The CSA Extension Services Manual for Amity Hall aims to provide agricultural extension staff in the region with ready-to-use guidelines for climate-smart practices. It incorporates the local experiences of farmers as well as the expertise of local and international adaptation researchers. A key feature of this manual is an assessment of the costs and benefits associated with implementing targeted CSA practices, with direct reference to local economic conditions.

**WHAT SETS THIS MANUAL APART?**

- **INTEGRATIVE:** Provides both technical information and incorporates the voices of farmers in the community of interest for improved integrated crop management.

- **CULTURALLY SENSITIVE:** Gives special consideration of cultural and traditional practices in the Parnassus area.

- **CROP-SPECIFIC:** Focuses on major crops that are important to the economy and culture of Parnassus, instead of presenting generic guidelines.

- **ECONOMICALLY RELEVANT:** Enables improved decision-making for the farmer and agricultural stakeholders who desires to understand the long-term benefits of their investment options, optimizing their farm practices by presenting cost-benefit analyses for each prioritized option.

- **ACTION ORIENTED:** Highlights farmers’ own perspectives and recommendations to attain opportunities to overcome current and potential barriers to adoption of CSA practices in the regional context.
Agricultural extension services aim to provide technical support to producers at the farm and community levels. Extension services have been found to improve farmer accessibility and use of climate information services, including in the Jamaican context. A knowledgeable and strategic extension service at the local level has great potential to have significant national impact on:

• increasing agricultural productivity sustainably
• enhancing food and nutritional security
• improving and diversifying rural livelihoods
• promoting agriculture as an engine of socio-economic growth
A consultative approach was taken in developing this manual, engaging a wide variety of agricultural stakeholders who are knowledgeable about the Amity Hall area, including agricultural extension officers, farmers, academic researchers, and other agricultural stakeholders. This multi-stakeholder approach enriches the perspectives presented in this manual, as it incorporates technical, academic, experiential, and cultural outlooks on climate-smart agricultural practices directly relevant to the community of interest. Key questions of consideration in the information gathering stages included:

- What key pieces of information do farmers need?
- What are the best methods to convey such information?

In response to these questions, the key gaps outlined by farmers were highlighted and compiled in this manual. Special emphasis was placed on devising methods that are useful for sharing such information, based on farmers’ preferences in the Parnassus region. Emerging from workshops and consultations with the agricultural stakeholders and experts in Parnassus, four key crops were identified as especially important in the region: Pumpkin, sweet potato, Scotch Bonnet peppers, and Irish potato. Productive, nutritional, and socio-cultural and economic criteria were analyzed and discussed to prioritize the crops, further considering current and viable options that included major crop categories: vegetables, legumes, condiments, fruits and tubers. Other crops such as sweet pepper and sweet corn were also considered robust and of relative high importance by stakeholders and with the potential to be addressed under the scope of this manual.

Perspectives on climate-smart practices were then solicited from farmers, extension agents and academics for each of these crops, and the importance of each practice was then ranked based on qualitative and quantitative assessments by...
This manual aims to achieve the following objectives:

- To enable agricultural extension officers to provide more targeted training to farmers in the Parnassus area, based on the priority needs identified.
- To build farmers’ knowledge capacity in adequately responding to key climate-related hazards to their agricultural production systems.
- To promote broader adoption of climate-smart practices in the Parnassus area.

In addition to the social and environmental considerations of the crops and practices, an ex-ante cost-benefit analysis was carried out to gauge the economic potential of farmers’ implementation of the priority CSA practices described herein for each crop. Input data from Focus Group Discussions (FGDs) and consultations with local experts was essential to calculate the profitability of the practices through financial indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), Cost-Benefit ratio (C/B) and Payback Period (PP), including the quantification of positive environmental externalities of practices adoption (Sain et al., 2017).
The term Climate-Smart Agriculture (CSA) was first introduced in 2010 by the Food and Agricultural Organization of the United Nations (FAO, 2010). The concept of being “climate-smart” refers to being prepared, adaptive, and strategic to the challenges that a changing climate brings. In the agricultural context, this includes any agricultural practice that “sustainably increases productivity and food and nutritonal security, strengthens resilience and adaptive capacity, and where possible reduces/removes greenhouse gases (mitigation) (FAO, 2010). CSA combines a multidimensional perspective to jointly address food security and climate challenges, including socio-cultural, economic, environmental, education-information and policy-institutional factors.

Climate-Smart Agriculture holds special relevance to Small Island Developing States such as Jamaica, as farmers grapple with increasingly frequent disasters and changing environmental conditions. Climate-related disasters induce significant economic and social stresses on farmers. Around 80% of farms on the island are directly dependent on rainfall (Selvaraju et al. 2013; Ministry of Agriculture and Fisheries, MAF 2014; World Bank 2016). Poor rural farmers are at the frontline of some of the most severe impacts of increased climate variability and their future well-being is tightly connected to their capacity to innovate and adapt to unfamiliar climate conditions. This manual is the product of a collaborative effort between farmers and extension officers to distill key insights of trustworthy CSA practices and technologies towards a more resilient future.
CLIMATE SMART PRACTICES ASSESSMENT

CSA does not intend to promote a new set of practices among farmers, but rather to incorporate a more integrated approach during the identification and evaluation of agricultural priorities that responds to farmers’ realities while inform future climate action. In this sense a participatory process was carried out with diverse local actors in each of the study regions, through multiple workshops, focus group discussions and experts interviews embedded as essential components of the CSA-Prioritization Framework and the CSA-Rapid Appraisal methodologies. These spaces for interaction and debate, facilitates the systematic evaluation of current and potential CSA practices and technologies relevant to the Amity Hall, Parnassus and Essex Valley agricultural regions. The assessment process is partly based on a multi-criteria decision analysis of socio-cultural, environmental, economic, information-knowledge and policy-intitutional factors. The CSA goals served to contextualize the prioritization process in each region.

The CSA practices, technologies and crops covered in the manuals are based on the top priorities in each category. Therefore these priorities are part of a wider range of options available and can be further tailored by stakeholders to the evolving social and environmental conditions in each region.

A valuable feature of the manuals is the identification and assessment of CSA indicators, which can be used to inform monitoring and evaluation of future programmes. These indicators were analyzed and discussed by stakeholders for each region, providing insights into potential synergies and trade-offs associated with prioritized practices and technologies. The CSA Investment Portfolios developed for each region aims to maximize investment yield and minimize income risk while supporting decision-making processes and strengthen climate resilience.
The indicators were framed into key/guiding questions that facilitated the identification of the potential benefits from the CSA practices implementation, and included but are not limited to:

“By implementing the CSA practice, what are the expected changes in:” Food and Nutritional security: Yield; post-harvest loss; income. Resilience/adaptation: Water availability; water use efficiency; soil disturbance; climate risks management and prevention; gender smartness (focusing on women); diversification of income sources. And Mitigation: biomass (above-ground); biomass (below-ground); soil carbon stock; nutrient use efficiency.

These indicators were participatory assessed for each practice, crop and region using the following qualitative scale:

<table>
<thead>
<tr>
<th>Other &lt; -10</th>
<th>-10</th>
<th>-9</th>
<th>-8</th>
<th>-7</th>
<th>-6</th>
<th>-5</th>
<th>-4</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>Other &gt; 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completely negative effect (-100% compared to baseline)</td>
<td>Medium negative effect (-50% compared to baseline)</td>
<td>No change/NA (0% compared to baseline)</td>
<td>Medium positive effect (+50% compared to baseline)</td>
<td>Completely positive effect (+100% compared to baseline)</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
COST-BENEFIT ANALYSIS

The cost-benefit analysis is the profitability or economic convenience of implementing a CSA practice on-farm. To better understand the implementation feasibility of a given CSA practice from the farmers perspective, and even compare it with other practices, it is possible to use different financial indicators. These indicators are complementary to each other and help to evaluate and identify ‘smart’ investment options, from the CSA practices prioritized by stakeholders for the key crops in the region.

The costs of the practices include both implementation and maintenance and the benefits correspond with crop income. To simplify the analysis, these costs and benefits are distributed across the cropping cycle, and adjusted to an standard evaluation period of seven years to be able to compare the practices under different cropping cycles.

Below a brief description of these indicators and a reference of when they turn out to be desirable investments under the study’s assumptions (Echeverría 2018).

- Net Present Value (NPV): Is one of the main indicators used to evaluate the efficiency of investing in a practice. It calculates the current value of all future cash flows generated by the practice implementation during the project lifespan (7 years) using an interest rate (r=9.5%). NVP must be equal to or greater than 0, meaning that the benefits exceed or outweigh the costs. Metric: JMD

- Internal Rate of Return (IRR): measures the profitability of each practice in relation to the initial investment. It is related to the NVP, since by definition if the IRR is greater than the discount rate “r” (9.5%) is a positive indicative of the investment profitability. Metric: %
• Payback Period (PP): Although this is not an indicator of efficiency in the use of resources, it is useful for farmers or investors because it indicates the time that elapses from the initial investment until it is recovered, providing an expectation (under average climatic conditions) of when the investment will pay off. Metric: Months

• Benefit-cost Ratio (B/C): is the relationship (ratio) between the benefits of the practice relative to its costs. If the ratio is greater than 1.0 it is expected that the practice will deliver positive NPV, providing a rough idea about the viability of the investment. Metric: Ratio

Additionally, positive externalities (indirect benefits to the society and environment) associated with the potential of the practices to generate positive changes in the land use in terms of Biodiversity and Carbon capture on the farm and eventually in the landscape, were estimated aside as a possible income source. Metric: JMD/Acre/year
FARMERS SAY

Many farmers cultivate pumpkin with only a small percentage growing sweet potato. Irish potato and hot pepper are not currently being grown by farmers; however, they welcome the Ministry’s plans to introduce them in the area.

Key activities along the pumpkin value chain are mostly done by men, both women and men are engaged in post-harvest activities, and market activities are predominated by women.

Farmers found shared post-harvest processing facilities and integrated management as very important technologies that should be prioritized. Farmers also highlighted improved irrigation systems and the use of organic inputs for some value chains. Rainwater harvesting and crop rotation were only considered to be of medium importance.
Sharing experiences and information is crucial for farmers to collaboratively improve their agricultural practices and crop-specific knowledge. For this reason ICT-based extension (e-extension) combined with data-driven agronomy is providing added value to conventional extension approaches. For this reason, the series of “Climate-Smart Agriculture Extension Services Manuals” are meant to integrate GeoFarmer App as a synergistic tool for farmers, extension officers and other agricultural actors to strengthen agricultural extension services, boosting the usability and continuous feedback from users of the content of the manuals enhancing the M&E activities of CSA practices in agricultural development projects. Likewise to facilitate two-way and real-time interaction and better follow-up with the farming community, democratizing extension services and providing an alternative to the often one-way top-down traditional extension services (Eitzinger et al., 2020).

To learn more on the CSA extension services manuals in the project working regions in Jamaica please visit:

https://geofarmer.org/csa-essex-valley
https://geofarmer.org/csa-parnassus
https://geofarmer.org/csa-amity-hall
Pumpkins are vine-based cultivars, that when mature, produce round fruits, with smooth, slightly “ribbed” skin. When mature, the outer skin colour of pumpkins may range from light green, to yellow or orange. Pumpkins belong to the same family as winter squash, cucumbers, and melons. (Scientific Family Name: Cucurbitaceae Juss.) (Kew Science, 2021).
% of farmers are cultivating the crop: **65%**

**Pumpkin**

**Service providers**
- Farm Stores

**Farmers**
- Farmers
- Most small scale

**Processors**
- Not aware of

**Wholesale & Retailers**
- Sell to Higglers

**Input supply** > **Farm production** > **Post harvest** > **Output market**

**Importance of Value Chain to Household Food**

<table>
<thead>
<tr>
<th>Food Security</th>
<th>Production</th>
<th>Economic</th>
<th>Adaptation to climate Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>Medium-high</td>
<td>Medium-high</td>
<td>High</td>
</tr>
</tbody>
</table>

**Key Activities**

- **Purchasing and gathering of inputs for use on the plot**
- **Ploughing, fertilization, spraying and pruning**
- **Reap, gather and store the crop**
- **Sale to higglers & within markets**

**Two main hazards affecting this VC**

- **Pest & Diseases**
  - Fungus disrupts the overall maturing of the crop
  - Moderate-Severe
  - All farmers affected
- **Animals**
  - Prevalence of cows that eat away at the pumpkin
  - Moderate-Severe
  - All farmers affected

**Severity**

**Who is mainly affected**

**Underlying Factors**

- * Financial resources: ability to purchase sufficient inputs; ability to pay for sufficient labor

**Barriers to Adaptation & Enabling environment**

- * Financial resources to offset the costs of input and labor
- * better access to tools and resources e.g., tractor
- * access to processing facilities
- * better access to export markets

**Prioritized technologies by farmers**

- * Pack houses (Shared facility)
- * Integrated Pest and Disease management (pest distraction, organic pesticides, scouting)
- * Improved irrigation systems (e.g. drip)
- * Rainwater harvesting systems (e.g. basins, reservoirs, thanks)
- * Use of organic inputs (e.g. compost, bio-fertilizers, natural repellents etc.)
IPM (INTERCROPPING WITH MARIGOLD, TRAPS, AND SCOUTING)

Despite being less susceptible to pests than other crops, various pests and diseases still affect pumpkins. Management of each one requires specific knowledge of the symptoms and tailored methods of control, which may include a combination of cultural, chemical, and biological. This section details some of the common pests and diseases that affect pumpkin crops and suggested methods of treatment.
The share between CSA pillar’s shows the balance between productivity, adaptation, and mitigation.

<table>
<thead>
<tr>
<th>FOOD SECURITY</th>
<th>ADAPTATION</th>
<th>MITIGATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allows to maintain or increase crop yield and quality with potential benefits on farm income</td>
<td>Promotes the use of environmental friendly pest and disease management practices reducing the use of synthetic pesticides</td>
<td>Reduces negative side effects of synthetic pesticides on the biological activity of the soil while maintaining its carbon sink capacity and functions such as nitrogen cycling</td>
</tr>
<tr>
<td>Contributes to sustainable production by reducing the need to purchase synthethic agrochemicals</td>
<td>Reduced use of synthetic agrochemicals minimizes the exposure of farmers and consumers to potentially hazardous compounds</td>
<td>Contributes to the progressive reduction of synthetic inputs (fungicides, insecticides etc.) generally produced off-farm reducing greenhouse gases emission from their manufacturing, transport, application and disposal</td>
</tr>
<tr>
<td>Minimizes pest or diseases damage thereby reducing harvest loss</td>
<td>Conserves biodiversity at different scales and reduces soil and water pollution</td>
<td></td>
</tr>
<tr>
<td>Eliminates or minimizes re-entry interval restrictions saving time to farmers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CLIMATE-SMART AGRICULTURE PILLARS**

<table>
<thead>
<tr>
<th>Food Security (8.3)</th>
<th>Adaptation (6.7)</th>
<th>Mitigation (8.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.7%</td>
<td>28.6%</td>
<td>35.7%</td>
</tr>
</tbody>
</table>
**GENDER SLIDER**

Slider represents additional benefits of the CSA practice on women in terms of participation in decision-making, increased income and freeing time.

**SYNERGISTIC PRACTICES**

Synergistic practices are those practices that when implemented together interact with each other to produce a greater positive effect on the crop and the agroecosystem than they would have when implemented separately.

- **Crop rotation**
- **Live barriers /fences in contours with leguminous bushes / hedgerows / fruit trees**
- **Use of organic inputs (compost, bio-fertilizers, natural repellents etc.)**
- **Agroforestry systems**

**PROFITABILITY INDICATORS**

- **66,050 JMD/ACRE**
  - Practice cost
- **1.4 MONTHS**
  - Payback period
- **3,226,238 JMD/ACRE**
  - Net Present Value
- **1.5**
  - Cost-benefit Ratio
- **50%**
  - Internal Rate of Return
- **N/A**
  - Potential additional benefits
- **N/A**
  - Biodiversity
- **N/A**
  - Carbon
### BARRIERS TO ADOPTION

<table>
<thead>
<tr>
<th>Very difficult to overcome</th>
<th>Very easy to overcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Knowledge of crop combinations</td>
</tr>
<tr>
<td>6</td>
<td>Resistance to new technologies</td>
</tr>
<tr>
<td>8</td>
<td>Implementation cost</td>
</tr>
<tr>
<td>2</td>
<td>Limited interest in new variety</td>
</tr>
<tr>
<td>8</td>
<td>Availability of farmland</td>
</tr>
</tbody>
</table>

### OPPORTUNITIES TO ADOPTION

<table>
<thead>
<tr>
<th>Very difficult to attain</th>
<th>Very easy to attain</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Introduction to new resistant varieties</td>
</tr>
<tr>
<td>8</td>
<td>Farmer Field schools for IPM</td>
</tr>
<tr>
<td>3</td>
<td>Grant funding</td>
</tr>
</tbody>
</table>

Categories:
- **Economic**
- **Environmental**
- **Socio-cultural**
- **Policy-institutional**
- **Educational-information**
Storing fruits and vegetables in pack houses is a climate-smart option as this often reduces wastage, by preserving the freshness and increasing the marketability of agricultural produce. Goods stored in pack houses may be preserved using a variety of methods including cold storage, drying, or vacuum jarring. Given its function as storage facilities, modern packhouses may have precise temperature controls, as well as airflow, and air pressure configurations.
The share between CSA pillar's shows the balance between productivity, adaptation, and mitigation.

### Food Security
- Contributes to food security by facilitating storage and postharvest activities of crops for future use
- Creates opportunities for reducing spoilage and minimizing harvest loss
- Facilitates further value addition processes for diverse crops specially if implemented at the community level

### Adaptation
- Contributes to manage overproduction reducing food waste and vulnerability to low market product prices
- Promotes the generation of value addition options and new/potential income options for farmers
- Prevents food spoilage caused by fungal or bacterial presence and possible foodborne illnesses

### Mitigation
- Enables indirect effects on greenhouse gases emissions per unit of produce by reducing post-harvest losses
- In complemet with rainwater harvesting or use of solar energy, reduces fossil fuel consumption during post-harvest management

### Climate-Smart Agriculture Pillars

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Security</td>
<td>42.0%</td>
<td>8.5</td>
</tr>
<tr>
<td>Adaptation</td>
<td>43.2%</td>
<td>8.8</td>
</tr>
<tr>
<td>Mitigation</td>
<td>14.8%</td>
<td>3.0</td>
</tr>
</tbody>
</table>

The share between CSA pillar's shows the balance between productivity, adaptation, and mitigation.
Rainwater harvesting systems

Use of drought tolerant varieties/crops and organic inputs to ensure quality

Crop diversification: Crop rotation, intercropping

Synergistic practices are those practices that when implemented together interact with each other to produce a greater positive effect on the crop and the agroecosystem than they would have when implemented separately.

Gender Slider

Slider represents additional benefits of the CSA practice on women in terms of participation in decision-making, increased income and freeing time.

GENDER SLIDER

SYNERGISTIC PRACTICES

PROFITABILITY INDICATORS

12,500 JMD/acre
Practice cost

8.8 months
Payback period

4,552,765 JMD/acre
Net Present Value

1.8
Cost-benefit Ratio

77%
Internal Rate of Return

N/A JMD/acre/year
Biodiversity

N/A JMD/acre/year
Carbon

Potential additional benefits

Practice cost

Payback period

Net Present Value

Cost-benefit Ratio

Internal Rate of Return

Biodiversity

Carbon
### Barriers to Adoption

<table>
<thead>
<tr>
<th>Very difficult to overcome</th>
<th>Very easy to overcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7</strong> Site/location selection</td>
<td>$i$</td>
</tr>
<tr>
<td><strong>6</strong> Implementation cost</td>
<td>$</td>
</tr>
</tbody>
</table>

### Opportunities to Adoption

<table>
<thead>
<tr>
<th>Very difficult to attain</th>
<th>Very easy to attain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8</strong> Collective action among farmers</td>
<td>$</td>
</tr>
<tr>
<td><strong>8</strong> Grant funding</td>
<td>$</td>
</tr>
</tbody>
</table>

### Categories

- **$** Economic
- ![plant_icon] Environmental
- ![person_icon] Socio-cultural
- ![building_icon] Policy-institutional
- ![info_icon] Educational-information
Scotch bonnet peppers (otherwise called ‘hot peppers’, ‘bonney’ or ‘Caribbean red peppers’) are a variety of chili peppers, which are usually fairly round or slightly elongated in shape. These peppers are also related to habanero peppers (Capsicum chinense), and are often red or yellow when ripe, but may also be green or brown when reaped. The name ‘scotch bonnet’ refers to its shape, resembling a tam o’shanter Scottish hat.
Pepper (Scotch Bonnet)

% of farmers are cultivating the crop:

0%

**Underlying Factors**

The Ministry wants to introduce the crop in region

<table>
<thead>
<tr>
<th>Service providers</th>
<th>Farmers</th>
<th>Processors</th>
<th>Wholesale &amp; Retailers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input supply</strong></td>
<td><strong>Farm production</strong></td>
<td><strong>Post harvest</strong></td>
<td><strong>Output market</strong></td>
</tr>
</tbody>
</table>

---

**Pepper (Scotch Bonnet)**

- Gathering of inputs/tools
- Planting, land maintenance
- Reaping, storage
- Sale within local markets

---

**IMPORTANCE OF VALUE CHAIN TO HOUSEHOLD FOOD**

<table>
<thead>
<tr>
<th>Food Security</th>
<th>Production</th>
<th>Economic</th>
<th>Adaptation to climate Risk</th>
</tr>
</thead>
</table>

---

**KEY ACTIVITIES**

<table>
<thead>
<tr>
<th>Two main hazards affecting this VC</th>
<th>Consequences of the hazards to the VC</th>
<th>Severity</th>
<th>Who is mainly affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drought</td>
<td>Moderate -Severe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hurricanes</td>
<td>Moderate -Severe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hot pepper does not thrive under drought conditions and irrigation is essential to produce consistent yields of high-quality hot pepper in the drier periods of the year. Irrigation water is mainly supplied to the crop by sprinkler or overhead irrigation or drip lines. The critical moisture periods for hot peppers are: 1) during the seedling stage, 2) at transplanting and the week after, 3) just before flowering and 4) during fruit set and development.
**Food Security**
- Contributes to improve nutritional outcomes through the possibility to increase yield and diversify farm production
- Improves the availability of the crop for household consumption and for sale
- Allows increased water use efficiency which can reduce farmers’ production costs

**Adaptation**
- Reduces the risk of crop failure under drought conditions
- Avoids soil nutrients leaching/runoff, hence improving soil and plants health, and minimizing environmental impact
- Minimizes time spent on irrigation activities compared to other irrigation systems

**Mitigation**
- Increases in yield due to water availability minimizing the emissions per unit of produce
- Contributes to a better accumulation of above and below-ground biomass, hence promoting accumulation of organic matter in the soil.
- Drip irrigation systems (gravity-fed or solar-powered) worsk with low pressure reducing the need of fossil energy

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**Climate-Smart Agriculture Pillars**

The share between CSA pillar’s shows the balance between productivity, adaptation, and mitigation.

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Security</td>
<td>32.8%</td>
</tr>
<tr>
<td>Adaptation</td>
<td>36.6%</td>
</tr>
<tr>
<td>Mitigation</td>
<td>30.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pillar</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Security</td>
<td>7.2</td>
</tr>
<tr>
<td>Adaptation</td>
<td>8.0</td>
</tr>
<tr>
<td>Mitigation</td>
<td>6.7</td>
</tr>
</tbody>
</table>
**GENDER SLIDER**
Slider represents additional benefits of the CSA practice on women in terms of participation in decision-making, increased income and freeing time.

**SYNERGISTIC PRACTICES**
Synergistic practices are those practices that when implemented together interact with each other to produce a greater positive effect on the crop and the agroecosystem than they would have when implemented separately.

**PROFITABILITY INDICATORS**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice cost</td>
<td>JMD/acre</td>
</tr>
<tr>
<td>Payback period</td>
<td>21.4 months</td>
</tr>
<tr>
<td>Net Present Value</td>
<td>JMD/acre</td>
</tr>
<tr>
<td>Cost-benefit Ratio</td>
<td>2.1</td>
</tr>
<tr>
<td>Internal Rate of Return</td>
<td>64%</td>
</tr>
<tr>
<td>Potential additional benefits</td>
<td>JMD/acre/year</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>JMD/acre/year</td>
</tr>
<tr>
<td>Carbon</td>
<td>JMD/acre/year</td>
</tr>
</tbody>
</table>
### BARRIERS TO ADOPTION

<table>
<thead>
<tr>
<th>Very difficult to overcome</th>
<th>Very easy to overcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation cost</td>
<td>$</td>
</tr>
<tr>
<td>Rainfall variability (and change)</td>
<td></td>
</tr>
<tr>
<td>Dependence on water sources</td>
<td>$</td>
</tr>
<tr>
<td>Labour intensive</td>
<td>$</td>
</tr>
<tr>
<td>Technical training required</td>
<td>i</td>
</tr>
</tbody>
</table>

### OPPORTUNITIES TO ADOPTION

<table>
<thead>
<tr>
<th>Very difficult to attain</th>
<th>Very easy to attain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diversity of materials available</td>
<td>$</td>
</tr>
<tr>
<td>Improved land preparation</td>
<td>i</td>
</tr>
<tr>
<td>Complement water harvesting techniques</td>
<td></td>
</tr>
<tr>
<td>Reduces weeds presence</td>
<td>$</td>
</tr>
<tr>
<td>Access to training</td>
<td>i</td>
</tr>
</tbody>
</table>

#### Categories

- **$**: Economic
- ****: Environmental
- ****: Socio-cultural
- ****: Policy-institutional
- **i**: Educational-information

Pepper (Scotch Bonnet)
INTEGRATED SOIL MANAGEMENT - RAISED BEDS

Raised beds are an important consideration for climate-smart cultivation of scotch bonnet peppers, as it reduces the likelihood of pest infestation, soil erosion and weed growth. Raised beds for scotch peppers are especially ideal in areas with waterlogged soils, such as heavy clay (McGlashan, 2019). Several considerations are important when planning and preparing raised beds for scotch bonnet peppers, including the soil types, ideal land preparation, seed spacing, structural design and inputs.
Food Security

- Raised beds reduces the risk of pest and diseases incidence avoiding harvest loss or poor produce quality
- Maintains or promotes yiled under drought or excess water conditions

Adaptation

- Raised beds contributes to sustainable water management leading to efficient fertilizer application and its potential leaching from the roots zone
- Reduces soil compaction and favours better drainage (specially under poor soil drainage conditions/water excess) which can improve crop growth

Mitigation

- Coupled with efficient nutrient management leads to a reduction in the carbon footprint associated to synthetic fertilizers application
- Improved crop growth conditions favours biomass accumulation improving soil carbon stock in the long run
- *Could present emissions when deep ploughing or reiterative mechanized tillage is carried out, specially when soil cover (mulching, cover crops etc.) are not implemented

Climate-Smart Agriculture Pillars

The share between CSA pillar's shows the balance between productivity, adaptation, and mitigation.

- Food Security (7.0)
- Adaptation (8.0)
- Mitigation (6.7)
GENDER SLIDER

Slider represents additional benefits of the CSA practice on women in terms of participation in decision-making, increased income and freeing time.

SYNERGISTIC PRACTICES

Synergistic practices are those practices that when implemented together interact with each other to produce a greater positive effect on the crop and the agroecosystem than they would have when implemented separately.

PROFITABILITY INDICATORS

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice cost</td>
<td>JMD/acre</td>
</tr>
<tr>
<td>Payback period</td>
<td>8.2 months</td>
</tr>
<tr>
<td>Net Present Value</td>
<td>JMD/acre</td>
</tr>
<tr>
<td>Cost-benefit Ratio</td>
<td>1.4</td>
</tr>
<tr>
<td>Internal Rate of Return</td>
<td>41%</td>
</tr>
<tr>
<td>Potential additional benefits</td>
<td>JMD/acre/year</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>11,567 JMD/acre/year</td>
</tr>
<tr>
<td>Carbon</td>
<td>15,423 JMD/acre/year</td>
</tr>
</tbody>
</table>
### Barriers to Adoption

<table>
<thead>
<tr>
<th>Very difficult to overcome</th>
<th>Very easy to overcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Costs of tractor service</td>
</tr>
<tr>
<td>5</td>
<td>Access to tractors/machinery</td>
</tr>
<tr>
<td>5</td>
<td>Change of cultural practices</td>
</tr>
</tbody>
</table>

### Opportunities to Adoption

<table>
<thead>
<tr>
<th>Very difficult to attain</th>
<th>Very easy to attain</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Reduced land preparation cost</td>
</tr>
<tr>
<td>4</td>
<td>Access to government incentives</td>
</tr>
<tr>
<td>8</td>
<td>Improved soil structure conditions</td>
</tr>
<tr>
<td>8</td>
<td>Reduce flood risk</td>
</tr>
<tr>
<td>8</td>
<td>Facilitate intercropping</td>
</tr>
<tr>
<td>8</td>
<td>Improved planting density</td>
</tr>
</tbody>
</table>

**Categories**

- Economic
- Environmental
- Socio-cultural
- Policy-institutional
- Educational-information
Irish Potatoes (also called ‘white potato’) are edible, perennial, starchy vegetable tubers that belong to the nightshade family Solanaceae (Scientific Name: Solanum tuberosum). There are two common varieties of Irish potatoes: red potatoes and white potatoes. The white varieties are known to have superior cooking qualities than the red potatoes, however, red potatoes preserve longer than the white varieties. Irish potatoes are one of the primary sources of starch in diets globally.
The Value Chain will be introduced in the region by government programs.

Underlying Factors

<table>
<thead>
<tr>
<th>Two main hazards affecting this VC</th>
<th>Consequences of the hazards to the VC</th>
<th>Severity</th>
<th>Who is mainly affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drought</td>
<td></td>
<td>Moderate -Severe</td>
<td></td>
</tr>
<tr>
<td>Hurricanes</td>
<td></td>
<td>Moderate -Severe</td>
<td></td>
</tr>
</tbody>
</table>

% of farmers are cultivating the crop: 0%
Water is one of the most important inputs in Irish potato production, as it affects both crop quality and yield. Irrigation is especially important in the early stages of the growing season, as it maximizes canopy growth (amount and rate), the number of tubers, and additionally reduces the risk of common scab. Irrigation at the early stages also minimizes crop damage during harvesting (UK Irrigation Association, 2005). Water needs at the early stages of the potato crop are lower and increase gradually throughout the stages of tuber growth.
The share between CSA pillar's shows the balance between productivity, adaptation, and mitigation.

**FOOD SECURITY**
- Drip irrigation maintains or improves overall quality and yield of the potato crop
- Irrigation distributes water directly to the roots zone avoiding waste and reducing costs

**ADAPTATION**
- Helps to keeps foliage dry compared to other irrigation systems, preventing incidence of fungal diseases
- Prevents runoff minimizing soil erosion cause by excess water
- Reduces the incidence of invasive plants (weeds) as water is applied locally

**MITIGATION**
- Drip irrigation systems (gravity-fed or solar-powered) often operates at low pressure hence reducing the need to use electrical or fossil energy for irrigation
- Contributes to the long-term increase in soil carbon stock by promoting above- and below-ground biomass

**CLIMATE-SMART AGRICULTURE PILLARS**

![Bar chart showing percentages of Food Security, Adaptation, and Mitigation]

- **Food Security (7.2)**: 32.8%
- **Adaptation (8.0)**: 36.6%
- **Mitigation (6.7)**: 30.5%
Gender Slider

Slider represents additional benefits of the CSA practice on women in terms of participation in decision-making, increased income and freeing time.

Synergistic Practices

Synergistic practices are those practices that when implemented together interact with each other to produce a greater positive effect on the crop and the agroecosystem than they would have when implemented separately.

- Use of organic inputs (compost, bio-fertilizers, natural repellents etc.)
- Integrated soil management: Raised beds
- Rainwater harvesting systems

Profitability Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice cost</td>
<td>JMD/acre</td>
</tr>
<tr>
<td>Payback period</td>
<td>4.4 months</td>
</tr>
<tr>
<td>Net Present Value</td>
<td>JMD/acre</td>
</tr>
<tr>
<td>Cost-benefit Ratio</td>
<td>2</td>
</tr>
<tr>
<td>Internal Rate of Return</td>
<td>56%</td>
</tr>
<tr>
<td>Potential additional benefits</td>
<td>JMD/acre/year</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>11,567 JMD/acre/year</td>
</tr>
<tr>
<td>Carbon</td>
<td>15,423 JMD/acre/year</td>
</tr>
<tr>
<td>BARRIERS TO ADOPTION</td>
<td>OPPORTUNITIES TO ADOPTION</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td><strong>Very difficult to overcome</strong></td>
<td><strong>Very easy to overcome</strong></td>
</tr>
<tr>
<td>5 Implementation cost</td>
<td>$</td>
</tr>
<tr>
<td>8 Rainfall variability (and change)</td>
<td></td>
</tr>
<tr>
<td>6 Dependence on water sources</td>
<td></td>
</tr>
<tr>
<td>5 Labour intensive</td>
<td>$</td>
</tr>
<tr>
<td>5 Technical training required</td>
<td></td>
</tr>
</tbody>
</table>
INTEGRATED SOIL MANAGEMENT - RAISED BEDS

Raised beds are an important consideration for climate-smart cultivation of Irish potatoes, as it reduces the likelihood of pest infestation, soil erosion and weed growth. The use of raised beds or ridge planting is especially useful in areas with wet soils, such as clay. Several considerations are important when planning and preparing raised beds for Irish potatoes, including the soil types, ideal land preparation, seed spacing, structural design and inputs.
FOOD SECURITY

→ Raised beds help to facilitate drainage reducing the likelihood of rot and maximising yield

→ Reduces the impacts of soil erosion minimizing harvest loss

ADAPTATION

→ Raised beds contribute to increased water management leading to efficient fertilizer application and its potential leaching from the roots zone

→ Reduce soil compaction and favour better drainage (specially under poor soil drainage conditions/water excess) which can improve crop growth

MITIGATION

→ Contributes to a better accumulation of above and below-ground biomass (roots and tubers), hence promoting accumulation of organic matter in the soil.

→ Raised beds avoids anaerobic conditions during flooding (particularly in heavy textured soils), contributing to soil aeration which reduces green house gases (GHG) emissions

→ When mechanic preparation of the soil is required may adversely affect the carbon balance (potential increase in emissions) from soil related activites

CLIMATE-SMART AGRICULTURE PILLARS

The share between CSA pillar's shows the balance between productivity, adaptation, and mitigation.

<table>
<thead>
<tr>
<th>Food Security (7.0)</th>
<th>Adaptation (8.0)</th>
<th>Mitigation (6.7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32.3%</td>
<td>36.9%</td>
<td>30.8%</td>
</tr>
</tbody>
</table>
GENDER SLIDER

Slider represents additional benefits of the CSA practice on women in terms of participation in decision-making, increased income and freeing time.

SYNERGISTIC PRACTICES

Synergistic practices are those practices that when implemented together interact with each other to produce a greater positive effect on the crop and the agroecosystem than they would have when implemented separately.

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<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice cost</td>
<td>550,000 JMD/acre</td>
</tr>
<tr>
<td>Payback period</td>
<td>8.2 months</td>
</tr>
<tr>
<td>Net Present Value</td>
<td>2,041,620 JMD/acre</td>
</tr>
<tr>
<td>Cost-benefit Ratio</td>
<td>1.7</td>
</tr>
<tr>
<td>Internal Rate of Return</td>
<td>74%</td>
</tr>
<tr>
<td>Potential additional benefits</td>
<td>11,567 JMD/acre/year</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>15,423 JMD/acre/year</td>
</tr>
<tr>
<td>Carbon</td>
<td></td>
</tr>
</tbody>
</table>
### BARRIERS TO ADOPTION

<table>
<thead>
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<th>Very difficult to overcome</th>
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</tr>
</thead>
<tbody>
<tr>
<td>5</td>
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</tbody>
</table>

### OPPORTUNITIES TO ADOPTION

<table>
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<tr>
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</thead>
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<td>6</td>
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</tr>
<tr>
<td>8</td>
<td>Improved planting density</td>
</tr>
</tbody>
</table>

**Categories**

- **Economic**
- **Environmental**
- **Socio-cultural**
- **Policy-institutional**
- **Educational-information**
Sweet Potatoes are a root vine crop which is native to tropical countries in the Americas. Sweet Potatoes are a perennial crop (grown all year round), and when ready for harvesting, the roots have the appearance of a purple-brown colour. The botanical name for Sweet Potatoes is Ipomoea batatas, and the crop belongs to the Convolvulaceae family (CABI Crop Protection Compendium, 2008).

PHOTO: P. Casier (CGIAR)
**Sweet Potato**

% of farmers are cultivating the crop: **less than 5%**

**IMPORTANCE OF VALUE CHAIN TO HOUSEHOLD FOOD**

<table>
<thead>
<tr>
<th>Food Security</th>
<th>Production</th>
<th>Economic</th>
<th>Adaptation to climate Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

**KEY ACTIVITIES**

<table>
<thead>
<tr>
<th>Gathering of inputs/tools</th>
<th>Planting, land maintenance</th>
<th>Reaping, storage</th>
<th>Sale within local markets</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Two main hazards affecting this VC</th>
<th>Consequences of the hazards to the VC</th>
<th>Severity</th>
<th>Who is mainly affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood</td>
<td>Flooding can create issues with rotting of roots and overall challenges with the tubers</td>
<td>Moderate -Severe</td>
<td>All farmers affected</td>
</tr>
<tr>
<td>Pest &amp; Diseases</td>
<td>The weevil burrows into the tuber leaving holes and damaging the produce</td>
<td>Moderate -Severe</td>
<td>All farmers affected</td>
</tr>
</tbody>
</table>

**Underlying Factors**

* Limited access to funds * Limited access to labour * Subpar planting material

**Barriers to Adaptation & Enabling environment**

* Access to funding * Access to tools and inputs * Access to processing facilities * Overseas markets (access ) * Better prices

**Prioritized technologies by farmers**

* Integrated Pest and Diseases management (Traps, clean planting material) * Use of drought-tolerant crops (e.g. sweet potato, cassava, pigeon peas, callaloo, etc.) * Improved irrigation systems (e.g. drip, micro sprinklers) * Use of organic inputs (e.g. compost, bio-fertilizers, natural repellents etc.) * Crop rotation (cover crops, N fixing species)
IPM (TRAPS AND CLEAN PLANTING MATERIAL)

Sweet potato production is affected by pests which significantly reduce both the quantity and quality of yields. Some producers within the Caribbean have reported losses due to pests reaching as high as 60 - 100% of harvested yields. Before pests can be managed, it is important that there is proper diagnosis so that the most appropriate and effective strategies can be implemented. Therefore, it is necessary for farmers to inspect the crop to determine the presence of pests, their numbers, and the level of damage to the crop. Once diagnosis has been completed an integrated management strategy should be identified to reduce pest numbers and damage to the crop.

PHOTO: (left) International Institute of Tropical Agriculture (middle & right) C. de Bode/CGIAR
The share between CSA pillar's shows the balance between productivity, adaptation, and mitigation.

**FOOD SECURITY**
- Reduces the need of external and often toxic inputs (to humans and biodiversity) minimizing production cost
- Clean planting material reduces the risk of crop loss/damage due to pest and diseases
- Maintains or improves crop yield and quality
- Eliminates or minimizes re-entry interval restrictions saving time to farmers

**ADAPTATION**
- Reduces the use of synthetic pesticides and the related risks to human health (farmers and consumers), biodiversity and ecosystems services such as pollination
- In combination with other crop management practices prevents the outbreak of pests and diseases, protecting non-targeted species
- Avoids potential soil, air and water contamination from pesticides application and residues

**MITIGATION**
- Reduces negative side negative effects of synthetic pesticides on the biological activity of the soil, while maintaining its carbon sink capacity and functions such as nitrogen cycling
- Allows adequate accumulation of biomass during the plant/crop growth due to lower rates of pest and diseases incidence
- Contributes to the progressive reduction of synthetic inputs (fungicides, insecticides etc.) generally produced off-farm reducing greenhouse gases emission from their manufacturing, transport, application and disposal

**CLIMATE-SMART AGRICULTURE PILLARS**
The share between CSA pillar's shows the balance between productivity, adaptation, and mitigation.

- **Food Security (9.0)**: 37.5%
- **Adaptation (6.7)**: 27.8%
- **Mitigation (8.3)**: 34.7%
GENDER SLIDER

Slider represents additional benefits of the CSA practice on women in terms of participation in decision-making, increased income and freeing time.

SYNERGISTIC PRACTICES

Synergistic practices are those practices that when implemented together interact with each other to produce a greater positive effect on the crop and the agroecosystem than they would have when implemented separately.

- Crop rotation
- Live barriers / fences in contours with leguminous bushes / hedgerows / fruit trees
- Use of organic inputs (compost, bio-fertilizers, natural repellents etc.)

PROFITABILITY INDICATORS

- **121,650 JMD/ACRE** Practice cost
- **9.2 MONTHS** Payback period
- **3,756,551 JMD/ACRE** Net Present Value
- **1.8** Cost-benefit Ratio
- **80%** Internal Rate of Return
- **N/A JMD/ACRE/YEAR** Potential additional benefits
- **N/A JMD/ACRE/YEAR** Biodiversity
- **N/A JMD/ACRE/YEAR** Carbon
### Barriers to Adoption

<table>
<thead>
<tr>
<th>Category</th>
<th>Very difficult to overcome</th>
<th>Very easy to overcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Access to planting material</td>
<td>$</td>
</tr>
<tr>
<td>7</td>
<td>Resistance to new technologies</td>
<td>$</td>
</tr>
<tr>
<td>6</td>
<td>Access to traps</td>
<td>$</td>
</tr>
<tr>
<td>7</td>
<td>Farmer’s acceptance to new varieties</td>
<td>$</td>
</tr>
<tr>
<td>5</td>
<td>Consumer’s acceptance of new varieties</td>
<td>$</td>
</tr>
</tbody>
</table>

### Opportunities to Adoption

<table>
<thead>
<tr>
<th>Category</th>
<th>Very difficult to attain</th>
<th>Very easy to attain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Increase yield</td>
<td>$</td>
</tr>
<tr>
<td>6</td>
<td>Access to new resistant varieties</td>
<td>$</td>
</tr>
<tr>
<td>5</td>
<td>Higher quality products for export</td>
<td>$</td>
</tr>
</tbody>
</table>

**Categories**

- Economic
- Environmental
- Socio-cultural
- Policy-institutional
- Educational-information
Crop rotation is an excellent method for ensuring maximum soil nourishment and for reducing pests and diseases for the sweet potato crop. Among the considerations for crop rotation include specific crop combinations. The growth of garlic right before the planting of sweet potatoes is recommended, as soil from garlic residue contains a natural pest repellent (allicin) to wireworms, which often affect sweet potatoes (Soderholm, 2021). Other useful crops to include in the rotation schedule with sweet potatoes include grains, soybean, and clover (Soderholm, 2021).
The share between CSA pillar’s shows the balance between productivity, adaptation, and mitigation.

**FOOD SECURITY**
- Contributes to crop diversification increasing household food sufficiency and nutritional security
- Reduces the incidence of pest and diseases maintaining or increasing crop yield and quality
- Minimizes the potential use of pesticides and herbicides hence reducing household expenses on synthetic/external inputs

**ADAPTATION**
- Foster the conservation of soil’s biodiversity contributing to improve its structure and biochemical activity reducing compaction and erosion, and increasing fertility
- Reduces reliance on the use of synthetic fertilizers and pesticides and their related costs and negative environmental impact
- Improves soil’s nutrients cycling as each crop explores and extracts diverse nutrients, returning them when crop biomass is reincorporated to the soil during soil preparation or as mulch or compost

**MITIGATION**
- Contributes to the long-term increase in soil organic matter (SOM) and soil organic carbon (SOC)
- Crop rotation with leguminous species favours biological nitrogen fixation, improving medium- to long-term soil fertility hence reducing the dependency to synthetic fertilizers and its associated carbon footprint.

**CLIMATE-SMART AGRICULTURE PILLARS**
The share between CSA pillar’s shows the balance between productivity, adaptation, and mitigation.

- **Food Security (9.0)**: 36.0%
- **Adaptation (8.0)**: 32.0%
- **Mitigation (8.0)**: 32.0%
GENDER SLIDER

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SYNERGISTIC PRACTICES

Synergistic practices are those practices that when implemented together interact with each other to produce a greater positive effect on the crop and the agroecosystem than they would have when implemented separately.

- Use of organic inputs (compost, bio-fertilizers, natural repellents etc.)
- Live barriers /fences in contours with leguminous bushes / hedgerows / fruit trees
- Integrated Pest and Disease Management (intercropping with marigold, traps, and scouting)

PROFITABILITY INDICATORS

241,650 JMD/acre
Practice cost

17.2 months
Payback period

5,591,059 JMD/acre
Net Present Value

2.7
Cost-benefit Ratio

74%
Internal Rate of Return

N/A JMD/acre/year
Potential additional benefits

N/A JMD/acre/year
Biodiversity

N/A JMD/acre/year
Carbon
### Barriers to Adoption

<table>
<thead>
<tr>
<th>Very difficult to overcome</th>
<th>Very easy to overcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Limited arable land</td>
</tr>
<tr>
<td>3</td>
<td>Available of ideal crops to rotate</td>
</tr>
<tr>
<td>5</td>
<td>Availability of market for certain crops</td>
</tr>
</tbody>
</table>

### Opportunities to Adoption

<table>
<thead>
<tr>
<th>Very difficult to attain</th>
<th>Very easy to attain</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Income diversification</td>
</tr>
<tr>
<td>7</td>
<td>Market diversification</td>
</tr>
<tr>
<td>5</td>
<td>Access to niche markets</td>
</tr>
</tbody>
</table>

#### Categories

- **Economic**
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DISCLAIMER:

This Climate-Smart Agriculture extension services manual for Parnassus has been prepared as an output for the Jamaica - Capacity Building Program to Improve Stakeholder Resilience and Adaptation to Climate Change in Jamaica, and has not been peer reviewed. This study was led by the International Center for Tropical Agriculture (CIAT) (now part of the Alliance of Bioversity International and CIAT) under the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and was implemented in collaboration with the Department of Geography and Geology of the University of West Indies (UWI). The project is financed by the Caribbean Development Bank (CDB) and implemented under the Ministry of Agriculture and Fisheries. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies or opinions of CCAFS, CIAT, donor agencies, or partners. The authors are responsible for any errors or gaps in the report.

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