal Coliform in faecal material (faeces) is comprised of *E. coli* which can cause illness in humans. The presence of Faecal Coliform in ambient water may indicate recent contamination of the groundwater by human sewage or animal faeces which could contain other bacteria, viruses, or disease-causing organisms. For this reason, Coliform bacteria are considered "indicator organisms"; their presence warns of the potential presence of disease causing organisms and they are widely used to assess the risk of diseases due to their nature and the fact that other pathogens may be difficult to detect by conventional methods and should alert the person responsible for the water to take precautionary action. |
| **Nitrate as Nitrogen (mg $NO_3^-$/L)** | 0.1 – 7.5 | Nutrients are chemicals that are essential for growth. Regarding plants, these include (but are not limited to) nitrogen (N), phosphorus (P), sulfur (S). Nitrogen, phosphorus, along with potassium are considered primary nutrients with nitrogen and phosphorus being the limiting nutrients responsible for plant growth. Nutrients have indirect adverse effects on aquatic ecosystems. Primarily, increased nutrients influence the growth and accumulation of plant and algal biomass resulting in eutrophication, especially in slow moving waters. This process reduces the available oxygen (as well as it can affect the pH of the water body) to the higher organisms and often results in death of these organisms. Eutrophication may also hinder the provision of viable ecosystem services such as recreation, fishing and hunting and may interfere with drinking water treatment and use of water bodies by other industrial facilities. |
| **Phosphate (mg $PO_4^{3-}$/L)** | - | |
| **Total Suspended Solids (mg/L)** | 0.01 – 0.8 | TSS comprises of those inorganic and organic solid particles dispersed in a water body. Several factors can contribute to the TSS content of ambient water bodies, these include but are not necessarily limited to:<br>Decaying biological matter,<br>point sources such as industrial and sewage effluent discharge, and |

| Parameters (units) | NRCA Ambient Water Quality Standard | Background and Relevance |
|---|---|---|
| | | Dredging activities.<br>TSS is widely regarded as a key pollution indicator as it greatly affects aquatic ecosystems negatively; primarily by hindering the breathing processes of aquatic organisms.<br>High TSS content will increase the turbidity of the affected system and will reduce the sunlight reaching the phytoplankton and other aquatic plants thereby limiting photosynthesis and by extension dissolved oxygen concentrations. TSS also affects the treatment process of water as it can block filters which can potentially lead to the proliferation of microorganisms especially in systems where chlorination is not employed. Solids passing through the filtration phase will reduce the effectiveness of chemical treatment by interacting with the chemicals used thereby reducing the concentrations available for effective treatment. |
| **Chloride (mg $Cl^-$/L)** | 5.0 – 20.0- | Chloride is a major constituent of most waters. It is normally present in low concentrations in surface waters, while groundwater will contain varying amounts of chloride depending on the surrounding geology. Chloride is widely distributed in the environment, generally as sodium chloride (NaCl), potassium chloride (KCl) and calcium chloride ($CaCl_2$). The weathering and leaching of sedimentary rocks and soils and the dissolution of salt deposits release chlorides into water. Chloride my also get into the environment via surface runoffs and sewage effluent discharge. High Chloride concentration will affect the conductivity, salinity and TDS of a water body and may be indicative of saline intrusion in groundwater sources; indicating that the water is being overdrawn. |
| **Salinity (ppt)** | - | Salinity is a measure of the content of salts in soil or water. Salts are highly soluble in surface and groundwater and can be transported with water movement. Widespread vegetation clearance, poor land use, poor irrigation and industrial practices have made it easier for salts to be transported to the soil surface or to waterways. Excessive amounts of dissolved salts in water can affect agriculture, drinking water supplies and ecosystem health. High concentrations of salts pose hazards for the environment as well as affecting agriculture and infrastructure and therefore, the wider economy. High levels of salinity in water and soil may cause native vegetation to become unhealthy or die and lead to a decline in biodiversity through dominance of salt-resistant species, potentially altering ecosystem structures. |
| **Alkalinity (mg $CaCO_3$/L)** | - | pH is a measure of the acidity or the basicity of a solution. It ranges from acidic (<7units) to basic (>7units), solutions with a pH of 7 are classified as neutral. A water body will can typically resist some changes in pH; this is called the buffering capacity and can be assessed by quantifying the ANC (alkalinity) of the water body.<br>pH affects most chemical and biological processes in water, and it is one of the most important environmental factors limiting the distribution of species in aquatic habitats as different species have a different tolerance for pH. Most freshwater bodies have a normal pH in the range of 6 to 8 pH units. |
| **pH (pH units)** | 7.00 – 8.40 | |

| Parameters (units) | NRCA Ambient Water Quality Standard | Background and Relevance |
|---|---|---|
| **Conductivity (mS/cm)** | 0.15 – 0.6 | Conductivity is a measure of the ability of water to pass an electric current. This is affected primarily by the presence of inorganic solutes such as chloride ($Cl^-$), nitrate ($NO_3^-$), sulfate ($SO_4^{2-}$), and phosphate ($PO_4^{3-}$) ions or metal ions, for example sodium ($Na^+$), magnesium ($Mg^{2+}$), calcium ($Ca^{2+}$), iron ($Fe^{3+,2+),}$ and aluminium ($Al^{3+}$) among others; these ions also make up the total dissolved solids content of a water body and also influence salinity. Dissolved organic compounds tend not to conduct electrical current very well and therefore have very little effect on conductivity of a solution and are usually undetected as dissolved solids. Conductivity and TDS are also affected by temperature as this affects the mobility of these ions.<br>Conductivity/TDS in ambient water is affected primarily by the geology of the area through which the water flows as well as it may be affected by point sources of contamination.<br>Ambient water from areas with granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize. On the other hand, ambient water from areas with clay soils tend to have higher conductivity because of the presence of materials that ionize when washed into the water; similarly, water moving through areas of limestone rocks will also have notable conductivity/TDS values due to the dissolution of calcium carbonate ($CaCO_3$) in these rocks.<br>Without having to assess the nutrient parameters, conductivity/TDS data gives general information on the amount of dissolved ionic compounds in water samples. This can also give indications of saline intrusion for the ground waters sources. Also, if there are any point sources of discharges to the surface water body, this can alter the conductivity depending on their make-up. A failing sewage system would raise the conductivity of nearby groundwater sources because of the increase in the concentrations of ions for example chloride, phosphate, and nitrates. |
| **Biochemical Oxygen Demand (mg $O_2$/L)** | 0.8 – 1.7 | Oxygen demand (OD) is defined as the amount of oxygen required to oxidize a compound to its final oxidation products. When this demand is created via chemical oxidative processes it is called chemical oxygen demand (COD) and when the demand is created via biochemical pathways it is called biochemical oxygen demand (BOD). Oxygen Demand in this sense refers to the demand for oxygen by aquatic systems and do not generally consider the demand for higher organisms in these systems. Organisms, however, compete with the environment for oxygen and as such in an unpolluted system, the oxygen demand as determined by COD and BOD is should be low. When COD and BOD are low it means there is a low concentration of oxidizable matter (primarily organics) in the water body and as such, the dissolved oxygen (DO) is typically high in these cases. DO, COD and BOD are used to monitor the pollution levels in natural water bodies and are generally classified as 'key pollution indicators'. These parameters are typically affected by point sources of pollution. BOD and COD has the potential to |
| **Dissolved Oxygen (mg $O_2$/L)** | - | |
| **Chemical Oxygen Demand (mg $O_2$/L)** | - | |

| Parameters (units) | NRCA Ambient Water Quality Standard | Background and Relevance |
|---|---|---|
| | | negatively impact water availability as capital input may be required to design treatment systems to convert these waters into water for potability. |
| Pesticide Screen | - | Pesticides are used to prevent certain insects and weeds from consuming agricultural plants. These are generally organic in nature. Overuse of pesticides can contaminate groundwater and surface water through leaching. |
| Copper (µg Cu/L) | - | Metals occur in all ecosystems, although natural concentrations will vary both spatially and temporally. Land disturbances can increase erosion and mobilize metals causing them to get into ambient water systems. Human activities can redistribute and concentrate metals in areas that are not naturally rich in metals. Unlike sediment and nutrient impairments, metal contamination in ambient water tend to go unnoticed unless it is extreme (for extremely high concentration of $Fe^{3+}$ can turn a stream rust brown). While some metals are essential as nutrients, all metals can be harmful at elevated levels, but there are noted metals that toxic in minute amounts. Adverse effects on the ecosystem will result when metals are biologically available at toxic concentrations. For some metals, example iron, copper and zinc, they will impart undesirable qualities to water that is intended to be used as potable water. High concentration of metals in water also limits its use in industrial applications. |
| Zinc (µg Zn/L) | - | |
| Boron (µg B/L) | - | |
| Manganese (µg Mn/L) | - | |
| Iron (µg Fe/ L) | - | |
| Magnesium (µg Mg/L) | 3600 – 27000 | |
| Sodium (µg Na/L) | 4500 – 12000 | |
| Calcium (µg Ca/L) | 40000 – 101000 | |
| Potassium (µg K/L) | 740 – 5000 | |
| Hardness (mg $CaCO_3$/L) | 127.0 – 381.0 | Assess the proportion of calcium and magnesium in water. Hard water has the negative effect of forming scales on industrial equipment resulting in high overhead and capital expenses relayed to cleaning, repairing and replacing damaged equipment. |

## 15.6 Appendix VI - MASP Consultation Plan and Report Template

| COMMUNITY MEETING | | |
|---|---|---|
| **COMPONENTS** | **DETAILS** | **EXPECTED OUTCOMES** |
| **VENUE** | | |
| **DATE** | | |
| **TIME** | | |
| **INVITEES** | | |
| | | |
| | | |
| **MEANS OF INVITING** | | |
| **REQUIRED ATTENDANCE** | | |
| **RECORD OF MEETING MANAGEMENT** | | |
| **PURPOSE OF MEETING** | | |
| **POST MEETING** | | |

| **Stakeholders that have a Participatory Role in the Projects planned implementation** | **Participatory Role** | **Current Interest Focus** |
|---|---|---|
| Ministry of Science, Energy and Technology (MSET) | Facilitating | Technology Input - Linkages with SRC for Training |
| The Ministry of Health | Facilitating & Procurement | Public Health Inspection of Facilities |
| National Environment and Planning Agency | Regulatory | Environmental permits/ licences |
| National Land Agency | Facilitating | Land ownership and titling |
| Independent lawyer(s) | Procurement and Facilitating | Support Land ownership changes |
| Jamaica National Heritage Trust | Regulatory | Guidance on changes to sites with key heritage features |
| Mines and Geology Division | Regulatory | Facilitating the extraction of material from rivers or quarries |
| JPSCo | Facilitating & Procurement | Electricity supply (AMC Complex only) |
| Subcontractors | Facilitating & Procurement | The details of the involvement of these subcontractors is yet to be worked out. They will perform contracted functions whether on the renovation of the AMC complex or farm management, or as to be determined. |
| Contract workers | Facilitating | These will likely comprise the workforce of the subcontractors. |
| Equipment suppliers | Procurement | As likely determined by Sub contractors |
| Contract service providers | Procurement and Facilitating | As likely determined by Sub contractors and Client |
| **Facilitators of Project** | | |
| National Irrigation Commission | Facilitating | Irrigation Water Supply |
| National Land Agency | Facilitating | Land acquisition and titling |
| National Water Commission | Facilitating & Procurement | Water supply (AMC Complex plus interfaces with existing networks in Agro Parks) |
| Water Resources Authority | Regulatory | Licence for Well Drilling, Pumping and Monitoring |
| Dep of Cooperatives and Friendly Society | Facilitating | Supporting the registration and maintenance of Farmers Groups |
| **Implementers - Stakeholders influencing Project** | | |
| Ministry of Industry Commerce Agriculture and Fisheries | Implementing Agency | Overarching |
| Agro Investment Corporation | Operations | Manage Operations of Agro Parks and AMC Complex |

| **Stakeholders that have a Participatory Role in the Projects planned implementation** | **Participatory Role** | **Current Interest Focus** |
|---|---|---|
| Municipal Corporations | Facilitation & Planning | Local Government Inputs – Possible interactions with the Interagency Committee, Parish Disaster Committee, Parish Development committee |
| National Works Agency | Procurement | Structural works |
| Social Development Commission | Facilitating | Social Environment |
| National Solid Waste Management Authority | Procurement & Facilitating | Waste Management |
| Planning Institute of Jamaica | Facilitating | Project Planning and Funding |
| **Affected Stakeholders** | | |
| All Agro Park and Packaging facilities | Affected Community | Impacts negative or positive |
| Communities surrounding all Agro Parks | Affected Community | Impacts negative or positive |
| AMC Complex – Spanish Town Road | Surrounding Community | Impacts negative or positive |
| **Stakeholders Able to Affect the Project** | | |
| Jamaica Social Investment Fund | Procurement & Facilitating | Liaison with Existing Projects funded in the project area. |
| Government of Jamaica/Adaptation Fund Programme (GOJ/. AFP) | Procurement & Facilitating | Liaison with Existing Projects funded in the project area. |
| Inter-American Institute for Cooperation on Agriculture (Jamaica) | Procurement & Facilitating | Liaison with Existing Projects funded in the project area. |
| RIU Group of Hotels | Market | Market for agricultural produce |
| Grace Kennedy | Market | Market for agricultural produce |
| Progressive | Market | Market for agricultural produce |
| Lees Food Fair | Market | Market for agricultural produce |
| Spur Tree Spices | Market | Market for agricultural produce |
| Chefs and Accountants | Market | Market for agricultural produce |
| Everything Fresh | Market | Market for agricultural produce |
| Jamaica's Finest | Market | Market for agricultural produce |
| Hi Pro | Procurement | Provision of Seeds |
| New Port Fersan | Procurement & Facilitating | Training<br>Provision of Pesticides and fertilizers |
| American Airlines | Procurement & Facilitating | Facilitating Export within short timeframe |
| Fly Jamaica | Procurement & Facilitating | Facilitating Internal movement of goods Montego Bay-Kingston |
| Caribbean Airlines | Procurement & Facilitating | Facilitating Export within short timeframe |

| **Stakeholders that have a Participatory Role in the Projects planned implementation** | **Participatory Role** | **Current Interest Focus** |
|---|---|---|
| Idel Brown | Procurement | Exporter - Market for agricultural produce |
| Patsy Duncan | Procurement | Exporter - Market for agricultural produce |
| Seaboard Shipping and Freight, | Procurement | Secure Fast transport of produce to UK |
| Corrpak | Procurement | Packaging Material |
| Jamaica Customs | Facilitating | Granting Export of Goods |
| DHL | Procurement | Export Services |