

Enhancing multi-scalar mapping and research of food security risk, due to climate change in Jamaica

Determining the limiting factors that lead to
food insecurity and identifying intervention
points and adaptation measures

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Executive summary

Jamaica's Food and Nutrition Security Policy highlights critical challenges such as low food production and reliance on imported food, contributing to widespread food insecurity. Addressing this issue involves tackling inefficiencies in farm production, post-harvest losses in the supply chain, and socio-economic barriers to household food access.

To support Jamaica's agriculture sector in adapting to climate change, the Climate Technology Centre and Network (CTCN) commissioned HR Wallingford to lead the project "Enhancing Multi-Scalar Mapping and Research of Food Security Risk Due to Climate Change in Jamaica". This report, the fourth deliverable of the project, identifies key factors driving food insecurity and proposes targeted interventions. It is based on a review of policy reports, scientific studies, data from the Agricultural Business Information System (ABIS), climate projections, and findings from a parish extension officer baseline survey. The report finds that food insecurity in Jamaica is driven by limiting factors affecting three main areas:

1. Agricultural Productivity

- Market competition with imports and price volatility.
- Declining soil fertility and unsustainable practices.
- Land tenure insecurity and demographic imbalances among farmers.
- Exposure to climate-related hazards.

2. Food Distribution

- Post-harvest losses due to inadequate storage and extreme weather.
- Poor infrastructure, including roads and centralized market access.
- Limited training and institutional capacity to address challenges.

3. Household Food Access

- Income inequality, particularly between rural and urban areas.
- Gender disparities in income and land rights.
- Increased reliance on imported processed foods and unhealthy dietary patterns.

To address these challenges, the report outlines recommendations to:

Enhancing Agricultural Productivity

- Training and Technology: Equip farmers with knowledge and tools, including climate information services, climate-resilient practices, drought-tolerant crops, and modern technologies like soil testing and drip irrigation.
- Irrigation and Soil Management: Expand irrigation access and create national soil health databases to monitor trends and prioritize restoration efforts.
- Access to Finance: Provide economic support for small-scale and female farmers to recover after climate shocks and invest in resilient practices.

Improving Food Distribution

- Infrastructure Development: Invest in roads, transportation, and community-based food storage facilities to reduce losses and improve market access. This will also help to prevent food loss in the wake of climate and weather related hazards.
- Market Connectivity: Facilitate access to market information, strengthen farmer cooperatives, and develop robust value chains connecting producers to retailers.
- Promote value-added projects for export such as spices, beverages and sauces.

Promoting Equitable Food Access

- Education: Implement programs to educate households on nutrition, healthy food preparation, and balanced diets.
- Social Support Systems: Increase financial support for low-income families through microfinance, subsidies, and home gardening initiatives. This should also include the continuation of school feeding programs, supplied by local agriculture and agribusiness.
- Public-Private Partnerships: Encourage initiatives like food banks and farm-to-table programs to enhance access to nutritious food.

Recommended citation

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Table 1.1: Abbreviations and acronyms

Abbreviation	Definition
ABIS	Agricultural Business Information System
CTCN	Climate Technology Centre and Network
FAO	Food and Agricultural Organization
FCS	Food Consumption Score
FIES	Food Insecurity Experience Score
GoJ	Government of Jamaica
JAMIS	Jamaica Agricultural Marketing Information System
JAMPRO	Jamaica Promotions Corporation
KMR	Kingston Metropolitan Region
MSD	Midsummer Drought
NDP	National Development Plan
PIOJ	Planning Institute of Jamaica
RADA	Rural Agricultural Development Authority
SDGs	Sustainable Development Goals
SIDs	Small Island Developing State
SSP	Shared Socioeconomic Pathway
STATIN	Statistical Institute of Jamaica
UN	United Nations
WFP	World Food Programme

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1 About the project

1.1 Project summary

Jamaica's Food and Nutrition Security Policy (Government of Jamaica, 2013) highlights the island's challenges with low food production and a heavy reliance on imported food, leading to widespread food insecurity among its population. According to the FAO (2022b), approximately 25 % of Jamaicans are classified as severely food insecure—defined as having exhausted food supplies and, in extreme cases, going days without eating.

As a Small Island Developing State (SIDS), Jamaica is also vulnerable to the negative impacts associated with climate change. Future climate projections indicate an increase in the frequency and intensity of climate-related hazards, including heatwaves, extreme rainfall, intensified storms, shifting seasonal rainfall patterns, and greater variability and unpredictability in rainfall (World Bank Climate Change Knowledge Portal, 2024). These changes pose significant threats to Jamaica's domestic agriculture sector.

Climate change is expected to reduce agricultural productivity, as many commonly grown crops may no longer be viable under future climate conditions. This is further exacerbated by climate-related hazards such as soil erosion, flooding, and salinization, which can lead to the contamination of agricultural soils and the loss of arable land.

While the agricultural producing parishes across the island are well documented, significant knowledge and technology gaps still remain. Policy makers as well as sector stakeholders have so far been unable to identify the food insecure regions across the island in relation to climate change. Knowledge on the spatial distribution of current and future food security risks across the island that ranges from the community scale to the parish level is therefore pivotal.

As part of ongoing assistance from the CTCN to increase its adaptive capacity and resilience of the agriculture sector in Jamaica, the CTCN commissioned HR Wallingford to lead a project titled "Enhancing multi-scalar mapping and research of food security risk, due to climate change in Jamaica". The purpose of the assignment is to develop a new software tool that maps current and future food insecure areas across Jamaica within the context of climate change projections. Working closely with national stakeholders, the Project outcome will be an increased adaptive capacity and resilience of the agriculture sector through better-informed decision-making tools, and increased awareness of food security risks by local producers and other stakeholders.

The project will deliver the following outputs:

1. Implementation planning and communication documents.
2. Implementation and reporting of baseline survey administered to parish managers and parish-extension officers.
3. Reporting of the status of agricultural database and recommendations for improvements.
4. **Determination of main limiting factors that lead to food insecurity, identification of intervention points and adaptation measures for enhancing food security.**
5. Development of software to spatially visualize current and future food security risk rates within the context of climate change.
6. Training on sustainable land management and crop/livestock management. We may also consider development of resource materials around integrated water resources management, as irrigation may be a big issue for local cropping systems.
7. Improved economic resilience of farming systems through increased market access and sustainable production.

8. Capacity building on the monitoring and maintenance of the database, and the ability to perform the analysis regularly.

The Project outcomes respond directly to United Nations (UN) Sustainable Development Goal (SDG) 2 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture' by providing a system that will support decision-making for sustainable food production in Jamaica. The Project will also contribute to SDG 1 (End poverty), SDG 6 (Availability and sustainable management of water), and SDG 13 (Climate action), as the tool aims to improve agricultural use of water resources, improve food security and increase the income of rural communities.

1.2 About this report

This report serves as the fourth deliverable of the project as indicated in **bold** in section 1.1.

It aims to identify the main limiting factors that lead to food insecurity in Jamaica by employing a comprehensive methodological approach, which includes:

- A desktop review of past policy reports and scientific studies (including the National Food and Nutrition Security Policy, the most recent National Adaptation Plan report, State of the Climate Report and Jamaica's Vision 2030 National Development Plan) to identify the main factors impacting food production, distribution and access across Jamaica.
- Analysis of on farmer demographics and farm productivity across Jamaica at the parish extension level. This data is accessible via the Agricultural, Business Information System (ABIS) from the Rural Agricultural Development Authority (RADA)
- Evaluation of historical and projected climate trends (including uncertainty in projections) to identify climate related hazards which may impact future food security in Jamaica.
- Incorporation of findings from the parish extension officer baseline survey (2nd Project deliverable) to support key findings.

The report concludes with a list of recommendations on possible intervention points grounded in data analysis and a critical review of the benefits and limitations of previous interventions.

2 Introduction to food security

2.1 Defining food security

The UN SDG 2 "Zero Hunger" strives to "End hunger, achieve food security and improved nutrition and promote sustainable agriculture" (United Nations, 2015).

Food security has been defined by the World Food Summit as:

“ Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. ”

World Food Summit (1996)

Food security holds immense global significance, especially in the context of a growing population, as it underpins the health, stability, and economic resilience of societies worldwide. Achieving food security requires confronting issues related to inefficiencies and loss in production at the farm level, losses within the supply chain process distributing goods from farm to markets, and availability and access of food at the household level which is often hindered by socio-economic limitations.

In the Caribbean, where many countries heavily rely on food imports and are particularly susceptible to climate change, achieving food security is an urgent priority. Jamaica's Vision 2030 National Development Plan emphasizes food security as a determinant of health and societal development, aiming to ensure that all Jamaicans have access to safe, sufficient, and nutritious food.

“ Food security for Jamaica will provide for adequate, safe food supplies for proper dietary requirements, access to basic food items for the population, informed food choices for a healthy lifestyle, and mitigation against food shortages resulting from natural and man-made hazards and emergency situations

Vision 2030 (PIOJ, 2009)



To monitor trends in food security, governments and other institutions rely on a variety of indicators, each designed to capture a specific facet of the issue. These indicators are generally collated from household surveys, capturing household-level access to food. Frequently used examples include the Food Consumption Score (FCS) which measures dietary diversity, food frequency, and relative nutritional importance of different food groups (World Food Programme, 2019), and the Food Insecurity Experience Scale (FIES) which measures the severity of food insecurity based on direct household responses about their access to adequate food (FAO, 2018b).

By employing these indicators, it is possible to gain a comprehensive understanding of food security dynamics at the household level, thereby informing effective policy and intervention strategies. However, incorporating additional data and indicators that capture the *drivers* of household-level food security into planning is essential.

2.2 Methodological approach

This report categorizes the limiting factors contributing to food security into three main sections: **Productivity**, **Distribution**, and **Access**. Each section is analyzed in detail in the subsequent sections 4.1, 4.2 and 4.3, respectively, with supporting diagrams that illustrate the pathways through which these factors affect food security.

- **Productivity:**

Productivity refers to the yield at the farm level. Food security is intrinsically linked to the domestic agricultural sector in Jamaica. This category encompasses various factors of domestic food production, including crop yield, crop sensitivity to natural hazards, and the agricultural workforce.

- **Distribution:**

Distribution pertains to the movement of food from farms to markets, households, and export destinations. This category includes the movement of goods nationally and internationally, including influences of domestic policy and external market forces. This category also captures the proportion of food lost through distribution as a result of inadequate storage, food waste, and transport infrastructure deficiencies.

- **Access:**

Access focuses on the household level food consumption and emphasizes the consumption of nutritious food across different demographics in Jamaica (e.g. urban versus rural, gender inequality). Factors influencing food access include affordability, household income, gender and education.

Many limiting factors trigger negative feedback loops. For instance, farm labor shortages and an ageing farm population can lead to reduced agricultural yields. This negatively impacts rural livelihoods, further accelerating migration to urban areas and exacerbating labor shortages.

The limiting factors and impacts across the three categories are interconnected. Although they are separated for clarity in this report, it is crucial to view them as components of a single, integrated system (as shown in Figure 2.1). The agricultural systems environment encompassing the farm and food distribution components will impact the social

and economic environment (national income, inequality and public health) thus impacting the longevity and efficiency of the agricultural system.

This report also identifies potential interventions to mitigate and address limiting factors. By disrupting negative feedback pathways, these interventions aim to improve food security outcomes.

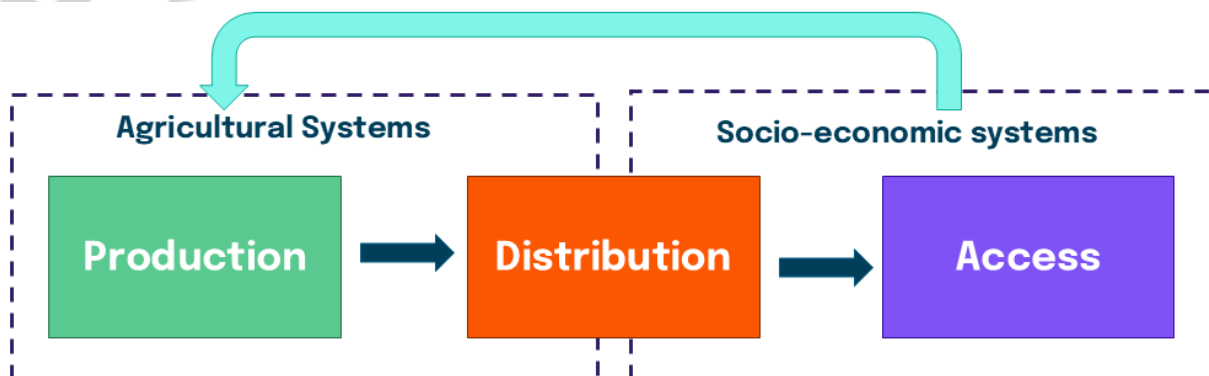


Figure 2.1: Conceptual diagram of food security pathways and limiting factors

Source: Authors

3 Background

3.1 Geographic profile

Jamaica is the third largest island and the largest English-speaking country in the Caribbean with an area of approximately 10,990 km². The island's topography is marked by a series of interior mountain ranges which extend from east to west, and a narrow coastal plain on which most of the major cities, towns, and critical infrastructure are located. The principal mountain range known as the Blue Mountains is situated in the eastern section of the island (Figure 3.1).

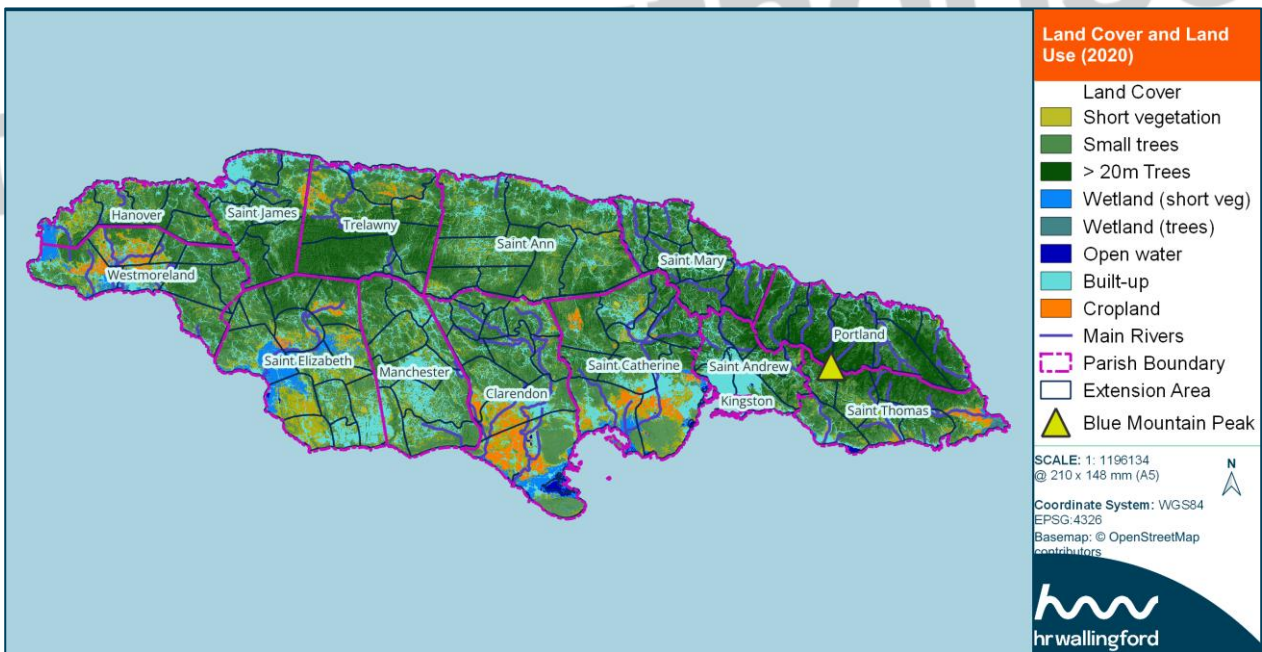


Figure 3.1: Land use and land cover map of Jamaica

Source: Land use data from Potapov et al (2022), map produced by authors

The island’s diverse terrain and geographic location contribute to its weather and climate. Jamaica has a tropical maritime climate with a characteristic bimodal rainfall temporal pattern with two main peak periods with higher values of rainfall and corresponding periods of lower rainfall amounts (Figure 3.2). The early rainfall season (May-June) is shorter and generally receives less rainfall than the later season which spans August through November, the latter coinciding with the peak in Atlantic hurricane activity. There is a brief drier period in July which separates the early and late wet seasons, which is often referred to as the midsummer drought (MSD). The MSD is a feature of a number of the Caribbean islands particularly in the northwestern part of the basin, though its relative timing may differ for each island. The dry season runs from December through March. There is also significant year-to-year annual average rainfall variability, largely due to the influence of the El Niño Southern Oscillation (ENSO) climate phenomenon.

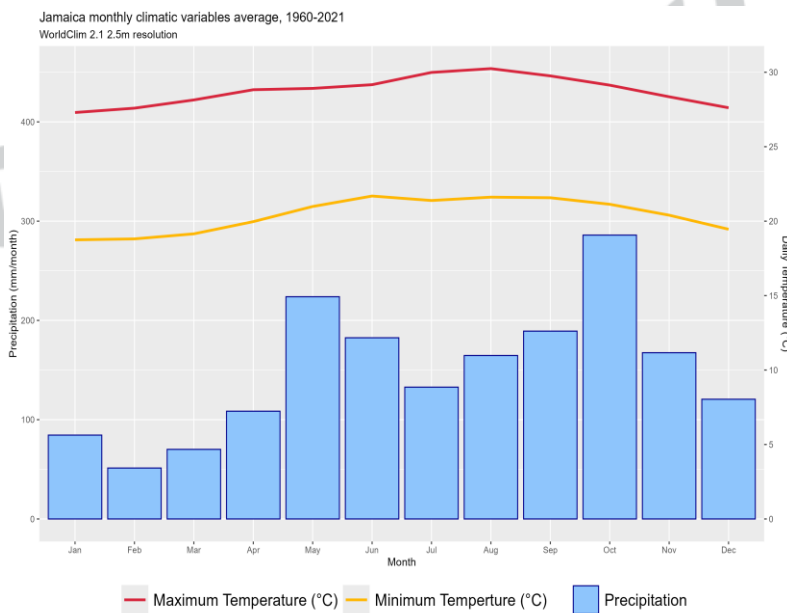


Figure 3.2: Jamaica monthly average climatology 1960-2021

Source: Data from WorldClim 2.1, graph produced by authors

The island’s climate is largely conditioned by its topography and interaction with large-scale atmospheric and oceanic processes such as the influence of the northeast trade winds, the Inter-Tropical Convergence Zone (ITCZ) and the North Atlantic High (NAH) pressure system. Despite Jamaica’s size, there is significant spatial variability in rainfall across the country which produces distinct ecological zones. The island records an average rainfall of 1,960 mm per year, with the northeastern section of the island receiving the vast majority of rainfall due to the orographic influence of the Blue Mountains. Rainfall totals are generally much lower in the southwestern section of the island which lies in a rain shadow region.

Jamaica lies in the Main Development Region for tropical cyclone activity in the Atlantic, which exposes the country to potential impacts from hurricanes and tropical storms each year. The hurricane season typically runs from June to November, peaking in September. The island has been impacted by several major hurricanes in recent decades and Jamaica has experienced more Category 4 or 5 hurricanes in the last few decades compared to earlier periods, with the number of storms directly and indirectly affecting Jamaica in the 2000s being the highest since 1940-1959 (CSGM, 2021).

3.2 Socio-economic context

Jamaica is classified as an upper-middle-income country and recorded a GDP per capita of USD 6,840 in 2023 (World Bank). Administratively, the island is divided into 14 parishes, which serve as the main units of local government. Kingston, the capital city, is the largest urban area and a central hub for economic activities. Other major urban centers include Spanish Town (Saint Catherine parish) and Montego Bay (Saint James parish).

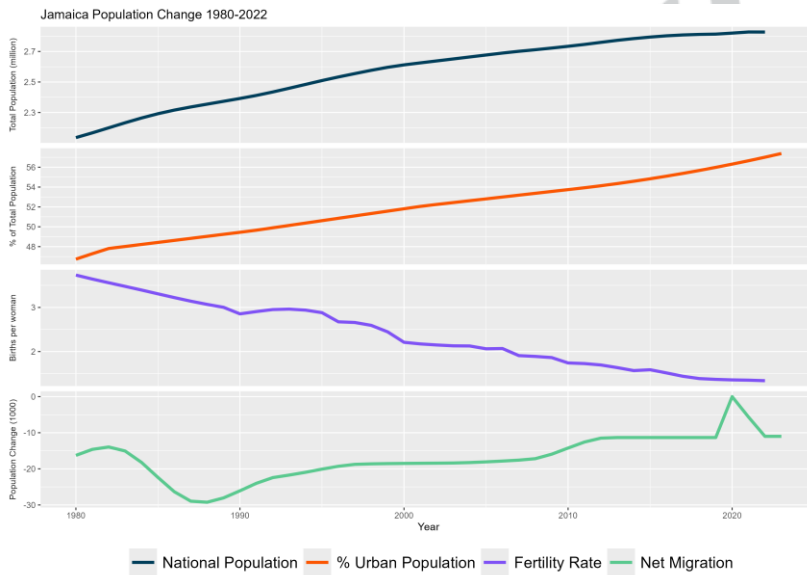


Figure 3.3: Jamaica Population Statistics

Source: Data from The World Bank (2024), graph produced by authors.

between the 2001 and 2011 census indicated a decline of 16.68 % of children aged 14 and under and a 16.26 % increase of the population age 60 and over. Consistent with the declining child population is a decline in the average household size, which in 2021 was 2.8 persons.

The country’s population is also unevenly distributed with 57.4 % residing in urban zones and 42.6 % in rural areas (The World Bank, 2024). More than half of Jamaica’s population reside in the parishes of Kingston, Saint Andrew, Saint Catherine and Clarendon. The vast majority of which live in the Kingston Metropolitan Region (KMR), which comprises the urban centers of Kingston, Spanish Town, Portmore and Old Harbour. Domestic rural to urban migration has contributed to the accelerated growth of the country’s urban areas, corresponding with a low but steady decline in rural areas (see Figure 3.3). This has resulted in an aging rural population as younger age groups migrate to urban centers in search of economic opportunities. This is shown visually in Figure 3.5, comparing Kingston with the rural and agricultural parish of St. Elizabeth. St Elizabeth has a higher proportion of elderly people (age 60 and over), but a relatively lower number of people aged 20-44.

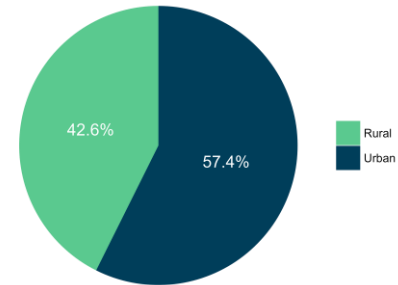


Figure 3.4: Rural and urban population distribution (2022)

Source: Data from World Bank, graphic produced by authors

In 2023, Jamaica's population stood at 2,825,544. Census records indicate that the country’s population growth rate has effectively plateaued, following a decline in growth rate over the last 30-years. The deceleration in the country’s annual total population growth rate is influenced by a combination of high net out-migration and declining fertility rates (Figure 3.3).

In terms of population structure, the Planning Institute of Jamaica (PIOJ) estimates that 67.5 % of the population is of working age (15 - 65 years of age). However, the population is ageing: the period

The GDP has been rising over recent decades (up from USD 3,392 in 2000) but declined in the year following 2020 due to the impact of the Covid-19 pandemic. However, these figures mask income disparities at the subnational level. As of 2022, 19 % of Jamaica’s population lived below the national poverty line, with several communities poverty rate exceeding 60 % (Figure 3.7; MONA, 2016). The percentage of rural families living in poverty is twice the rate of poverty in Kingston; parishes that have a large rural population (such as Hanover, Westmoreland, St. Elizabeth, and Trelawny) comprises some of the highest poverty rates for the country (CIDA 2009; World Bank, IADB). Figure 3.6 and Figure 3.7 highlight that rural areas with low population density are correlated with those of high poverty rates. Female headed households account for two-thirds of all poor households (CIDA, 2009) and earn a lower average income (World Bank, 2023). The rural-urban demographics and how they are linked with food security are further discussed in section 4.1 and 4.3.

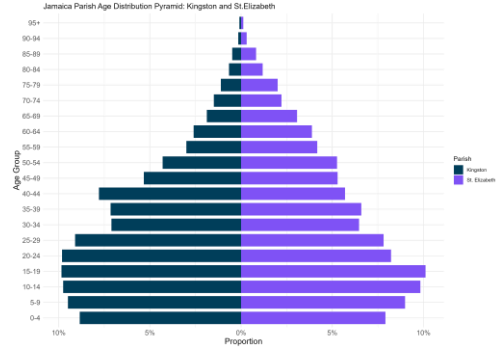


Figure 3.5: Age distribution (%) for Kingston and St Elizabeth parishes (2016)

Source: Data from Mona GeoInformatics Institute/Mona Informatix Ltd. Graph produced by authors

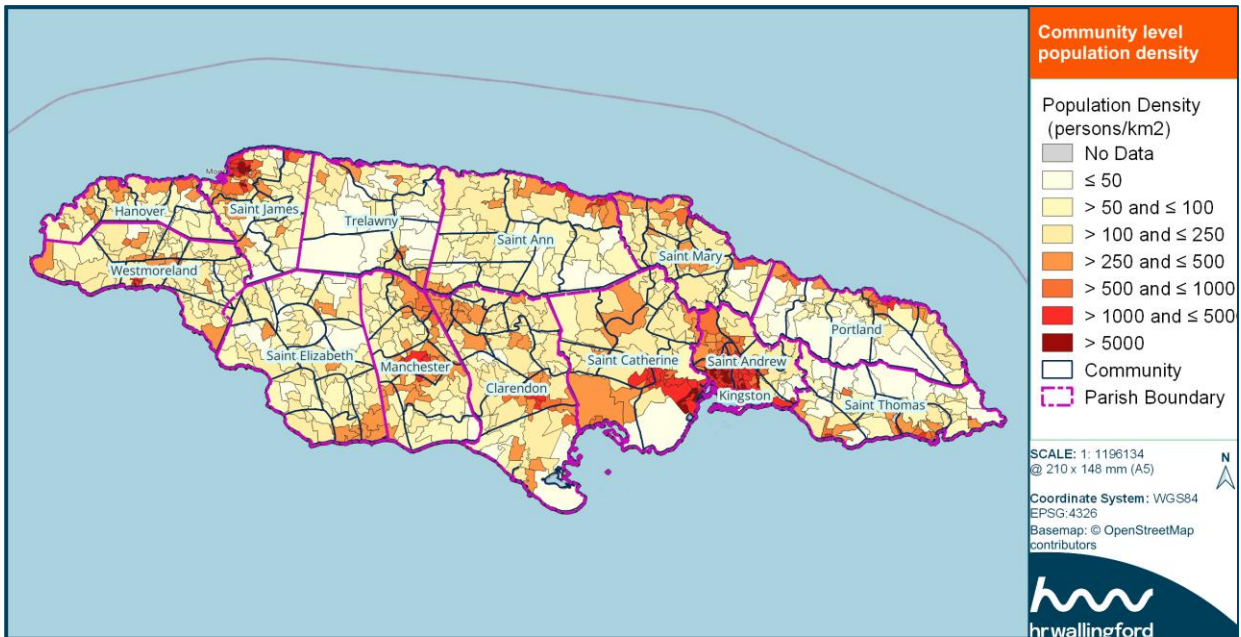


Figure 3.6: Jamaica community level population density (2016)

Source: Data from Mona GeoInformatics Institute/Mona Informatix Ltd. Map produced by authors

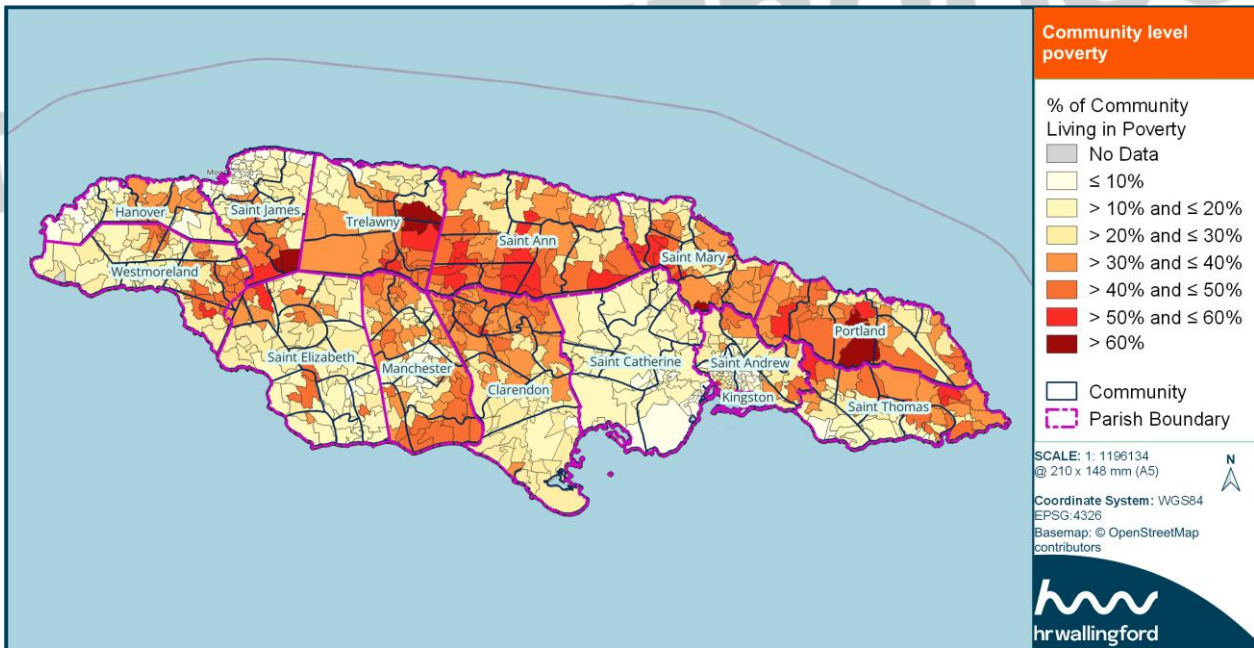


Figure 3.7: Jamaica community level population poverty (2016)

Source: Data from Mona Geoinformatics Institute/Mona Informatix Ltd. Map produced by authors.

4 Limiting factors that lead to food insecurity

4.1 Productivity: The agricultural story

Key messages

Food security begins at the farm. Jamaica has the potential for high agricultural productivity owing to its warm climate and fertile lands. However, the actual yield is constrained by several limiting factors.

The agricultural sector represents a critical component of Jamaica's national development strategy, contributing just over 8% of Jamaica's Gross Domestic Product (GDP) in 2020 and serving as a significant source of employment, foreign exchange earnings and rural livelihoods. The sector employs approximately 258,000 registered farmers that represent an estimated 15 % of Jamaica's labor force, supporting over 200,000 farm households. (ABIS, 2024; RADA, 2021). This sector is therefore highly important in terms of national food security and poverty alleviation.

The key limiting factors for agricultural productivity have been identified as:

- Market volatility and competition with imported goods.
- Insecure land tenure and imbalanced farmer demographics.
- Decline of soil fertility and unsustainable farming practices.
- Regional variability and exposure to climate and weather related hazards.

The key opportunities for intervention to improve agricultural productivity have been identified as:

1. **Training and Education:** Investing in educational programs to equip farmers with the knowledge and skills to adopt innovative agricultural practices, improve productivity, and enhance resilience to climate change.
2. **Improvement of Climate Information Services (CIS):** Enhancing the accessibility and usability of climate information services to empower farmers to make informed decisions. This includes improving internet connectivity, simplifying the delivery of climate-related information, and providing targeted training on how to utilize these services effectively.
3. **Investment in irrigation systems:** Expanding access to irrigation to help mitigate the impacts of droughts and ensure a more consistent supply of water for crops.
4. **Promotion of drought-tolerant crop varieties:** Encouraging the adoption of drought-resistant and climate-resilient crop varieties to enhance agricultural productivity and food security in the face of climate challenges.
5. **Support for innovative agricultural practices:** Encouraging practices such as intercropping, crop rotation, and integrated pest management can improve soil health and crop resilience, leading to higher yields.
6. **Access to financial resources:** Economic support for small-scale farmers following climate shocks to facilitate quick recovery and prevent a long term yield reduction. This should focus on supporting farmers with limited savings and insecure farm tenure.
7. **Community collaboration and farmer groups:** Promoting the formation of farmer groups to foster knowledge sharing, collaboration, and support among farmers, enhancing their capacity to address common challenges and adopt best practices. This will also improve communication of market needs and place small-scale farmers in an empowered position to grow crops with a high market value.
8. **Utilization of technology:** Introducing modern agricultural technologies, such as drip irrigation and soil testing services, to provide farmers with the tools needed to optimize their production and manage resources effectively.
9. **Collate data on soil health and land fertility:** Consider an initiative to collate national data related to soil quality to understand trends in land quality in response to crop diversity and climate hazards. This could be completed by training farmers on local soil data collection to contribute to a national database. This will help track trends across Jamaica and prioritise restoration in regions with poor land quality by training farmers in good agricultural practices.

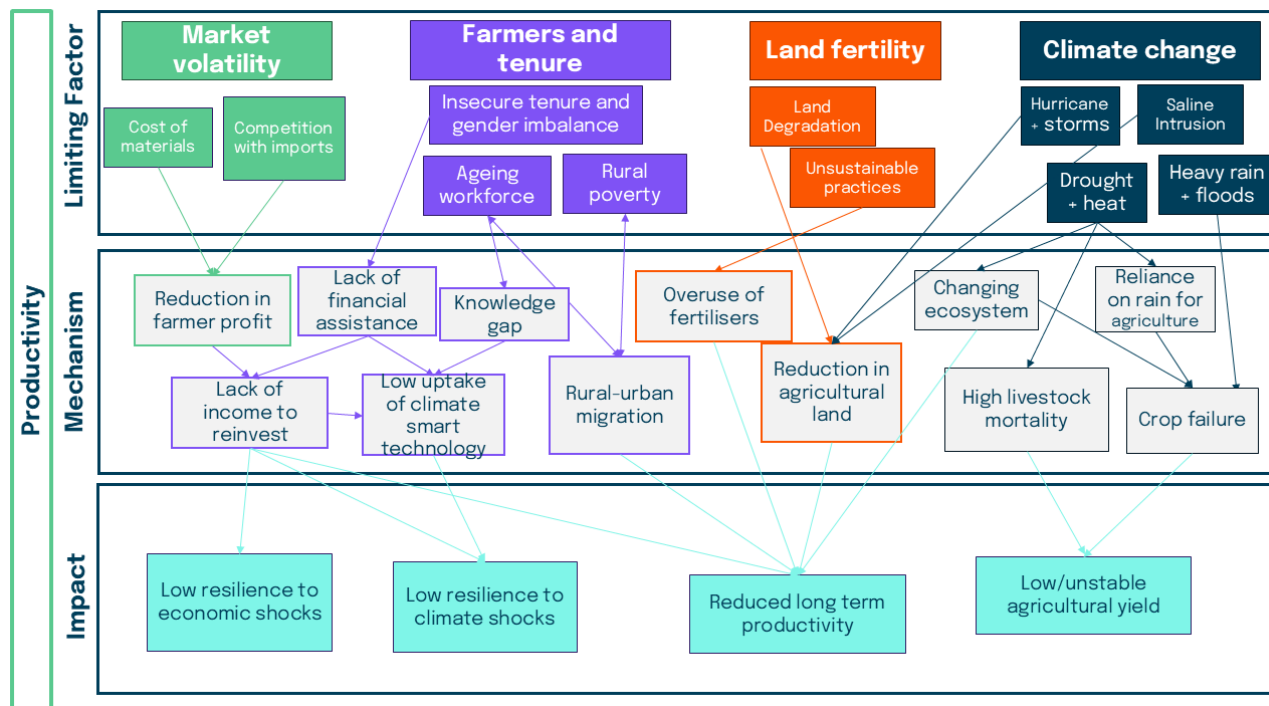


Figure 4.1: Limiting factors to food productivity conceptual diagram

Source: Authors

Market volatility and competition with imported goods

Agricultural production in Jamaica has fluctuated significantly over recent decades, with the overall decline being coupled with an increasing reliance on food imports and increased vulnerability to food price volatility and food price inflation (FAO, 2021).

The domestic agricultural sector, with limited use of modern inputs, poor farming practices, restricted water access, and climate-related losses (The World Bank, 2022), struggles to compete with cheaper imported goods risks made possible by trade liberalization. This risks making local food production unprofitable and putting smallholder farmers out of business. This has been particularly significant in the poultry and dairy sector.

Reviews of trade liberalization (e.g. White et al., 2004) have shown that despite macroeconomic policies improving Jamaica’s economy since the late 1990s, there has been a negative impact on poverty rates, notably in rural areas. Trends in the volume and type of crop grown across the parishes are also influenced by national policy. Domestic and national export markets including the cost of production prices (e.g. cost of seeds and fertilizers) and the price at market also influence the farm yield. These factors make market volatility a key factor in shaping agricultural adaptation and intervention strategies.

From 1961 to 2020, yields declined for traditional crops like sugar cane, cocoa, bananas, and pineapples (Figure 4.2). This is in part driven by market volatility and competition (linked to trade liberalization) since traditional crops are facing increased competition from cheaper imports. This discourages farmers from investing in these crops. Furthermore, sugar cane and bananas are particularly vulnerable to extreme weather events due to temperature sensitivity and water dependency.

Meanwhile, crop productivity has been increasing for others such as sweet potatoes, yams, and coffee (Figure 4.3). The increase, in particular fruits and vegetables, has been in part driven by high demand from the tourism industry,

hospitality and, retail sectors. Sweet potatoes and yams have also been reported by Jamaican parish extension officers as being relatively more adapted to climate variability (HR Wallingford, 2025).

While Jamaica is likely to remain intrinsically linked to the global food market, measures can be taken to improve Jamaica’s standing in relation to the global market. Firstly, providing small-scale farmers with guidance on market demand and future projections will empower small-scale farmers to adjust their infrastructure and agricultural land accordingly. In addition, Jamaica should prioritize the production of value-added foods such as condiments, sauces and ready-to-eat products (Ministry of Industry Investment and Commerce, 2024). This should be in combination with maintaining a diverse domestic agricultural sector so that Jamaica’s food security is insulated against global food price inflation.

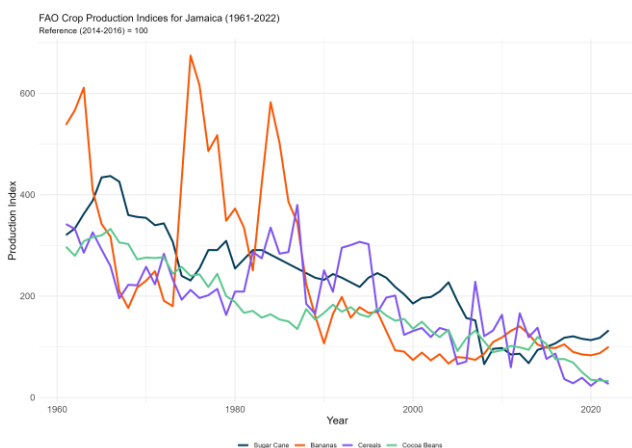


Figure 4.2: Declining trends in the production of key crops (1961 – 2022)

Source: FAOSTAT Production Indices (2022a)

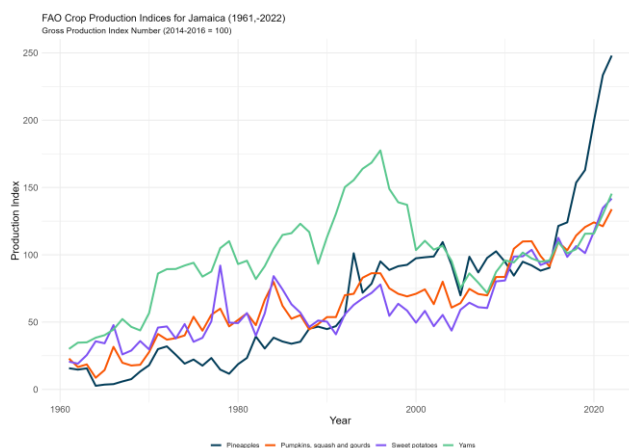


Figure 4.3: Increasing trends in the production of key crops (1961 – 2022)

Source: FAOSTAT Production Indices (2022a)

Farm demographics and land tenure

Agricultural land in Jamaica is unequally distributed both in terms of land size and quality. Jamaica has a long history of unequal agricultural land distribution, with most of the best suited agricultural lands concentrated among a small number of large farms (Figure 4.4). Small-scale farmers (farms of 2 hectares/5 acres or less) are the most resource deficient, having access to less than 15 % of total arable land. Small-scale farmers often do not own their land and instead have a farm tenancy arrangement or cultivate family landed handed down informally across generations (Bedasse, 2018). These land tenures are often insecure, and few rural landholders have written documents of their rights to land (PIOJ, 2019).

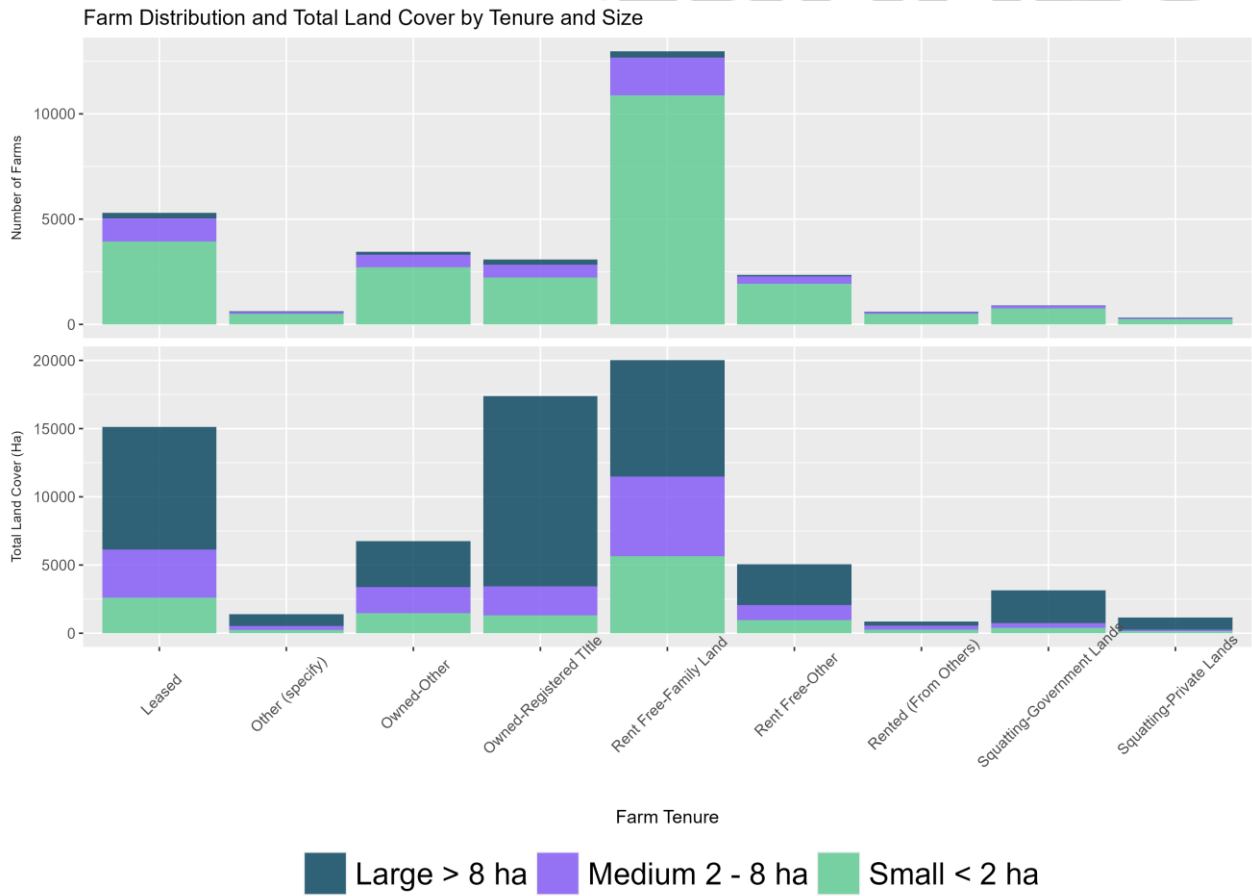


Figure 4.4: Number of farms and total farm land area by farm tenure

Source: ABIS (2024), graph created by authors. Farm size categories from FAO

Further, there is also gender disparities in land ownership. Women account for only 33% of registered farmers (ABIS, 2024). Men tend to have greater access to ownership and use of land resources than women, as only about 11% of female farmers own the land which they cultivate (RADA). And while there is limited disaggregated data on the roles women play in the food production system, data from RADA indicates that most female farmers are between the ages of 35 and 65 years and most are believed to be small farmers with significant involvement in the production, as well as marketing and processing of fresh food.

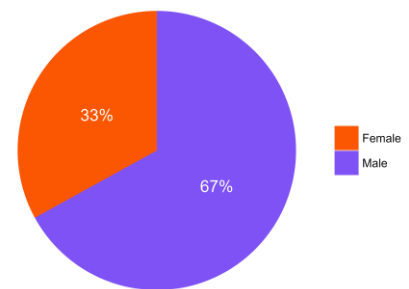


Figure 4.5: Gender of registered farmers

Source: ABIS (2024)

As with farmers of insecure land tenures, women who lack ownership or formal land tenures do not have the ability to invest in their farm and generate a high yield. Women farmers' ability to invest in their farms may also be impacted by traditionally prescribed gendered norms, such as household caregiving responsibilities, which may impact their ability to tend to their lands compared to their male counterparts. Insecure land tenure can hinder access to capital to invest in improved farming practices and technologies, as well as prepare for natural hazards or market shocks. A negative consequence of tenure insecurity has been low productivity and increased risks of livelihood displacement.

The average age of farmers is increasing. Most farmers (approximately 89 %) are above the age of 45, with 31 % being above the age of 75 years. This is primarily driven by rural-urban migration and the prospect of prosperous and secure livelihoods in urban areas. This poses a significant risk to the future of agriculture, particularly in smallholder farms, where a dwindling agricultural workforce may result in loss of yield and the inability to recover and respond to external shocks such as market volatility and natural hazards.

Insecure land tenure coupled with a dwindling and ageing agricultural workforce is considered to be a key limiting factor leading to food insecurity. This is because these farmers with short tenures have limited access to resources and capital and therefore have limited ability to prepare for and recover from external shocks, resulting in a low agricultural yield.

Land fertility and unsustainable farming practices

Small-scale farmers cultivate mainly root crops, pulses and vegetables and cultivate land typically in the rugged interior of the island. In Jamaica, more than three quarters of small farmers cultivate on hillsides and are dependent on rainfall for irrigation. Production is generally done in open field mixed farming systems and is very labor intensive, which generally translates to an increase in the cost of production. Unsustainable farming activities on slopes in upper watershed regions have been recognized as the main cause of land degradation, thus impacting future yield potential (USAID, 2021). Smallholder systems are therefore disproportionately exposed to landslides and soil erosion as they tend to occupy less suitable arable land.

The effects of agrochemicals misuse on farmers’ health must also be considered, as recurring medical expenses often erodes income and diverts human and other resource that might have otherwise been invested in building resilience. The interaction of climate change and variability with the complex topography and fragile degraded soils pose a growing risk to the dependent livelihoods and food security.

By comparison, large plantations tend to dominate the more fertile coastal plains. With the dominant share of fertile land, the large-scale plantations tend to have a higher agricultural yield, thus providing economic stability and the ability to invest in intervention strategies to ensure longevity of the farm. This includes improved irrigation technologies, climate forecasting and storage facilities to prevent post-harvest losses.

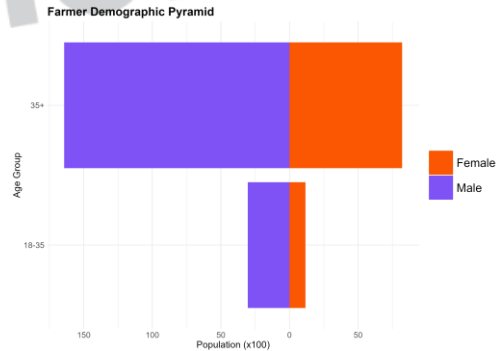


Figure 4.6: Age distribution of registered farmers

Source: Data from ABIS (2024)



Figure 4.7: Agroforestry in Jamaica’s Blue Mountain region

Agroforestry is an agricultural technique which has the potential to mitigate against declining land fertility and degradation. Agroforestry is the intentional integration of trees and shrubs into agricultural systems to create environmental, economic, and social benefits. This practice combines agriculture and forestry technologies to form more diverse, productive, and sustainable land-use system (USDA, 2017). In Jamaica, this practice has potential benefits for fruit trees in particular; it is a recommended practice for slopes 25 % - 50 % gradient (FAO, 2014). This helps maintain soil fertility, water conservation and reduce the risk of erosion as the tree roots stabilize the land.

Source: Jamaica conservation and development trust

However, despite promotion from RADA, Jamaica has a low success rate of agroforestry due to a lack of resources for small farmers without the sustained input of external funding.

Furthermore, there is a lack of a national overview in soil fertility and land quality. This data would be beneficial to understand the linkages between agricultural practices, crop diversity and extreme weather on agricultural land quality. Such a database would help facilitate guidance on best practices and prioritize locations where intervention is required.

Regional Variability and Exposure to Climate Hazards

The regional disparity in land tenures and the cultivated crops is linked to the exposure to climate and weather related hazards. The types of crops grown across Jamaica varies according to the local climate and land type. Shifting climate patterns therefore poses a significant risk to the current crop distribution across Jamaica. Localized guidance on crop climate suitability in future climate is essential to ensure the resilience of the agricultural sector to climate change.

Figure 4.8 shows the distribution of the major crops in the six major agricultural parishes.

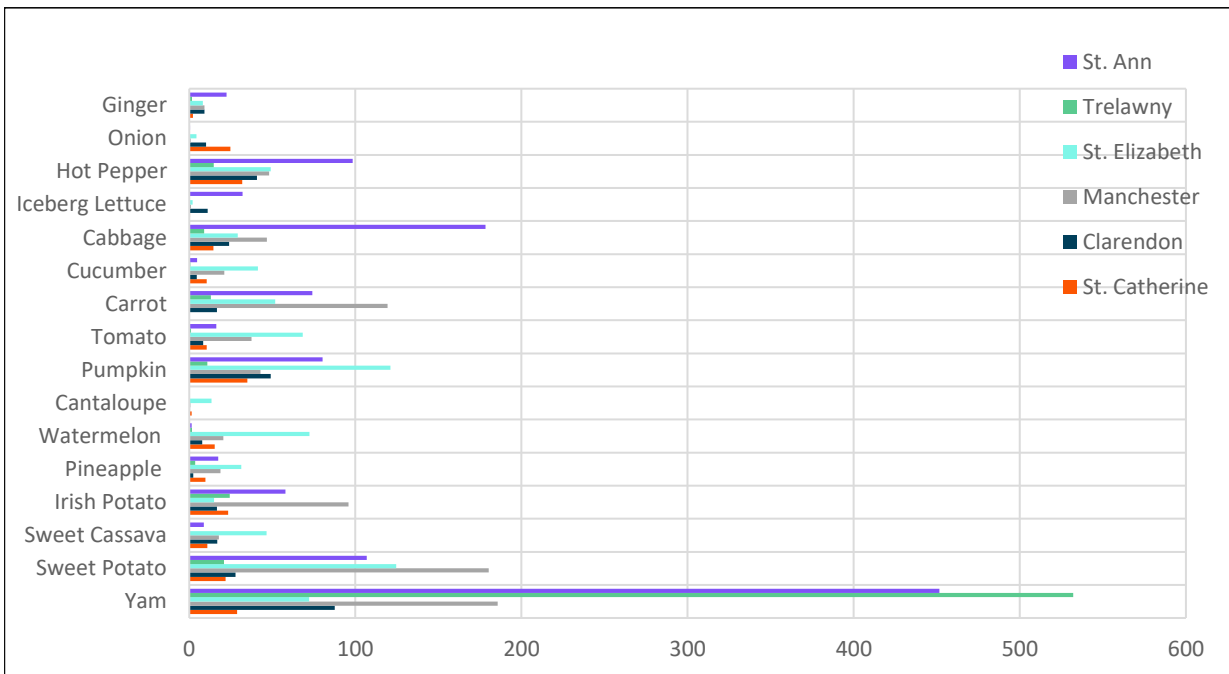


Figure 4.8: Main Production Zones for Selected Crops

Source: Jamaica Agri-Business Information System (ABIS)

St. Elizabeth, known as the breadbasket of Jamaica, and the southern plains of the parish produce some of the largest volumes of fruits, vegetables and herbs and spices on the. A significant portion of these crops are grown in open field

and rainfed systems, where farmers have adapted a range of dry farming techniques such as mulching to cope with the drier and warmer climate characteristic of the region (Gamble et al., 2010), with average rainfall being 30 % lower than the national average (CSGM, 2012). Rainfed agriculture is particularly susceptible to droughts and rainfall variability, potentially increasing the vulnerability of small-scale farmers to climate related shocks (Eitzinger et al., 2022).

Therefore drought and rainfall variability are key limiting factors for agricultural productivity and food security. The agricultural sector is considered as one of the most climate sensitive industries in Jamaica given its reliance on favourable conditions for optimal production and normalcy (GOJ, 2015).

In accordance with farmer perceptions of worsening drought conditions, satellite estimates of rainfall suggest that severe (high magnitude/long-duration) drought events are becoming more frequent in St Elizabeth and the southern plains. Gamble et al. (2010) showed that the early growing season (which aligns with the smaller early rainy season for the island) is drying faster than the primary growing season in September-October. The study also highlighted that smallholder farmers need assistance in adapting to changes in rainfall patterns as existing coping strategies and traditional land management practices may not be sufficient to offset the impacts of future climatic changes. These findings have been supported by other local studies, that have highlighted the complex interactions between shifting rainfall patterns and farmer perception and attitude towards climatic changes (Gamble et al., 2017). Local knowledge of these climate patterns is essential in the agricultural business to determine the optimal time for planting and harvesting different crops.

Most farming systems lack irrigation. Despite having one of the largest amounts of agricultural land areas in the Caribbean, less than 10 % of the land is irrigated in Jamaica. Figure 4.9 shows that the proportion of cropland under irrigation varies across the country and there are many regions which experience low annual rainfall and additionally lack sufficient irrigation.

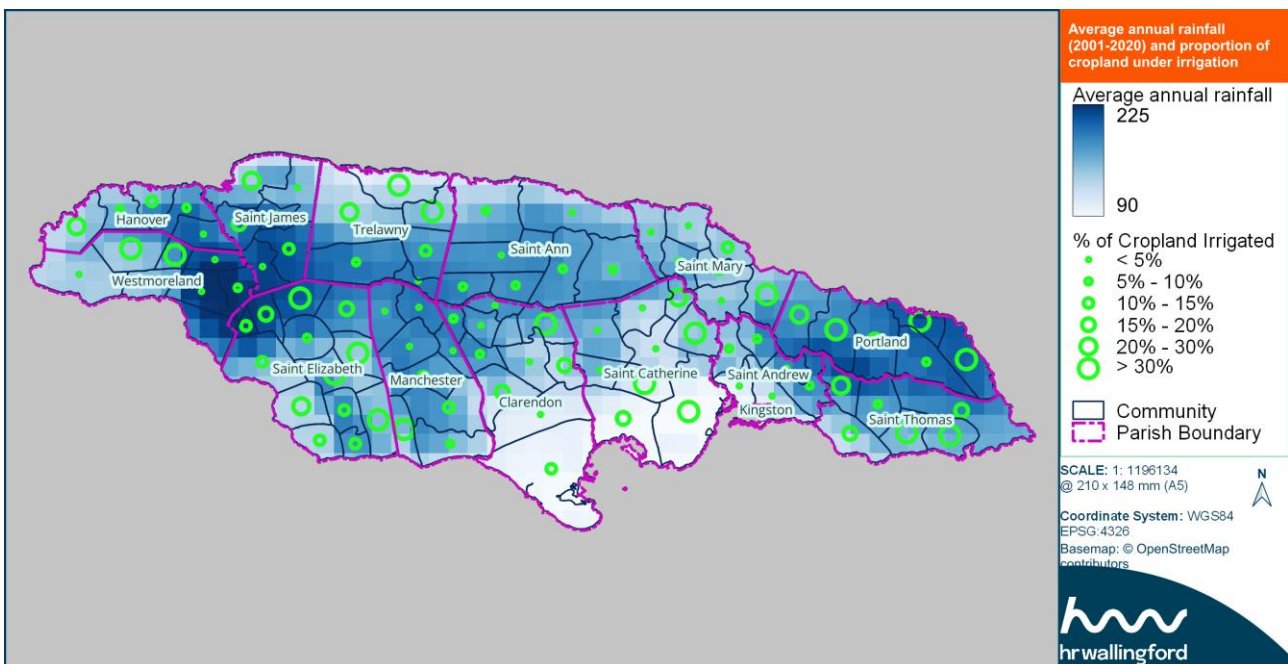


Figure 4.9: Average annual rainfall (2001-2020) with reported farm irrigation facilities

Source: Climate data processed for WorldClim 2.1 2.5m resolution. Farm data from ABIS (2024). Map produced by authors

Figure 4.10 highlights that while the total area of irrigated land is low amongst all farm tenure arrangements, those with a registered land title are more likely to use irrigation. This lack of irrigation infrastructure, along with difficulties procuring water during extended drought periods – linked to limited state capacity and restrictive costs - exacerbates the challenges created by drying conditions (Campbell et al., 2011). In addition, during extended periods of drought, there are higher mortality rates among livestock, decreased livestock yields, and greater competition for water with other sectors.

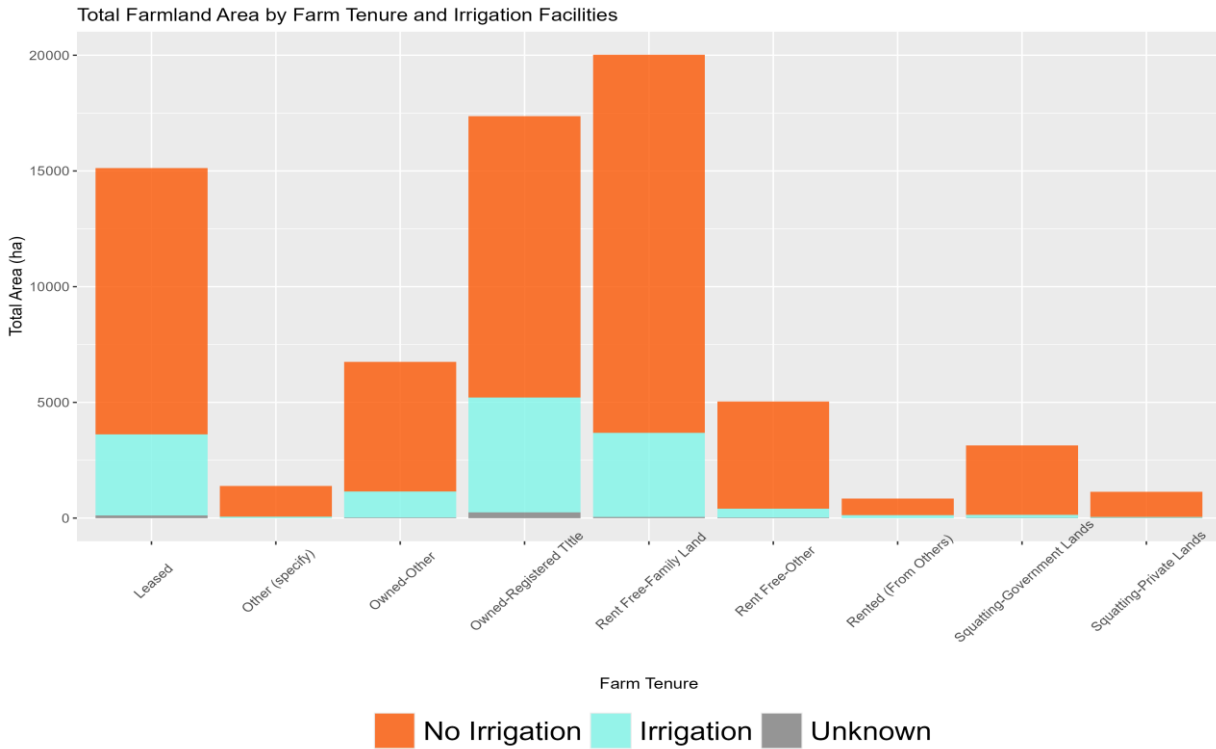


Figure 4.10: Total farmland area irrigated and non-irrigated by farm tenure category

Source: ABIS (2024), graph produced by authors

Coupled with rainfall variability is rising temperatures. Figure 4.11 shows the average rising temperature (daily maximum and night minimum) over 20-year periods between 1960 and 2021.

Jamaica climatic variables seasonal change, 1960-2021
 WorldClim 2.1 2.5m resolution

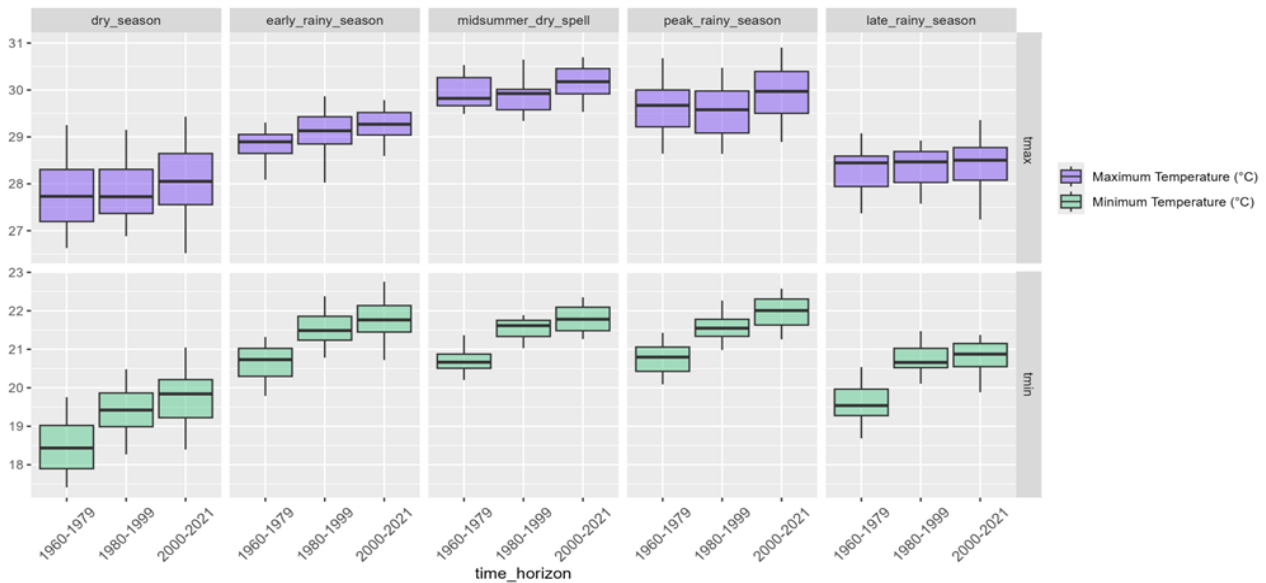


Figure 4.11: Annual average daily minimum and maximum temperature by season, for the 20-year periods between 1960 and 2021.

Source: Climate data processed for WorldClim 2.1 2.5m resolution. Graph produced by authors

The temperature is rising across all seasons, with the most significant increase occurring at night (daily minimum temperature) meaning that the diurnal difference is decreasing. The rising temperature exacerbates droughts, and increases the risk of crop and livestock mortality. In addition, there is greater difficulty maintaining food freshness through the supply chain without adequate storage facilities and efficient market networks (this is discussed further in section 4.2). While droughts and rainfall variability are recognised as dominant natural hazards limiting agricultural productivity across the island, hurricanes and tropical storms, particularly in the eastern and southern regions, have caused significant damage, including USD 143 million in crop losses from storms like Ivan (2004) and Sandy (2012). Flooding exacerbates losses through farm inundation, soil nutrient depletion, infrastructure damage, and delays in farming activities, reducing food security and incomes. Additionally, climate change increases pest and disease risks, harming food production and security. Recent outbreaks, such as Beet Armyworm (onions), coffee leaf rust, and fungal diseases in yams, have caused major crop losses. These events raise production costs, management demands, and risks to biodiversity and food safety.

4.2 Distribution: Food imports and exports in Jamaica

Key messages

The distribution of food from farm to table is a key component of food security. This encompasses the distribution of both locally produced food and imported food. Inefficiencies in the distribution supply chain can result in high food waste, thus limiting both farmer income and national food security. The efficiency of distribution networks vary across Jamaica owing to the centralized market system and poor road infrastructure in rural regions.

The key limiting factors for agricultural productivity have been identified as:

- Limited access to adequate food storage facilities resulting in post-harvest loss due to extreme weather and pest outbreaks.
- Limited institutional capacity to deliver training.
- Centralized market access and poor roads and infrastructure.

The key opportunities for intervention to improve food distribution networks have been identified as:

1. **Enhancing infrastructure:** Investing in the improvement of road conditions and transportation facilities to aid in the efficient movement of agricultural products from farms to markets. This includes repairing existing roads and developing new transport routes to reduce travel time and costs.
2. **Establishing storage facilities:** The lack of adequate food storage facilities is a critical barrier. Developing new and upgrading existing storage solutions will help reduce post-harvest losses and ensure that food can be stored safely until it reaches consumers. This could include community-based storage solutions that are economically feasible for local farmers.
3. **Facilitating access to market information:** Providing farmers with timely and relevant market information can empower them to make informed decisions about when and where to sell their produce. This could include information on market prices, demand trends, and buyer requirements.
4. **Strengthening cooperative models:** Encouraging the formation of farmer cooperatives can enhance collective bargaining power, improve access to resources, and facilitate better distribution of produce. Cooperatives can also share transportation resources and storage facilities, making them more efficient.
5. **Training and capacity building:** Offering training programs focused on logistics, supply chain management, and market access can equip farmers with the skills needed to navigate the distribution landscape effectively. This includes educating them on best practices for handling and transporting food products to maintain quality.
6. **Developing value chains:** Robust value chains that connect farmers with processors, distributors, and retailers can enhance the overall efficiency of food distribution networks. This involves ensuring that each link in the chain is optimized for performance and sustainability.
7. **Policy support and incentives:** Advocating for government policies that support food distribution improvements, such as subsidies for transportation costs, grants for storage facility development, or tax incentives for businesses engaged in food distribution, can create a more favourable operating environment for all stakeholders involved.
8. **Promoting local and regional markets:** Encouraging the consumption of locally grown food can reduce reliance on external sources and strengthen local economies. Initiatives that promote farmers' markets and support farm-to-table programs can enhance the visibility and accessibility of local produce.

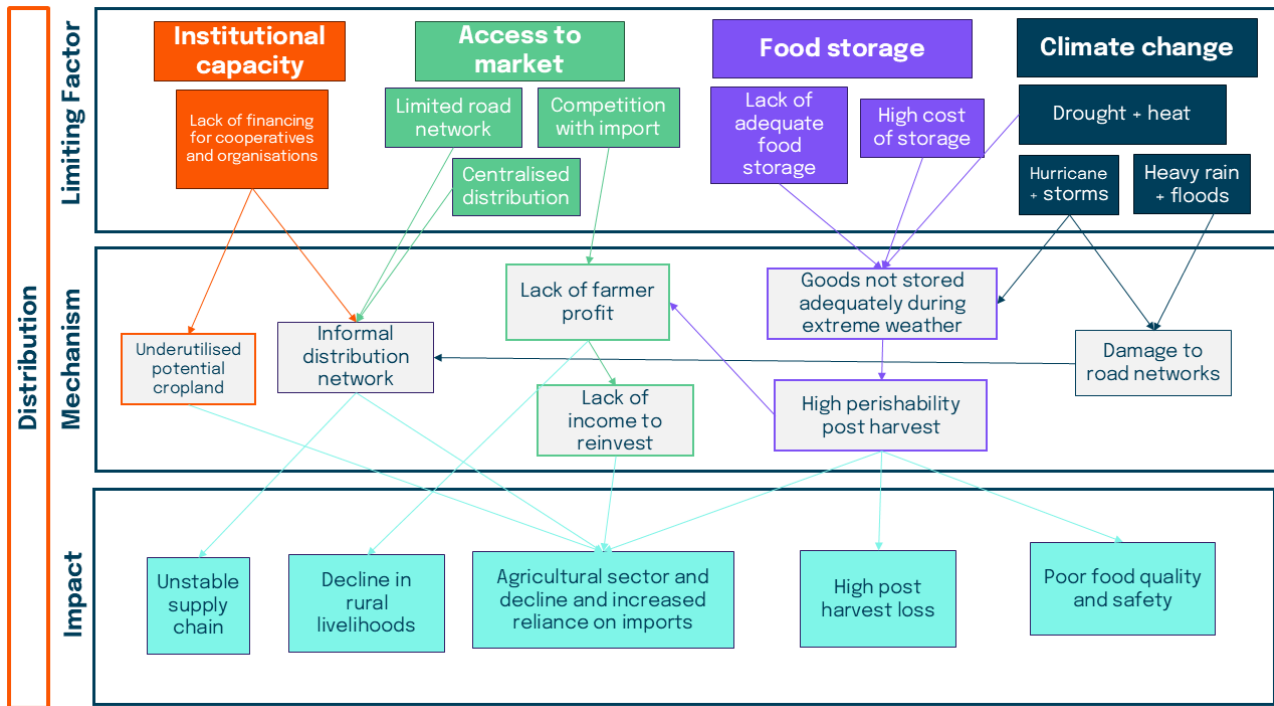


Figure 4.12: Limiting factors to food distribution conceptual diagram

Source: Authors

Food storage and post-harvest loss

Within the food production cycle, food loss is estimated at 30–40 % (FAO, 2021). This is largely due to pest and disease outbreaks, extreme weather (especially from droughts, hurricanes, and floods), improper packaging, insufficient or lack of storage, rough handling and the overloading of transportation moving produce to markets.

While there is an absence of data on this issue in Jamaica, pest and disease outbreaks are reported to destroy up to 40 % of crops before harvest and approximately 20-30 % of the national domestic food production post-harvest.

In a survey distributed to parish extension officers (HR Wallingford, 2025), 83 % of responders said that there were no storage facilities in the extension area, and a further 6.4 % said facilities that did exist were not fit for purpose (Figure 4.13). The most cited reason for the storage facilities being not fit for purpose was that it is not economical for farmers.

Disruptions in local food production threaten both farmers' incomes and domestic food security by driving up food prices (Rhiney et al., 2018). Projected increases in temperature, and frequency of extreme weather events (drought, storms, and floods), coupled with inadequate production and post-harvest handling practices underscore the need for urgent action to transform the food system supply chain. Addressing these challenges requires tackling other critical issues, such as

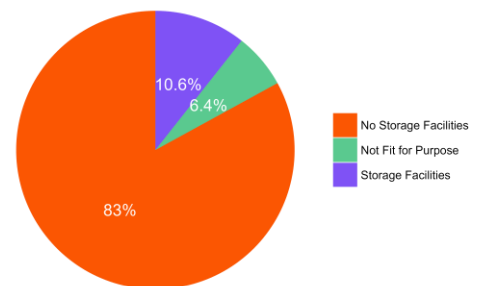


Figure 4.13: Parish extension officers survey response to presence and adequacy of storage facilities.

Source: HR Wallingford (2025) survey results. This statistic is caveated by the number of responses received in this survey (see HR Wallingford, 2025 for further information).

limited technical capacity among farmers and extension agencies, insufficient capital for storage infrastructure, and poor coordination, information flow, and cooperation within the value chain.

Institutional Capacity

The impact of climate-driven shocks and stressors are also exacerbated by inherent market system weaknesses and inefficiencies. COVID 19 has demonstrated the additional complexities of non-climate shocks and their impact on supply chains, small farmers' income, and food security. More than 100,000 farmers are members in about 39 agricultural cooperatives, most of which are in the rural areas. There are also a significant number of producer organizations. This network of farmer organizations (Jamaica Agricultural Society, Producer Marketing Organizations and other producer groups) aid members' access to information and services such as training and the dissemination of new resilient practices. This provides a foundation of lessons and best practices especially in drought management responses that can be scaled and replicated.

Supporting this, a survey distributed to parish extension officers in 2024 revealed that over 50 % of respondents listed training programs for farmers as the most effective to boost productivity and resilience to climate shocks (HR Wallingford, 2025).

However, agricultural cooperatives and farming organizations face many challenges for their sustainable operations such as poor management, inadequate financing, and limited integration. The Rural Agricultural Development Authority (RADA) is the main institution providing extension and advisory services to small farmers within the project area. It delivers agronomic knowledge and agricultural marketing information, collects data on demand and supply in some local markets, and allocates rural development budget transfers. However, the technical capacity of extension workers, particularly on climate-resilient agriculture, needs to be strengthened.

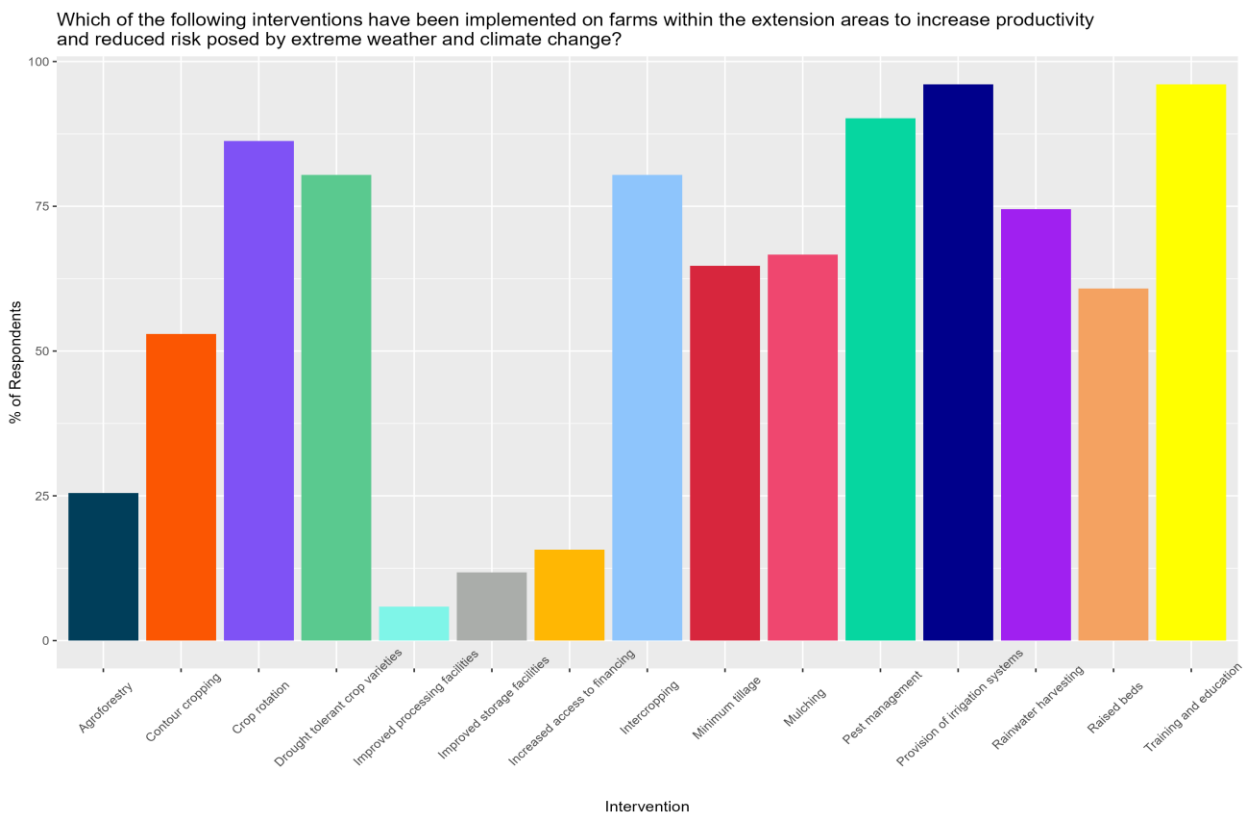


Figure 4.14: Extension officer survey results for interventions within farms across Jamaica

Source: HR Wallingford (2025)

Market Access

Smallholder farmers operate within value chains that are not efficient and are characterised by poor coordination, information flow and cooperation between the links, resulting in delivery delays and produce quality decline. Market intelligence efforts to understand destination market demands (local and overseas) and requirements are limited, and such information often does not reach farmers to inform planning.

There are significant inefficiencies in the municipal market and Coronation Market infrastructure that serve producers from the target parishes. The current centralized marketing system is heavily reliant on pedlars (higglers) for the movement of produce which usually compromises food safety, quality, and the shelf life of fresh produce.

Approximately 60–70 % of domestic food produced in rural Jamaica moves through Coronation Market in the Kingston Metropolitan Area (KMA) to distributors, such as retailers (56 % market share), wholesalers (13 %) and operators of whole and retail markets (31 %) within the KMA. This highly centralized marketing system dictates the movement of produce, while simultaneously causing high post-harvest losses and food safety issues. As a result, farmers lose out on their initial investment in production and forgo as much as 50 % of their potential income. There is potential however to engage with more structured transporters and aggregators that target the hotels, large restaurant chains and retailers as they possess the capacity to properly transport (refrigerated), package (crates and ventilated bags) and store the produce to enhance their storage life.

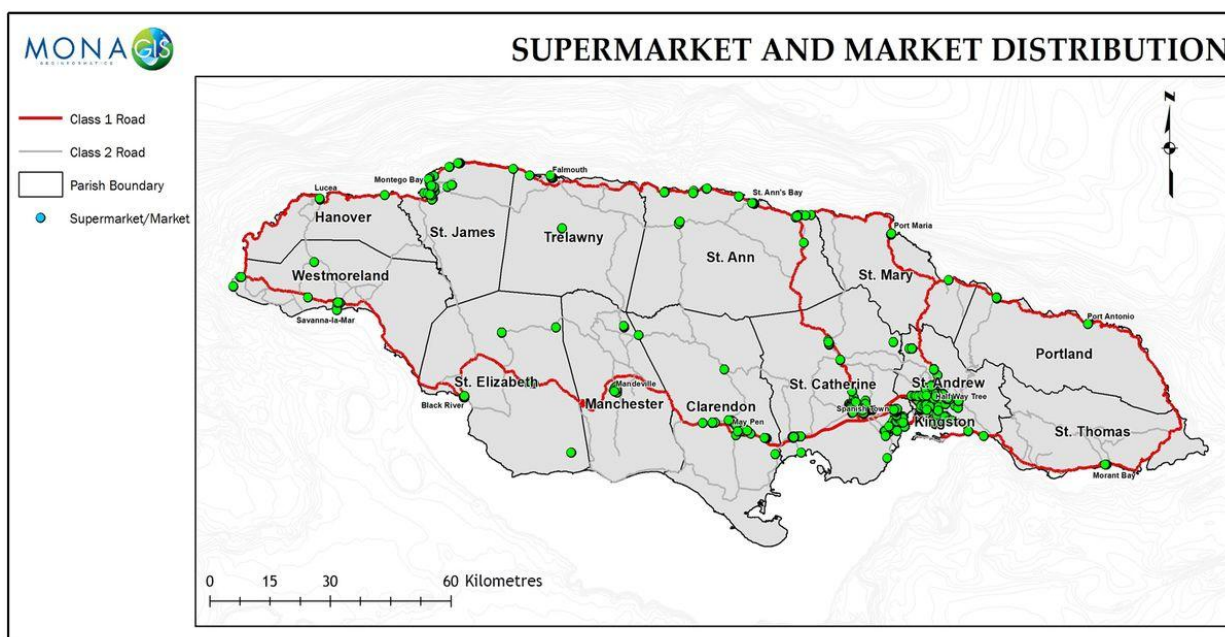


Figure 4.15: Major road network, supermarket and market distribution across Jamaica

Source: MONA

Exports

The agricultural export sector tends to consist of large plantations that produce a smaller range of crops that compete for sale in markets of developed countries (FAO, 2022). Papaya, pumpkin, sweet potatoes, mangoes and yams are among the produce accounting for a significant proportion of the export market. In recent years, Jamaica has shown a decline in export volumes, however there has been an increase in lightly processed agricultural produces (sauces, fruits, spices and beverages) (FAO, 2022).

The Jamaica Promotions Corporation (JAMPRO) promotes agriculture exports and investment opportunities, however market intelligence efforts to understand market demands and requirements are limited and when available may not

accessible to most farmers. Better marketing and promotion could help establish long-term relationships with domestic hotels as well.

The value of food imports as a percentage of total merchandise exports is a critical indicator of Jamaica's reliance on foreign food supplies (Figure 4.16). A higher percentage suggests that a significant portion of the country's export revenue is spent on importing food, highlighting the need for a more self-sufficient and efficient domestic food supply. This underscores the importance of exporting value-added goods and supporting an efficient domestic food supply to enhance food security. By focusing on value-added agricultural products and improving local production capabilities, Jamaica can reduce its dependence on food imports, retain more export revenue, and strengthen its food security.

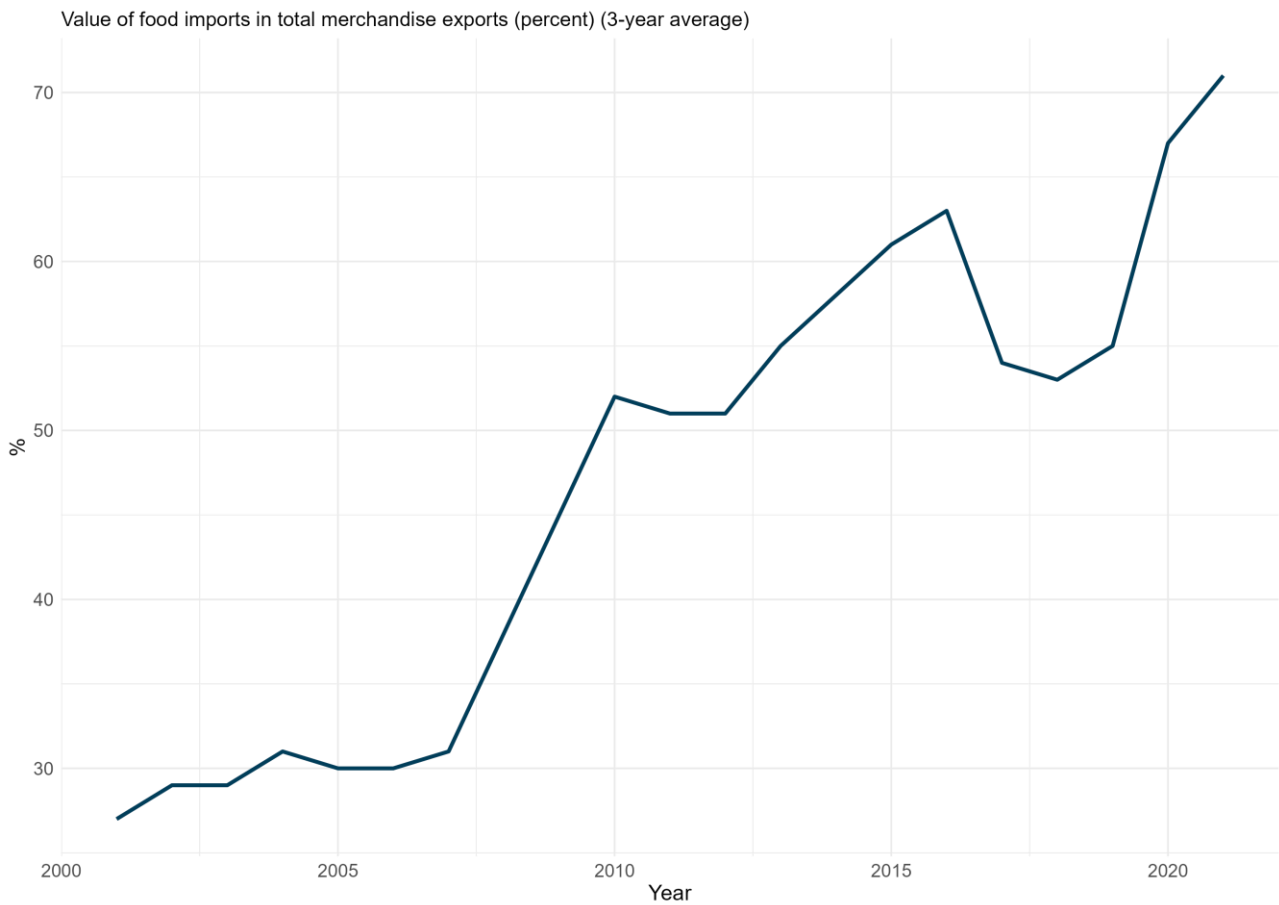


Figure 4.16: Value of food imports over total merchandise exports (%) (3-year average)

Source: FAOSTAT (2022c)

4.3 Access: Household level food security

Key messages

The Vision 2030 Jamaica - National Development Plan prepared by the PIOJ aims to put Jamaica in a position to achieve development country status by 2030. As part of this national target, food security has been identified as one of the determinants of health, and therefore a reflection of the development of the society and the capacity of the society to develop (PIOJ, 2009). Ensuring access to safe and nutritious food is the most immediate and tangible realization of national food security. Achieving this vision will require coordinated efforts to guarantee equitable access to food for all citizens, with particular attention to gender disparities and rural-urban divides.

The key limiting factors for household access to safe and nutritious food have been identified as:

- Rural and urban divide
- Gender inequality
- Changing consumption patterns and increase in imported processed food.

The key opportunities for intervention to improve household access to safe and nutritious food have been identified as:

1. **Education and awareness programs** to empower households with knowledge about healthy eating, food preparation, and the importance of a balanced diet, leading to better food choices.
2. **Access to financial resources** (e.g. microfinance options or subsidies) for low-income families can help them purchase nutritious food and invest in home gardening or small-scale farming initiatives.
3. **Public-private partnerships** to promote initiatives such as school feeding programs, food banks, community-supported agriculture, and nutritional programs can enhance access to healthy food options.
4. **Strengthening food safety standards** to ensure that food products are safe for consumption, which is crucial for public health and nutrition.

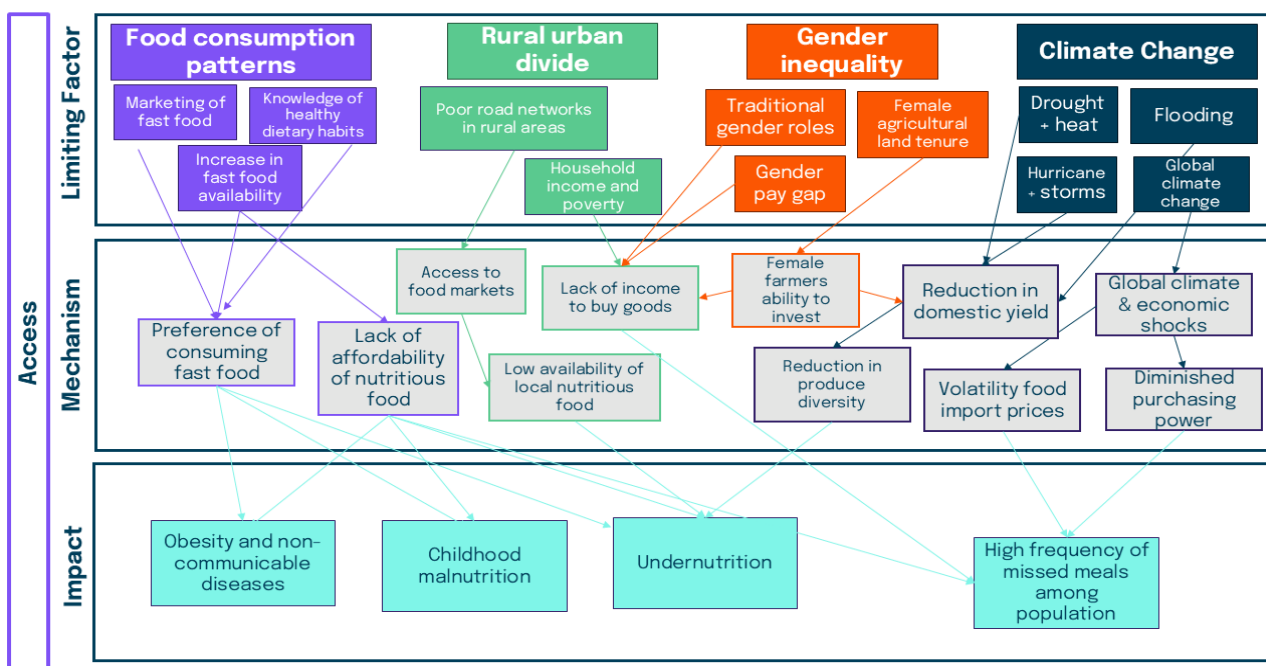


Figure 4.17: Limiting factors to food availability and access conceptual diagram

Source: Authors

Summary of Key Statistics

As a result of recent food security initiatives there have been a multitude of surveys to capture the current status of food security in Jamaica at the household level. Table 4.1 summarizes key statistics collated across multiple sources.

Table 4.1: Summary of Food Security Statistics for Jamaica

Indicator	Data (Year)	Trend	Source (Year)
Population classified as moderate* or severe food insecurity	55.1 % (2021-2023) (male: 56.0 % female, 54.2%)	Rising trend since 2020, where the prevalence was 50.3 % (55.2 % female, 45.4 % male). Generally female moderate severe food insecurity is higher than male (see Figure 4.22) though recent years indicate a trend reversal	FAOSTAT (2022b)
Population classified as severe** food insecurity	26.6 % (2021-2023) (male: 27.0 % female, 26.2)	Rising trend since 2016, where there was 24.8 % (28.5 % female, 21 % male). Generally female severe food insecurity is higher than male (see Figure 4.21) though recent years indicate a trend reversal.	FAOSTAT (2022b)
Household responses to food security	52.4 % reported having sufficient food generally 31.9 % reported having sufficient food sometimes 15% reported not having sufficient food	Declining proportion of food secure households (from 62.0 % in 2019).	Jamaica Survey of Living Conditions in 2021 (PIOJ, 2023)
Pre-cleaned of children under 5 years affected by wasting	3.2 % (2016-2018)	Stable trend over past decade.	FAOSTAT (2022b)
Percentage of children under 5 years of age who are stunted (modelled estimates) (percent) (3-year average)	6.5 % (2022)	Increasing trend over the past decade, up from 6.8 % in 2011-2013 3-year average	FAOSTAT (2022b)
Prevalence of obesity in the adult population (18 years and older)	33.8 % (2022)	Increasing trend over the past decade, up from 22.3 % in 2011-2013 3-year average.	FAOSTAT (2022b)

**People experiencing moderate food insecurity have reduced the quality and/or quantity of their food and are uncertain about their ability to obtain food due to lack of money or other resources. (FAO, xxx)*

People experiencing severe food insecurity have run out of food and, at the most extreme, have gone days without eating. (FAO, xxx)

Rural and urban inequality

Throughout this report, rural and urban inequality has been cited as a key limiting factor to food security.

In Table 4.1, it is reported that 55.1 % of the population was classified as moderate or severe food insecure in the period 2021 - 2023. Disaggregating this by the rural and urban populations showed that the rural areas are the most food insecure compared with urban areas. This is supported by Figure 4.18 which shows food poverty data (note this food poverty is a different metric to severe food insecurity). This map highlights that urban areas have significantly lower percentage of food poverty compared with urban areas

The rural communities in Jamaica are predominantly agricultural communities, producing the domestic food supply from Jamaica. Rural food markets often suffer from inadequate infrastructure and limited access to diverse food products, leading to higher food prices and reduced availability of nutritious options. These markets are also highly vulnerable to both weather extremes and economic shocks.

Furthermore, as discussed in section 4.1, the majority of the agricultural land is owned by a small number of large farms which produce food for competitive international markets and the centralized markets in Jamaica (see section 4.2). This results in a disconnect between regional agricultural productivity and local food supply.

A key driver of this divide is largely related to household income inequality (Figure 4.19). As national dependency on imported food products increases, poorer rural communities are more exposed to global price volatility, diminishing their purchasing power. Nevertheless, poorer regions within urban areas are also exposed to financial constraints of purchasing adequate food. The State of Household Food Security Report in Kingston (Kinlocke, et al., 2019), reported that while overall Kingston appeared to have relatively low levels of food insecurity, there were many challenged at the neighborhood level. In addition, relatively lower levels of dietary diversity were observed, with carbohydrate being the most frequently consumed food group, significantly above fruit and vegetables. This reveals that changing food consumption patterns also poses a risk to food security.

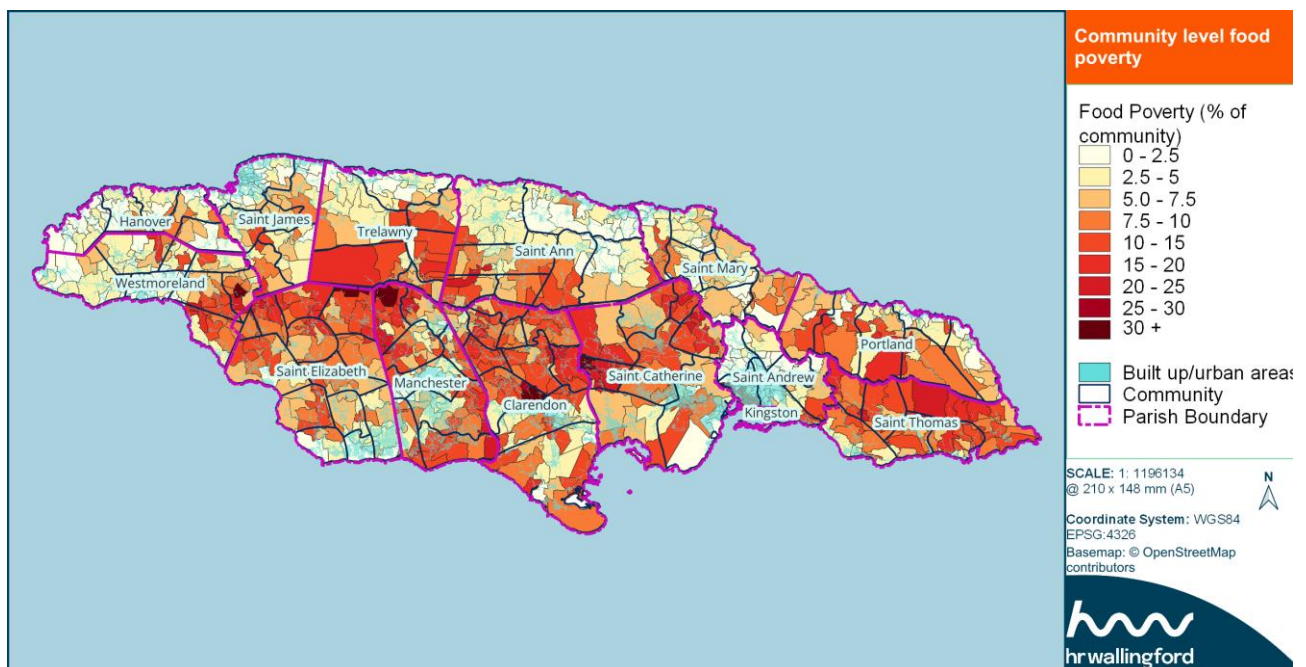


Figure 4.18: Food poverty map of Jamaica overlain with urban areas (2012)

Source: Food poverty data from STATIN (2012), Land Use data from Potapov et al., (2022). Map produced by authors.



Figure 4.19: Jamaican annual household dollars by community

Source: Household income data from STATIN (2012), Land Use data from Potapov et al., (2022). Map produced by authors.

Gender inequality

In Table 4.1, it is reported that 55.1 % of the population was classified as moderate or severe food insecure. Analyzing this statistic over the past decade (Figure 4.20) reveals a gender disparity where on average approximately 7 % more women than men experience moderate to severe food insecurity. Figure 4.21 shows data for severe food insecurity, where a similar trend persists. Notably, in both data sets, the most recent data points to a reduction in food insecurity gender inequality. Given the short length of this trend, data for the coming years will be required to assess if this trend will continue long term.

The reported gender inequalities in food insecurity are consistent with global trends which indicate gender norms and gender inequities can act to restrict women’s access to resources and services. This means that in urban and rural communities alike, women face the burden of unpaid caregiving responsibilities and a persistent wage gap of on average 19% (The World Bank, 2023), reducing their ability to purchase sufficient safe and nutritious food for their households.

As discussed in section 4.1, women account for a third of registered farmers (ABIS, 2024) and often lack the rights to their land and have limited investment and income from their farm. Women working in the agricultural sector will therefore not only have an increased likelihood of low agricultural yield but also have a lower income and a reduced capacity to buy sufficient food for their household. This also presents an untapped potential for innovation and community development.

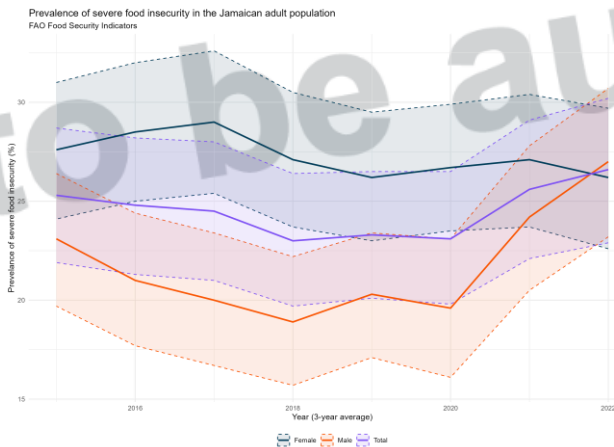


Figure 4.20: Prevalence of severe food security in the Jamaican adult population.

Source: FAOSTAT (2022b)
 Note: dotted color bands represent the confidence interval

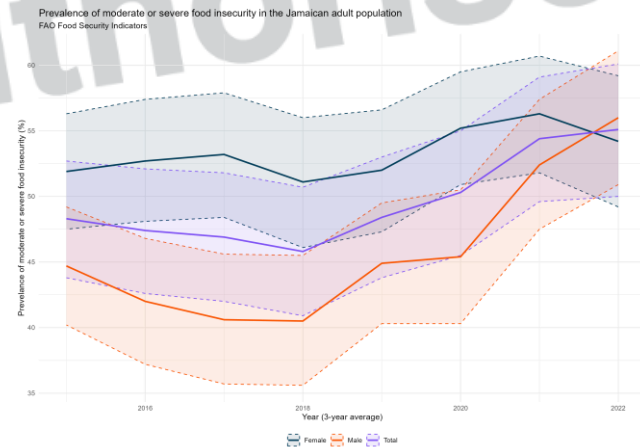


Figure 4.21: Prevalence of moderate and severe food security in the adult population.

Source: FAOSTAT (2022b)
 Note: dotted color bands represent the confidence interval

Changing consumption patterns

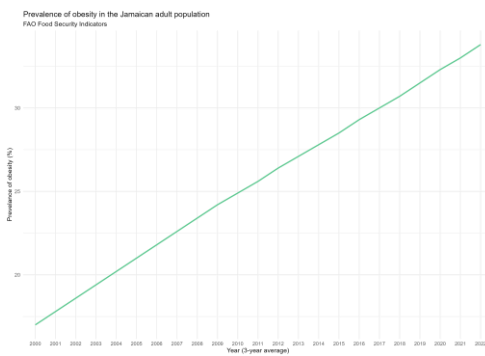


Figure 4.22: Proportion of the adult population (18+) who are obese

Source: FAOSTAT (2022b)

The increased volume of food imports has shifted food consumption from traditional domestic foods such as fruits, root vegetable and grains, which are nutrient rich and support the local agricultural economy, towards imported processed foods, typically higher in sugar, fats and salts (FAO, 2022; Nelson et al., 2020). This leads to increasing obesity, malnutrition and diet related chronic diseases such as diabetes and heart disease, with severe impacts to both public health and national economy.

In urban areas, the shift is more evident with the popularity of packaged, convenience foods driven by the widespread availability of supermarkets and global food brands. This is coupled with the high price of nutritious food and the change in consumer preferences.

There is evidence to suggest that there is limited knowledge of nutritional requirements amongst the population in general. Nelson et al., (2020) indicated that television advertising contains frequent low-nutrient food and beverage content which are thought to influence consumer behavior. Therefore the availability and relative cost of fast food is a limiting factor to food security,

5 Impacts of future climate change

5.1 Historic climate trends

Jamaica is already facing very serious threats from rising temperatures, droughts, floods and sea level rise linked to climate change (The World Bank Climate Change Knowledge Portal, 2024).

As shown in Figure 4.11, rising temperatures are occurring across all seasons, with nighttime maximum temperature increasing faster than the daytime maximum. This has consequences on crop stress (Peters et al., 1971), water usage and food storage requirements.

While temperature trends are discernible island wide, rainfall trends are more variable and complex. Consistent with analysis of WorldClim climate data (Figure 4.11), MONA (2021) report that the mean Jamaica rainfall record shows no statistically significant trend and there is significant interannual variability. However there has been a shift in localized climate and a perceived increase in the duration of droughts and the irregularity of rainfall patterns (FAO, 2013).

The key impact mechanisms of climate change on the limiting factors to food security have been woven through this report (see Figure 4.1, Figure 4.12 and Figure 4.17). This section provides a summary of climate change projections of the 21st century from Shared Socioeconomic Pathways (SSPs) and the potential consequences to food security.

5.2 Shared Socioeconomic Pathways Projections

SSPs are scenarios that project different global development trajectories through the 21st century based on factors such as population growth, economic development, inequality, and energy use (including dependence on fossil fuels). The SSPs provide a framework for projecting future socioeconomic developments and their implications for climate change, while the Coupled Model Intercomparison Project Phase 6 (CMIP6) consists of climate models that simulate the Earth's climate response to various greenhouse gas emission scenarios. The SSPs serve as input for CMIP6 simulations, allowing researchers to assess how different socioeconomic trajectories can influence climate outcomes and inform climate policy and adaptation strategies.

The SSPs are linked to different CO₂ emissions pathways, which influence how the climate might change under various levels of global development. SSP 2 is often referred to as the 'middle-of-the-road' or 'business-as-usual' scenario. SSP 5 – 8.5 (8.5 refers to the of RCP8.5 which is a = trajectory of emissions and land-use. leading to a specific forcing level. 8.5 watts per meter squared (W/m²) between 1750 and 2100) is considered the most severe scenario in terms of global warming.

These SSPs have been analyzed for Jamaica using downscaled and bias corrected WorldClim data. Figure 5.2 and Figure 5.3 show the average warming over 20-year time horizons from 2021-2100, with reference of the historic average between 2001-2020. Figure 5.2 presents the SSP2 – 4.6 (middle of the road) scenario, highlighting that in a moderate scenario then significant warming will increase across all months, with a potential of +1.5 °C warming in August by 2100 (based on CMIP6 ensemble 50th percentile). Figure 5.3 presents similar analysis for the more severe SSP5 – 8.5 warming. This shows that in a more extreme forcings climate scenario then warming could be as high as +3.0 °C (based on CMIP6 ensemble 50th percentile). In Figures 5.2 and 5.3, the ensemble percentiles reflect the range of projected temperature increases derived from multiple climate models, allowing for a more robust assessment of potential warming scenarios under varying greenhouse gas emissions pathways. The 50th percentile represents the median projection, while the 10th and 90th percentiles provide insights into the range of uncertainty, highlighting the variability in model outcomes and emphasizing the need for adaptive strategies in response to potential climate impacts.

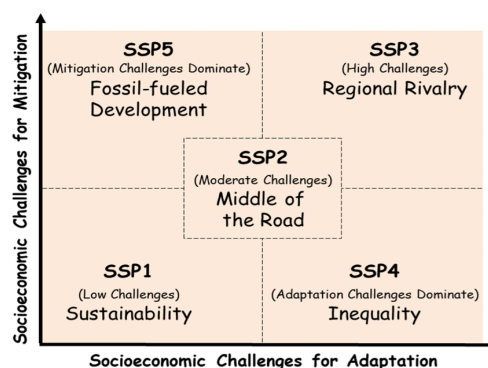


Figure 5.1: Shared Socioeconomic Pathways summary of adaptation and mitigation challenges

Source: Oneil et al., 2014

Figure 5.4 shows the spatial variability of warming on a parish extension scale, presenting just the early rainy season as an example. This highlights that the rate of warming is variable across the island. In this seasonal example, the temperature is increasing at a greater rate in the northern parishes.

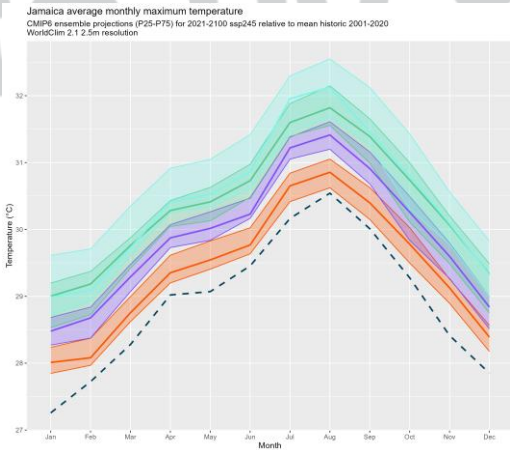


Figure 5.2: Jamaica average monthly temperature for SSP2 – 4.5 scenario at 20-year intervals to 2100

Source: WorldClim 2.1 2.5m CMIP6 projections. Graph produced by authors.

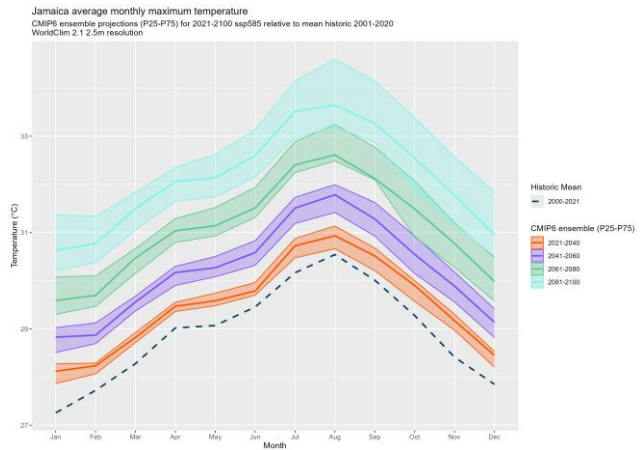


Figure 5.3: Jamaica average monthly temperature for SSP5 – 8.5 scenario at 20-year intervals to 2100

Source: WorldClim 2.1 2.5m CMIP6 projections. Graph produced by authors.

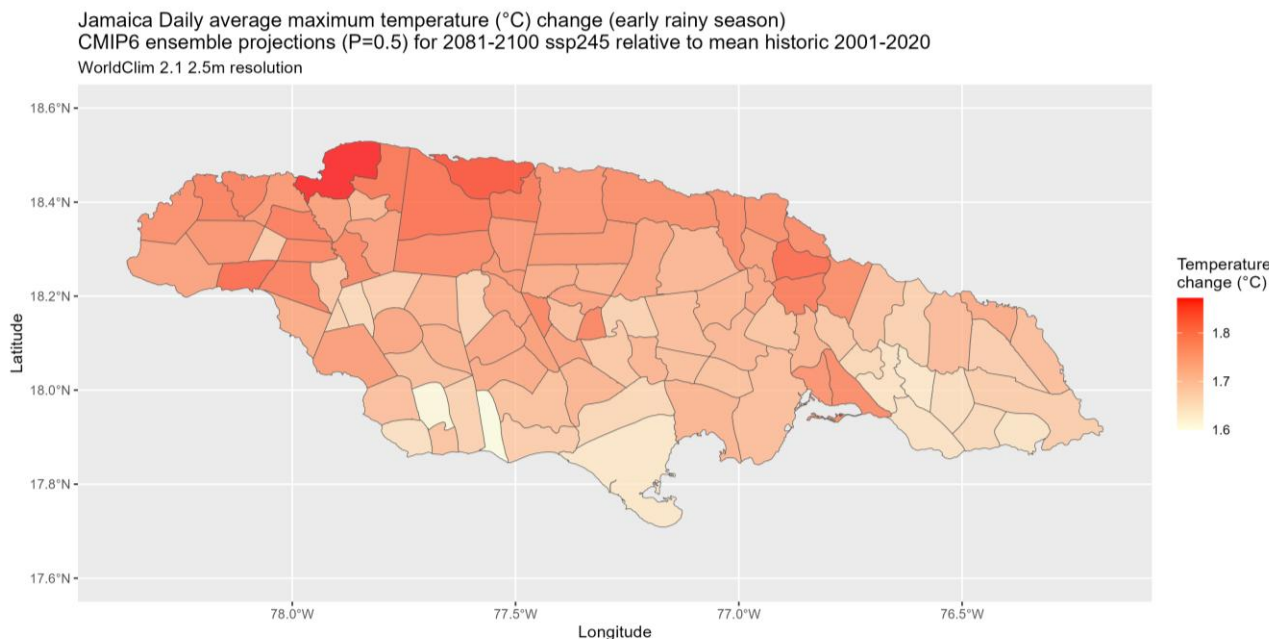


Figure 5.4: Jamaica average temperature in the early rainy season (May - June) for SSP2 – 4.5 scenario for the period 2081-2020 relative to mean historic 2001-2020.

Source: WorldClim 2.1 2.5m CMIP6 projections. Map produced by authors.

Analyses of WorldClim downscaled precipitation data shows that there is a decrease in rainfall on average across Jamaica (SSP 2-4.6 scenario shown in Figure 5.5). This becomes most significant by the late 21st century, a finding supported by the Climate Studies Group (CSGM, 2012). However, rainfall is projected to increase in the dry season

December-February. Figure 5.6 shows the same statistics for the parish of St. Mary in the north east of Jamaica. In this region, while overall rainfall is significantly declined annually, the projections indicate a shift in the timing of the late rainy season. This highlights the regional variability of rainfall projections which is important for local knowledge particularly in the agricultural sector.

Figure 5.7 shows the spatial variability in rainfall as an example selected for the period 2080-2100 relative to 2001-2020 in the early rainy season. This indicates that the southern parishes are becoming drier by ~ 25 %, and at a faster rate than national average.

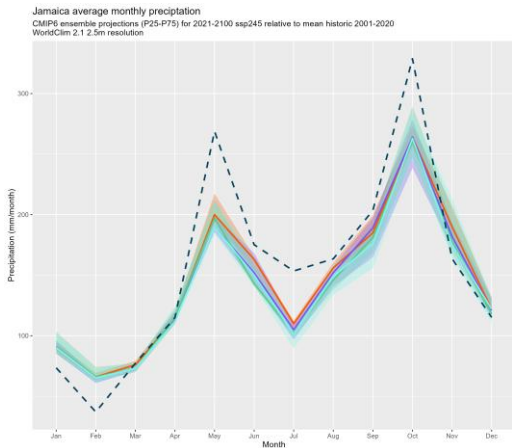


Figure 5.5: Jamaica average monthly rainfall for SSP2 – 4.5 scenario at 20-year intervals to 2100

Source: WorldClim 2.1 2.5m CMIP6 projections. Graph produced by authors.

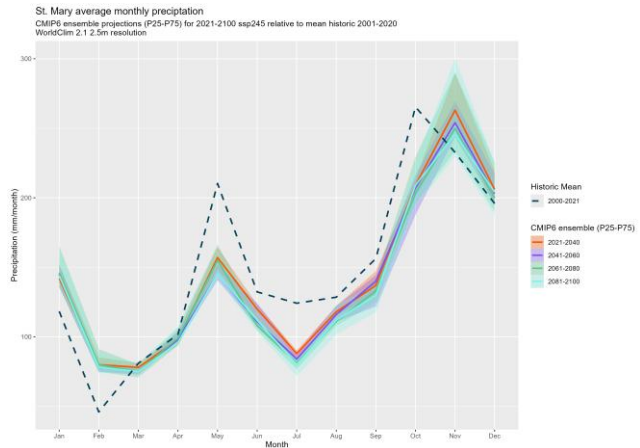


Figure 5.6: St. Mary parish average monthly rainfall for SSP2 – 4.5 scenario at 20-year intervals to 2100

Source: WorldClim 2.1 2.5m CMIP6 projections. Graph produced by authors.

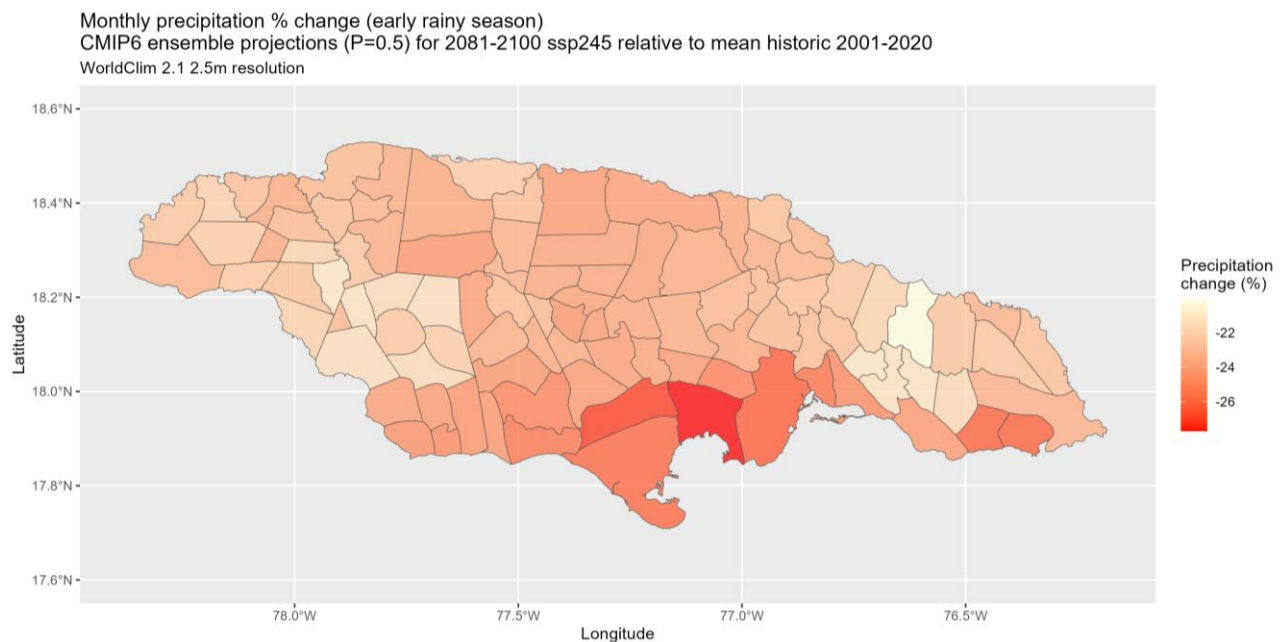


Figure 5.7: Jamaica average rainfall in the early rainy season (May - June) for SSP2 – 4.5 scenario for the period 2081-2020 relative to mean historic 2001-2020.

Source: WorldClim 2.1 2.5m CMIP6 projections. Map produced by authors.

to be authorised

5.3 Key impacts

The climate projections presented in Section 5.2 provide a snapshot of key climate variables across various time horizons, SSPs, and seasons. Additional details will be accessible through the interactive tool developed as part of Output 5 of this project.

These projections illustrate the variability among models and the inherent uncertainties in climate modelling, which must be considered when making decisions. While planning for the worst-case scenario is often recommended, it may not always be feasible due to the economic costs of mitigation. As a result, these projections should be used as a guide to assess the likelihood of climate change impacts and associated risks.

In summary, the key climate projections and their potential effects on food security are outlined below.

Summary of Climate Change Risk

Climate change poses significant risks to Jamaica, impacting various sectors and the overall well-being of its population. Key risks include:

- 1. Increased extreme weather events:** Jamaica is vulnerable to more frequent and intense hurricanes, storms, and heavy rainfall, leading to flooding, landslides, and infrastructure damage.
- 2. Rising sea levels:** Coastal areas are at risk from rising sea levels, which threaten ecosystems, infrastructure, and livelihoods, particularly in low-lying regions and urban areas.
- 3. Changing precipitation patterns:** Altered rainfall patterns can lead to droughts in some regions, affecting water supply, agriculture, and food security, while other areas may experience increased flooding. Farmers rely on knowledge of annual precipitation trends for planting and harvesting planning.
- 4. Impact on agriculture:** Climate change can disrupt agricultural productivity through changing temperature and moisture levels, leading to reduced crop yields and increased pest and disease pressures.
- 5. Biodiversity loss:** Climate change threatens Jamaica's rich biodiversity, including endemic species and fragile ecosystems, particularly coral reefs, which are vulnerable to ocean warming and acidification.
- 6. Public health risks:** The rise in temperatures and changing weather patterns can exacerbate health issues, including heat-related illnesses and the spread of vector-borne diseases such as dengue and Zika virus.
- 7. Economic vulnerability:** Key sectors such as tourism, agriculture, and fisheries may be adversely affected by climate change, leading to economic instability, job loss, and reduced income for communities reliant on these industries.
- 8. Social inequality:** Vulnerable populations, including those in low-income communities, may face heightened risks and limited capacity to adapt to climate impacts, exacerbating existing social inequalities.

6 Current policies and programs

This section provides a brief overview of the formal institutional context within which food security planning takes place in Jamaica, highlighting recent initiatives by the Jamaican government and partnering organizations aimed at building climate resilience and productivity in the agricultural sector.

Table 6.1 and Table 6.2 provide a brief summary of recent policies and programs. For each example, a reference is made to the mechanism by which the policy or program aims to have a positive impact on food security by targeting a limiting factor to food security.

6.1 Policies

Table 6.1: Summary of key policies to tackle food security in Jamaica

Policy	Summary	Impact	Intervention mechanism
Vision 2030- Agriculture Sector Plan	<p>Enhance agricultural competitiveness and productivity through mechanization and modernization of farming.</p> <p>Innovation and research into agricultural production by applying new technology and improved planting material.</p> <p>Diversification into high-value production, and strategies for traditional and non-traditional crops.</p> <p>Enhance marketing of agricultural products locally and internationally.</p>	<p>The plan is expected to boost agricultural efficiency and global competitiveness, promote food security, and elevate the value-added potential of Jamaican agriculture. It supports sustainable growth by encouraging innovation, enhancing market access, and improving the quality of agricultural inputs.</p>	<p><u>Production</u></p> <p>Training for farmers</p> <p>Crop diversification increases resilience to climate change</p> <p>Mechanization and technology to improve efficiency (alleviating labor shortage problem)</p> <p><u>Distribution</u></p> <p>Access to markets</p> <p>Better price for farmers</p>
Agricultural Land Use Policy	<p>Guide for administration and management for sustainable use.</p> <p>Promote adoption of climate smart farming techniques in addition to the exploration of accessible and affordable risk insurance and mitigation techniques to ensure sustainable farming.</p>	<p>Encourage investment into farming and satisfy the demand for lands for agricultural production.</p> <p>Proactive development in ensuring the resilience of the agricultural sector to climate change.</p>	<p><u>Production</u></p> <p>Utilize more agricultural land</p> <p>Improve climate resilience by adopting climate smart technology</p> <p>Better recovery to extreme weather shocks due to insurance</p> <p><u>Access</u></p> <p>Improved livelihood for rural communities</p>

Policy	Summary	Impact	Intervention mechanism
National Food and Nutrition Security Policy (FNSP)	<p>The policy forms an integral part of the National Agriculture Policy and National Development Strategy and aims at addressing the threats and opportunities relating to food security in the country.</p> <p>The broad goal of the Food and Nutrition Policy is to <i>ensure that all Jamaicans, at all times, have physical and economic access to sufficient safe and nutrition food to meet their dietary needs and food infrastructure and food preferences for an active life.</i></p> <p>The policy recognizes the threats to climate change in the agricultural sector.</p>	<p>The policy has a 10 year action plan of ongoing initiatives across multiple sectors.</p> <p>Improve production, distribution and access to food in a holistic approach that aims to cover all aspects of food supply chain.</p>	<p><u>Production</u> Increasing domestic production</p> <p><u>Distribution</u> Increasing sustainable levels of imports</p> <p><u>Access</u> Increase access to food for a nutritious diet. Improve food safety and stability of access at times of economic shocks</p>
Draft National Seed Policy Action Plan (2016-2025)	<p>Increased investment in crop research and the development of a seed system via a robust institutional framework. Key objectives include creating pest-resistant and high-yielding seed varieties, enhancing seed availability, regulating the seed industry, and protecting national plant genetic resources.</p>	<p>Ensures the availability of high quality seeds which are accessible to end users.</p> <p>Promotes farmers rights and traditional knowledge.</p>	<p><u>Production</u> Ensure the longevity of the agricultural sector by maintaining crop diversity</p>
Draft National Forest Policy (2012 – 2014)	<p>National priorities for forests, including conservation, protection and reforestation of forest ecosystems, as well as the need for forests to be supportive of rural livelihoods and uses.</p> <p>The three Goals are related to Governance, Forest Ecological System Conservation and Socio-Economic Considerations.</p>	<p>The Forest Policy provides the basis on which necessary changes to the legislative and management framework can be established.</p> <p>The Policy addresses the activities such as data collection, forest management planning, and regulation on state and privately owned land.</p>	<p><u>Production</u> Maintain ecosystem balance necessary for clean water, fertile land and resources for future generations.</p> <p><u>Access</u> Improve livelihoods for rural communities.</p>

Policy	Summary	Impact	Intervention mechanism
Draft National Plant Health Policy	Seeks to address the gaps and failures in the current plant health system in light of requirements of international treaties and agreements and food safety and phytosanitary standards of the country's major trading partners. The policy identifies issues faced by the Jamaican government that hinder the development of an efficient plant health system.	The policy makes provision for the revision of existing legislations, building of institutional capacity, scientific systems, quarantine capacity, surveillance systems, emergency response for pest outbreaks and increased public awareness.	<p><u>Distribution</u></p> <p>Improve access to international markets. Reduce post-harvest loss due to poor food quality</p> <p><u>Access</u></p> <p>Improve food quality Improve public awareness for food standards</p>
Vision 2030 - Natural Resources and Environmental Management & Hazard Risk Reduction and Climate Change Sector Plan	The plan identifies four areas for priority attention, namely, biodiversity and ecosystem management, natural resource management, environmental governance and natural hazard mitigation and climate change. This seeks to address risk mitigation by developing mechanisms to integrate disaster risk reduction into development planning.	<p>Improving awareness of natural hazards and climate risk to stakeholders.</p> <p>Implement best practices for hazard risk management/</p>	<p><u>Production</u></p> <p>Improved resilience to climate shocks for the agricultural sector. Bottom-up approach will improve uptake of mitigation strategies by farming communities.</p>
National School Feeding Policy	This policy aims to provide safe and nutritionally adequate meals to the school-age population, encourage school gardens, improve nutritional knowledge, and establish partnerships with local producers and small farmers to provide a sustainable source of locally produced foods.	<p>Evidence suggests that this approves student performance by alleviating classroom hunger (Simeon, 1998).</p> <p>This has the potential to improve BMI and other health metrics, though studies vary in their conclusions of the ability of the program alone to alleviate malnutrition.</p>	<p><u>Access</u></p> <p>Provides direct safe and nutritious food to school age population</p>

6.2 Programs

Table 6.2: Summary of recent programs to improve food security in Jamaica

Program	Summary	Positive Impact	Limitations	Intervention mechanism
Agro Parks (Agro Investment Corporation and GoJ)	Farmers can lease small areas of arable lands, usually located in Agro Parks with access to infrastructures such as irrigation and post-harvest processing and storage infrastructure. The primary goal of the Agro Parks is to bring underutilized rural land and labor into a more efficient agricultural production system.	Integrate all facets of the agricultural value chain from pre-production to production, post harvesting and marketing. Crops are being produced at competitive prices to facilitate import substitution, enhance the agricultural supply chain, deepen industrial linkages and increase food security.	- Requires expansion to target more communities across Jamaica Susceptible to changes in government priorities and policies, which can affect funding, support, and overall continuity of the initiative.	<u>Production</u> Access to irrigation Access to markets Reduce post-harvest loss Increase farmer income and reduce poverty <u>Distribution</u> Reduce supply chain efficiencies and post-harvest loss
Land Rehabilitation (RADA, Jamaica Bauxite Institute (JBI), private companies)	Restored mined out bauxite lands for protected agriculture and water harvesting. This involves a training programs and toolkits to train and build capacity in the practice of rainwater harvesting.	Enables use of currently unproductive lands, while promoting food production through protected agriculture technologies.	Rehabilitating land that has been severely degraded—such as areas impacted by bauxite mining—can be challenging due to poor soil quality and loss of nutrients, making recovery slow and difficult. Insufficient mechanisms for monitoring and evaluating rehabilitation progress can make it difficult to assess the success of interventions	<u>Production</u> Increases the land available to cultivate and trains farmers to use agricultural technology

Program	Summary	Positive Impact	Limitations	Intervention mechanism
<p>Youth in Agriculture (Agro-Investment Corporation, Ministry of Agriculture and Fisheries)</p>	<p>Encouraging young farmers aged 18 to 35, to join the Youth in Agriculture Program. The objectives of this program are to have 20% of Government lands being produced by youths. This will also:</p> <ul style="list-style-type: none"> - improve access to markets and technical assistance to youths - offer technical assistance from the participating entities - provide business planning and consultation services to the youths at a subsidized cost. 	<p>It is expected that for the youths participating in this program, they will learn how to maintain and operate a profitable agri-business and have at least 70% of their land under production.</p>	<p>Agriculture may be perceived as an unattractive career choice among young people, due to stereotypes and a lack of awareness about the potential benefits and opportunities in the sector.</p> <p>A lack of mentorship and support networks can leave young agricultural entrepreneurs without guidance and resources to navigate challenges.</p> <p>Insufficient training programs or educational opportunities tailored to youth, resulting in gaps in knowledge and skills necessary for modern agricultural practices.</p>	<p><u>Productivity</u> Improve the labor work force</p> <p><u>Access</u> Improve rural livelihoods, thus increasing ability to provide food for household.</p>
<p>Climate Information Services (CIS)</p>	<p>Climate Information Services includes weather forecasting (on a range of timescale) and customized guidance on crop and livestock suitability vulnerability to climate and weather related hazards</p>	<p>Amongst farmers who engaged with and used the climate information services recorded a reduction in crop losses, financial strain and a greater ability to reinvest following drought shocks</p>	<p>Limited uptake amongst farmers. Both age and gender were cited as significant factors impacting the uptake of CIS, with younger and male farmers being the most likely to group to engage with CIS.</p>	<p><u>Production</u> Increases the efficiency of agricultural practices by growing crops according to local climate</p>

7 Recommended intervention points

7.1 Report summary

This report has presented the key limiting factors to food security in Jamaica. The limiting factors have been presented as influences impacting the agricultural productivity, the distribution from farm to market and the import/export of goods, and the access to food at the household level.

Recent policies and programs have been described, with respect to the mechanism with which they successfully (or otherwise) tackle a limiting factor to food security. Many of the policies require more data and research to quantify their success and support the development of future policies.

7.2 Recommendations

This section outlines strategic recommendations to enhance food security in Jamaica by addressing the key limiting factors identified in this report. The recommendations are categorized according to the three primary areas of focus: Agricultural productivity, distribution, and access.

Agricultural productivity

- 1. Enhance farmer training and education:** Implement comprehensive training programs focused on climate-smart agricultural practices, including the use of drought-resistant crops, efficient irrigation techniques, and climate forecasting tools. This will equip farmers with the knowledge necessary to adapt to changing climate conditions and improve yields.
- 2. Secure land tenure for farmers:** Develop and implement policies that strengthen land rights for farmers, particularly smallholders and women. Providing secure land tenure will encourage investment in land improvements and sustainable agricultural practices, fostering long-term productivity.
- 3. Promote gender equity in agriculture:** Create initiatives that specifically address the barriers faced by women in agriculture, including access to land, credit, and training. Empowering women farmers will not only improve household food security but also enhance overall agricultural productivity.
- 4. Promote sustainable farming practices:** Encourage the adoption of agroecological practices, such as agroforestry and crop rotation, to improve soil health and fertility. This can be supported through grants or subsidies for farmers who transition to sustainable farming methods.
- 5. Invest in agricultural research and development:** Increase funding for agricultural research focused on developing high-yield, pest-resistant crop varieties suitable for Jamaica's climatic conditions. Establish partnerships with local and international research institutions to facilitate knowledge exchange and innovation.
- 6. Implement a national soil health program:** Conduct a comprehensive assessment of soil health across Jamaica and develop a national program aimed at improving soil fertility. This should include recommendations for the appropriate use of fertilizers and agrochemicals, as well as strategies for soil conservation.

Distribution

- 1. Upgrade food storage and processing facilities:** Invest in the development of modern, high-quality food storage facilities to reduce post-harvest losses. This includes providing farmers with access to refrigeration and processing equipment to extend the shelf life of their products.
- 2. Strengthen supply chain infrastructure:** Improve rural transportation infrastructure to facilitate timely delivery of produce to markets. This may involve upgrading roads and transport networks, as well as enhancing market access for smallholder farmers.

- 3. Enhance market intelligence and coordination:** Establish a centralized market intelligence system that provides farmers with up-to-date information on market demand and prices. This will enable farmers to make informed decisions about what to produce and when to sell, thereby reducing inefficiencies in the supply chain.
- 4. Promote agricultural cooperatives:** Support the formation and strengthening of agricultural cooperatives to enhance collective bargaining power, improve access to resources, and facilitate better market access for smallholder farmers.

Access

- 1. Implement targeted food security programs:** Develop and expand targeted food security programs aimed at the most vulnerable populations, particularly in rural areas. This could include food assistance programs, nutrition education, and community gardens to enhance local food production.
- 2. Continue school feeding programs:** Feeding programs for school age Jamaicans has been a long standing social policy in Jamaica. Economic support of these programs should continue with increased staffing and cooperation with local food suppliers.
- 3. Increase awareness and education on nutrition:** Launch national campaigns to educate the population about nutritious food choices and the importance of a balanced diet. This should be coupled with initiatives to make healthy food options more affordable and accessible, and a curb on advertising for unhealthy food.
- 4. Facilitate access to financial services:** Improve access to microfinancing and credit for smallholder farmers to enable them to invest in their farms and mitigate the impacts of climate shocks. Financial institutions should be encouraged to develop tailored financial products for the agricultural sector.
- 5. Monitor and evaluate food security initiatives:** Establish a robust monitoring and evaluation framework to assess the effectiveness of food security initiatives and policies. This should include regular assessments of food security indicators and the impact of interventions on vulnerable populations.

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