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Study on the State of Agriculture in the Caribbean

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Background and objectives

The majority of the Caribbean Development Bank's (CDB) Borrowing Member Countries (BMCs) have achieved key development milestones in the post-independence era, including relatively high human development indices and middle-income status. Nonetheless, BMCs continue to face significant socio-economic and climate challenges. These include low and variable economic growth; unsustainable debt and weak fiscal management; high unemployment; high prevalence of non-communicable diseases; vulnerability to the effects of climate change and natural hazards; environmental degradation; crime and increasing threats to citizen security; as well as persistent and extreme poverty and food insecurity. Most of these socio-economic and climate challenges bear distinctive gender imbalances.

Since its inception, the CDB has identified the development of the agriculture sector in its BMCs as one of its main priorities. In 2017, following forty years of structural change in the BMCs' agricultural sector, the CDB decided to update and revisit its Agriculture Sector Strategy, which dates back to April 1981. This decision would allow the CDB to confront old and new challenges with a new vision, especially considering the BMCs' heavy dependence on food imports, the end of the preferential European Union market access for sugar and bananas, financial instability, and climate change.

Today, BMCs face major challenges in their attempt to improve the competitiveness of the agriculture sector, including fisheries and aquaculture. Growth in agricultural productivity has been slow and the sector suffers from high trade costs and a low capacity to comply with modern food safety and quality standards. Consequently, the agriculture sector has been unable to adequately respond to rapidly growing demand for high-standard, agri-food products from the tourism, processing, and retailing sectors, in and outside the region. Instead, the growing demand in these sectors in the region is mainly fulfilled by imports. The region's agricultural sector is also constrained by ever-growing pressure on natural resources and a high vulnerability to climate change.

However, there is great potential for strengthening market linkages and helping farmers, fishers, and agri-food businesses to catch up with current best practices and technologies. If the region succeeds in fulfilling this potential without further compromising its natural capital and related ecosystem services, agriculture can be an important source of economic growth and a key contributor to poverty reduction, particularly for households that benefit less from growth in other sectors. In addition, through the promotion of inclusive and sustainable agricultural development, the CDB can contribute to overcoming major socio-economic and environmental challenges in the region, including food and nutrition insecurity, obesity, youth unemployment, gender inequality, the unsustainable use of natural resources, and climate change.

This report on the State of Agriculture in the Caribbean supports the development of a new CDB Agricultural Policy and Strategy Paper (APSP), by identifying key trends in agriculture in BMCs, and the related opportunities for investments to promote growth, reduce poverty, and ensure sustainability.

Heterogeneous countries and the role of agriculture

The nineteen BMCs are a heterogeneous set of countries, varying in size, location, income, economic structure, and so on. For example, incomes vary from more than USD 30 000 to less than USD 5 000 per capita.

Historically, agriculture has played a central role in the Caribbean economies. Large plantations, of especially sugar and bananas, produced agricultural commodities for exports and they represented

an important sector of the economy. Today Caribbean agriculture is more diversified. Reforms of the European Union agricultural policies had a dramatic effect on export demand for sugar and bananas, and catalysed a restructuring of BMC farming systems as well as a shift in exports from raw materials (agricultural products) to processed food products.

Agriculture also makes up a smaller share of the economy. A well-known aspect of the structural transformation of an economy is that, as an economy develops, the share of its agricultural sector declines. In several countries, especially among the Islands, such as the Cayman Islands, agriculture represents less than 1 percent of GDP. However, in countries such as Dominica, Grenada, Guyana, and Haiti, agriculture is still an important sector in the economy, with contributions to GDP averaging between 7 and 17 percent. The agricultural sector also contributes significantly to employment in these countries – between 10 and 25 percent, and almost 50 percent in Haiti.

For the analysis, we have classified the BMCs into three sub-groups: thirteen Small Island States (SIS) with a population of less than 400 000 people; three Larger Island States (LIS) with populations ranging from 1.4 to 10.8 million people; and three Continental States (CS) with population sizes between 350 000 and 800 000 people.

There is still significant heterogeneity in terms of income and the role of agriculture in the economies within the three groups. For this reason, we have also identified four focus countries, all of which have a relatively large agricultural sector within their country group: one out of each sub-group of BMCs (Grenada, Guyana, and Jamaica), and Haiti, representing the BMC with the largest agricultural sector and the most critical economic condition. Haiti is in fact an outlier among BMCs, with much lower per capita income, higher poverty and undernutrition rates, and higher levels of natural disaster damage, especially in recent years. Per capita income is lower today than it was in 1980, while employment in the agricultural sector has been adversely affected by recent natural disasters, such as the catastrophic damage following Hurricane Matthew in October 2016.

Growth, employment and poverty

Economic growth is the most powerful instrument for reducing poverty and undernutrition, and for improving the quality of life in developing countries. However, average GDP growth in the BMCs has been lower than in any other developing region during the last 35 years.

The situation was exacerbated by the 2007–2008 global food crisis, when the price of major food products increased significantly. The BMCs most dependent on imports were particularly affected by the crisis.

With their GDP relying heavily on the financial sector, the 2008–2009 global financial crisis hit the Small Island States hard. Not only did the crisis lead to a downturn in tourism earnings, but it also had a negative impact on remittances, especially in Jamaica and Haiti, which have many migrants. In terms of unemployment, the average BMC rate is around 11 percent. Though unemployment levels had decreased from the very high levels in the 1980s, they rose again after the 2008–2009 economic crisis.

The unemployment rate of young and female workers is higher than the overall average in BMCs: The average youth unemployment rate is around 28 percent, while the female unemployment rate is systematically higher than male unemployment across the focus countries.

In addition, slow economic growth in BMCs is reflected in high levels of poverty, which average around 26 percent, and are higher for rural households, women, and indigenous people. In Haiti, no less than 77 percent of people live below the poverty line. Poverty is also very high in other focus

countries: Levels in Grenada and Guyana are about 36 percent, while they are somewhat lower in Jamaica (18 percent). Thus, reducing poverty remains a major challenge for BMCs.

The degree of urbanization, however, has remained relatively stable over the past 25 years, with the exception of Haiti. Similarly, the share of the population living in urban areas in BMCs has remained constant since 1990, at around 50 percent.

Agriculture can play a key role in advancing development and reducing poverty in BMCs. Research suggests that agricultural growth is the most efficient way to reduce poverty in rural areas, particularly for households that do not benefit from growth in tourism, financial services, and natural resource extraction.

Food security and malnutrition

Though it has decreased slowly over the past 20 years, undernourishment is still widespread in BMCs. In Haiti, undernourishment levels are as high as 77 percent, pulling up the averages in BMCs. However, the average in the Small Island States – including many of the richer BMCs – is close to 15 percent.

In addition to undernutrition, other forms of malnutrition and its consequences, such as obesity, are on the rise, which is a cause for concern. In fact, obesity has increased significantly since 2000 in all BMCs. This suggests that the BMCs are increasingly vulnerable to "the double burden of malnutrition" – the combination of undernutrition and poor diets which leads to obesity.

In all BMCs, except Haiti, food availability exceeds the established food energy requirement guidelines. The greater problem for food and nutrition security is access to food, or more specifically, the lack of access to food, which is strongly related to poverty. Not surprisingly, food access is low in countries such as Haiti, where a large share of the population lives under the poverty line.

Moreover, BMCs spend more than half of the value of total exports on food imports, and this share is increasing. While it is relatively low for Continental States (such as Guyana), which are net exporters of cereals, this share has increased to high levels for the Small Island States and Haiti. Grenada and Haiti in particular depend heavily on their foreign exchange revenues to import food.

A high proportion of this imported food is calorie-dense, high in fat and high in sugar. As these products are more affordable than heathier alternatives, poorer households are more likely to make unhealthy nutritional choices, which lead to increased obesity levels.

Gender inequality

Although the region performs well compared to other developing regions in international comparisons, gender inequality is still a major concern. Women in the BMCs have fewer economic opportunities, earn lower incomes, are more likely to be unemployed, and have lower political representation than men.

Women account for 22 to 30 percent of the registered farmers in the region. Despite this, women have fewer opportunities due to limited access to finance, land, networks, information, and decision-making in organizations, such as farmer organizations, governmental bodies, and companies.

There are many complex gender issues in domestic and family life in the Caribbean, not only in relation to the use of time, accumulation of savings, distribution of food, access to and control over money and other resources, but also in relation to violence perpetrated on those who are most vulnerable. Gender-based violence is widely perceived as a persistent and pervasive issue, which threatens resilience and severely damages the human capital base of BMCs.

Structural transformation in the agriculture sector

BMCs have undergone a significant structural transformation of their overall economy, with agriculture becoming a less important part of GDP and employment. However, the structural transformation process of the overall economy, away from agriculture, has not coincided with a significant change towards a highly productive agriculture sector. Both agricultural yields and output value per worker are low throughout BMCs in regional and global comparisons.

In the past, BMCs largely produced similar agricultural commodities, such as sugar and bananas, particularly for export. However, as a result of changing market opportunities and an altered trade environment, many agricultural production activities are no longer profitable, while others have gained in profitability.

Recently, BMCs have developed more heterogeneous production systems that reflect their regional and international competitive advantages towards more high-value products.

However, there is ample opportunity for further growth. Productivity is still fairly low, and many farmers still have to catch up with current best practices in the sector. The productivity of agriculture is constrained by a broad set of factors, including inadequate access to improved varieties and other technologies, low access to credit, high labour costs, insufficient monitoring and response to pests and diseases, and inadequate skills and entrepreneurship among farmers.

The productivity of the livestock sector is constrained by several additional factors, including the low availability (and high prices) of quality feed – due to limitations in large-scale feed production and limited availability of grazing lands. Theft, low-quality feed concentrate, and low-quality breeding stock are other factors that specifically limit the productivity of the livestock sector.

Farm sizes remain small in the majority of BMCs. Small farmers with limited financial resources for investments and restricted access to credit, require improved technologies and extension services that are suited to small farms and low volumes of on-farm investments.

Some BMCs, specifically all Continental States and Haiti, have experienced significant cropland expansion. However, agricultural land expansion occurs at the expense of natural vegetation, leading to losses in soil fertility, biodiversity, and ecosystem services, while providing comparably few benefits in terms of production increases.

The challenge BMCs now face is to increase productivity and competitiveness in the agricultural and livestock sector, while ensuring environmental sustainability.

Fisheries and aquaculture

The sustainability of the fisheries sector is under threat as a result of overfishing and natural resource degradation. While fishing in the Caribbean Sea has almost doubled since the 1990s, the annual catch has declined by more than 25 percent. Fifty percent of the catch are species that are being overexploited.

The fisheries sector also struggles with problems of informal labour use, seasonality, remoteness, hazardous working conditions, and value chain complexity.

Overfishing is closely interlinked with resource degradation: it may lead to the overgrowth of coral reefs with sponges and algae, and therefore to further degradation of the resource base. Related threats include coastal development, pollution, the introduction of invasive species, and the impacts of climate change.

In future, the degradation of the aquatic ecosystem and coastal resources may pose a serious challenge to the tourism and fisheries sectors in BMCs.

Trade and value chains

The BMCs are either islands or have direct access to the sea; they are also relatively small and constrained by natural and geographic conditions. Therefore, trade and international value chains are important for them, both for agricultural production, including potential exports, and food consumption, including potential imports.

Borrowing Member Islands are mostly net importers of agri-food products. On the Islands, food imports have increased more than exports, whereas the Continental States export more agri-food products than they import. In fact, exports from the Continental States have increased considerably since 2000.

Although BMCs are close to the markets of the United States of America and Canada, integration into these international trading systems is constrained by weak liner shipping connectivity and inefficiencies in port operations.

Historically, agricultural supply chains and trade in BMCs were heavily targeted towards export to the European Union. However, European Union trade policy reforms caused a dramatic decline in export demand for sugar and bananas from BMCs, resulting in a more diversified BMC trade structure. So-called traditional exports – including sugar, bananas and basic agricultural commodities – have declined from 60 percent of BMC agri-food exports in the early 1990s to less than 20 percent now. The main growth area has been in processed food exports, including beverages, which have increased from about 15 percent to around 50 percent of BMC agri-food exports. This transformation has been greater in the Island economies, and less so in the Continental States.

Transformation in the global agri-food trade occurs through the tightening of produce and process standards. The BMC agri-food systems are confronted with these changed environments and more stringent standards in (a) tourism, (b) foreign investments in BMC value chains, and (c) trade. This creates challenges for farmers and producers along local food value chains, as they strive to address these new standards for quality, safety, volumes, and timeliness.

Tourism and modern retail linkages

Tourism and modern retail linkages also create opportunities for local farmers; demand for high-value food has risen as a result of the growing tourism sector and downstream investments in modern retail, processing and wholesale markets.

In BMCs, links between the food value chains and the tourism sector have great potential to be strengthened further. Growth in tourism in BMCs has led to important structural change over the past decades; nevertheless, the importance of tourism varies from country to country, being as heterogeneous as they are. The average effects, however, are large: Tourism *directly* contributes 8 percent to GDP, and *indirectly* contributes about 25 percent to GDP. The Small Island States are the most dependent on tourism, with the total impact being as high as 40 percent. Larger countries such as Jamaica are also highly dependent on tourism, with the total share as high as 30 percent. This creates major challenges and opportunities for local agri-food chains.

Today, linkages between local agricultural production and tourism are limited. This is due to a lack of irrigation, inadequate cold storage facilities, low productivity, and asymmetry with regard to the food safety standards and information required by hotel and restaurant chains, cruise ships, and the yachting sector.

Investments in infrastructure and institutions – irrigation, cold chains, food safety systems, port operations – are key to enable farmers to comply with the standards required by international companies. This is fundamental to complement the high-value food demand, which is generated by changes and growth in the tourism, processing, retail, and international trade sectors.

Climate change and natural hazards

Climate change and natural hazards pose key threats to agricultural development in the Caribbean. The main challenges of climate change include droughts, temperature increase, lower precipitation, sea level rise and saltwater intrusion, increased intensity of cyclones, and shifting agricultural seasonality.

While such concerns are globally relevant, climate change and natural hazards are likely to affect agricultural development and overall economic growth more dramatically in the Caribbean (and BMCs in particular) than many other countries because of their exposure and vulnerability profile:

- Being part of the Atlantic Hurricane Alley, BMCs are more likely to be affected by frequent and intense cyclones.
- BMCs are characterized by low-lying coastal areas and long coastlines, which implies high exposure to a set of particular climate change impacts – such as sea level rise and rising water temperatures.
- With a comparably large share of their economy based on the coastal ecosystem or located in proximity to the coastline, BMCs are highly vulnerable to coastal climate change impacts.
- BMCs account for seven of the world's top 36 most water-stressed countries, which puts particular pressure on rain-fed cropland agriculture.

Climate change adaptation and mitigation should therefore be a key priority for a sustainable future and for sector development in the medium and long term. Key adaptation actions include the development of water-efficient irrigation systems, the strengthening of agricultural extension and agro-meteorological information systems, the scaling of improved land management practices, and the exploration of precision agriculture for smallholders.

Institutions and regional governance

Most BMCs rank low in international comparisons with regard to the "ease of doing business" indicator, developed by the World Bank. The main business development constraints are related to getting credit, registering properties, and obtaining permits.

Agricultural and food policies in BMCs typically include import tariffs and export duties, as well as tax exemptions, grants and loan programmes. Agricultural support programmes have placed emphasis on providing tangible products, such as irrigation works, chemical fertilizers, and transferring modern agricultural technologies. However, policymakers have started to realize that, without good governance, the achievements brought about by these efforts will be limited.

In addition, as small open economies, international agreements and institutions have played a very important role in the economic and agricultural development of BMCs. In the years following independence, the Caribbean economies were still strongly influenced by institutional arrangements dating back to the pre-independence period. Agricultural development strategies and production would later be given preferential access to markets in the European Union. However, the Uruguay Round and the establishment of the World Trade Organization (WTO) ended the preferential access of BMC agricultural exports to markets in the European Union.

The establishment and deepening of regional Caribbean integration, coordination and collaboration was an important feature of the post-independence period, with the shift to the Caribbean Community (CARICOM), and the establishment of the Organisation of Eastern Caribbean States (OECS). Most BMCs are relatively small and thus have limited capacity to govern major emerging issues, such as on trade, climate change, resource management and food safety.

Moreover, many of these governance issues have a regional and international component, demanding both a regional and international response. The following are some of the many regional initiatives and institutions: (a) the Common Agricultural Policy (CAP); (b) the CARICOM Regional Food and Nutrition Security Policy and Action Plan; (c) the Caribbean Agricultural Health and Food Safety Agency (CAHFSA); (d) Caribbean initiatives to regionally integrate climate resilience and climate change adaptation policies; and (e) the CARICOM Youth Development Action Plan (CYDAP). However, intra-regional governance can still be strengthened.

Opportunities and investment priorities

This report identifies a large set of opportunities and areas for policies and investments to improve the agriculture sector – see Chapter 8 for more details. Key opportunities and investment priorities are summarized below.

Improving the general policy and regulatory environment to stimulate investments in agriculture and agribusiness is important to spur agricultural and economic growth. Improving the environment in which farmers and agribusiness operate will also enable them to meet local demand for products which are currently imported or consumed by the growing tourist industry.

This includes general policies, such as stimulating foreign direct investment (FDI), improving the investment climate, ensuring macro-economic stability, and *general* infrastructural investments – port facilities, national food safety systems, and more. Value-chain-specific investments are also needed, such as extension and certification services, capacity building of farmer associations, and stimulating *specific* infrastructural investments (such as cold storage, transport and irrigation for certain sectors), which are necessary to meet private standards.

Poverty reduction and food security enhancement are strongly related. Food security concerns relate mostly to access to food rather than the availability of food, while improved food security is achieved through poverty reduction. It is therefore crucial to stimulate income growth amongst the poorest through a combination of economic growth and targeted social policies.

As poverty is highest in the countries with the largest agricultural sector, and is concentrated in rural areas, stimulating agricultural development is not only important for economic growth, but also for food security, as it will enhance access to food for the poorest and most food insecure.

Preventing other forms of malnutrition and the further rise of obesity can be addressed in many ways:

- **Enhance synergies between agriculture and food security**. Agricultural policies directly affect food insecure households (their incomes and access to food), while the types of crops being (implicitly) promoted have a direct impact on what people eat and on their nutritional status. Synergies can be achieved by making agricultural policies and programmes more nutrition-sensitive.
- **Catalyse behavioural change across the production-to-consumption continuum** by providing nutrition education and through behavioural change communication.

- **Support nutrition-sensitive value chain (NSVC) interventions** to enhance the supply and demand of nutritious food.

Food safety regulations and quality standards are crucial for a variety of development purposes, including public health and value chain integration. Actions include:

- **Strengthening domestic policies and the legislative environment** (food safety and hygiene, food labelling laws and regulations, and compliance and enforcement mechanisms).
- **Stimulating further intra-regional cooperation to address food safety concerns**. The Caribbean Agricultural Health and Food Safety Agency (CAHFSA), established in 2010, provides a good basis; however, considering the rise in incidences of food-borne diseases, further alternatives may need to be explored.

Gender equality and youth empowerment in agriculture can be promoted more actively by:

- **Strengthening legal and regulatory instruments that govern rights to productive resources for youth and women**, including the right and access to land titles and capital.
- **Supporting the development of targeted financing mechanisms** to reduce specific entry barriers of youth and women.
- **Promoting governance structures that improve equitable** access to decision-making.

Mainstreaming gender analysis in the design phase of agricultural programmes and policies remains a challenge and a priority.

Investment in the transformation of the agri-food sector

There is great potential for reallocating resources to crops that generate more value, including many horticultural crops. The share of the area devoted to these crops has increased, but many farmers have yet to make this shift. Many producers are also far from the efficiency frontier and have not yet been able to catch up to the current best practices in the sector to improve productivity or to meet quality requirements. There is therefore much to be gained by enabling and stimulating farmers to shift production to more remunerative products and state-of-the-art technologies and practices, through extension programmes and other enabling policies (see below).

Key investment recommendations for improving the competitiveness of the BMCs agri-food sector include:

- **Develop national long-term investment strategies for selected agri-food subsectors**. These development strategies provide national governments, industry associations and other stakeholders with a road map to guide investments – considering their scarce resources – and to improve the performance of high-potential subsectors.
- **Invest in scientific research.** A strong domestic research capability is essential to identify and adapt promising technologies to local conditions. It is also paramount for sector planning and development (see above) and central to responsible investment.
- **Create incentives and an attractive enabling environment for the development of rural business services**, especially those that are suitable for smallholders. Incentives such as tax breaks, technical assistance, or business planning could help develop valuable services for farmers, including the provision of modern farm inputs, technical advisory services, small-scale commercial laboratories for food testing, irrigation, packaging, small-scale cold rooms, and processing technologies.

- **Support clustering of smallholders based on a product of common interest or common infrastructure**. Clustering of smallholders has proven successful in achieving economies of scale to enable growers to purchase cheaper production inputs and increase their bargaining power when selling produce.
- **Strengthen capacity for early detection and quarantine services to prevent the entry, establishment, and spread of pests and diseases in plants and livestock**. This involves strengthening public health measures by enhancing quarantine facilities, regular disease surveillance, capacity building of veterinary officers and microbiological surveillance of animal produce.
- **Establish national livestock identification, traceability and animal health certification**. This is essential for the management of disease outbreaks and food safety incidents, reducing praedial larceny and illegal animal processing, tracking animal movement, and controlling for the use of veterinary drugs and pesticides.

Improved competitiveness of the agri-food sector should go hand in hand with environmental sustainability and enhanced climate change resilience.

Integrated land-use strategies that actively consider the various environmental and resilience benefits of natural vegetation are essential in order to ensure that cropland expansion does not lead to land degradation, loss of carbon stocks, and loss of biodiversity.

Many BMCs and regional institutions still require further assistance and support to (a) increase their knowledge and capacity to assess climate change risks, and (b) to design and implement appropriate climate-resilient policies and programmes. Key areas for investment include:

- Integrated water resource management.
- Investments in coastal zones to reduce the pressures on coastal ecosystems and reduce coastal degradation.
- Development and diffusion of climate-smart agriculture (CSA), including the development of crop varieties which are better adapted to the expected effects of climate change.
- Climate-smart mapping and planning of sustainable value chains and climate proofing of value chain-related infrastructure, technologies and practices.

In the fisheries sector, and for the marine ecosystem in general, there is potential to improve intra-regional governance, including legal regulation and enforcement. Many countries in the region do not have formally adopted fishery management plans in place. Often, existing laws and regulations are outdated and do not allow for effective enforcement. Regional fisheries bodies have just recently begun collaborating to close this governance gap.

Natural resource conservation and sustainable tourism development can be combined in a synergistic manner, as underlined in the Blue Economy approach – aimed at the achievement of economic growth, social inclusion, and livelihoods development in harmony with the environmental sustainability of oceans and coastal resources. This approach includes:

- integrated (participatory) marine spatial planning;
- the valuation of the economic and social benefits of the fisheries and aquaculture sector;
- representative governance mechanisms; and

- the promotion of public–private partnerships.

Investment opportunities to strengthen trade and value chain linkages

Value chain development policies and programmes can enable local agriculture to fulfil local, regional, and international demand for high-value agri-food produce. Most importantly, this involves enabling farmers, fishers, and agribusinesses through general policies, such as stimulating FDI, improving the investment climate, and through general public investments – including port facilities and national food safety systems. It can also involve value chain-specific investments, such as specific extension and certification services, capacity building of farmer associations, and stimulating specific infrastructural investments – cold storage, transport and irrigation for certain sectors – which are necessary to meet private standards.

The following represent several new value chain opportunities:

- The tourism industry: only a fraction of the food demand generated by tourism is supplied locally. Proximity and flexibility are especially important for perishable foods, such as fruits, vegetables, and animal products.
- The growing yachting sector: full-service, modern marinas have been built in several BMCs.
- Domestic cassava value chains: for bread, poultry feed, and beer.
- Meat for the domestic and regional retail and services sectors: in land-abundant BMCs, such as Guyana and Suriname.

Key investment recommendations for strengthening trade and value chain linkages include:

- **Invest in air and maritime transport infrastructure**. Many BMCs have low shipping connectivity and inefficient port operations, and therefore forgo beneficial trade opportunities, especially for perishable products. Investments in ports, freight logistics, and transport and communication networks are essential to lower the high trade costs.
- **Enhance intra-regional cooperation on trade and value chains**. The analysis shows that many BMCs have a comparative advantage with regard to the same agricultural commodities. The creation of a solid, competitive–cooperative network of local enterprises and favourable institutional conditions may foster economies of scale and can attract foreign direct investments.
- **Support the development of national food safety strategies,** which consider the international perceptions of food risks, international standards, and any international commitments in the food protection area.
- **Address pertinent risks and opportunities associated with food safety** by supporting a limited set of catalytic and demonstrative initiatives that will raise food safety awareness, and encourage better practices among selected food system stakeholders. These initiatives involve: designing and supporting the implementation of assured quality produce schemes; strengthening the implementation of Good Handling Practices (GHP) in selected industries; implementing Good Manufacturing Practices (GMP) and Hazard Analysis and Critical Control Points (HACCP) in selected food industries; as well as establishing and strengthening food inspection operations.
- **Finance "Integrated value chain development" programmes** that offer the potential to directly assist farmers in specific high-potential value chains. Different modalities are possible,

but all require close collaboration with major companies in the respective value chains – suppliers to the tourism sector, hotel and restaurant chains, exporters, processors, and so on.

- **Facilitate public–private dialogue**. Intensive and continuous dialogue between public and private actors is necessary for a variety of policy and institutional improvements, such as effective value chain development strategies.

1 Background and main objectives

The majority of the Caribbean Development Bank's (CDB) Borrowing Member Countries (BMC) have achieved key development milestones in the post-independence era, including relatively high human development indices and middle-income status. Nonetheless, as reflected in the CDB's Strategic Plan 2015–2019, BMCs continue to face significant socio-economic and climate challenges. These include low and variable economic growth; unsustainable debt and weak fiscal management; high unemployment; high incidence of non-communicable diseases; vulnerability to the effects of climate change and natural hazards; environmental degradation; crime and increasing threats to citizen security; and persistent and extreme poverty and food insecurity. Distinctive gender imbalances are found in most of the abovementioned challenges.

Since its inception, one of the CDB's main priorities has been the development of the agriculture sector in its BMCs. The CDB has supported the sector by lending directly to governments and private enterprises, or indirectly to private enterprises through national Development Finance Institutions (DFIs). Through its Technical Assistance (TA) programmes, the CDB also supports the implementation of a wide range of agriculture sector development activities by providing financing to governments and international organizations, as well as national and regional agricultural support institutions and non-governmental organizations.

From 1970 to 2015, the CDB approved approximately USD 380 million in loans, equity and grants in support of interventions in the agriculture sector, of which approximately six percent (USD 21.6 million), was channelled through DFIs. The rate of CDB approvals has, however, slowed considerably as reflected in the fact that, between 1970 and 2000, total CDB approvals to the sector was approximately USD 270 million. A similar trend can be observed in the contribution to the regional agriculture sector by governments and other donors.

To face such challenges, the CDB has decided to update and revisit its Agriculture Sector Strategy, which dates back to April 1981. Much has happened since 1981. Almost forty years of structural change are particularly relevant for the BMCs' agricultural sector, considering the heavy dependence on food imports and the end of the preferred market access for sugar and bananas. In the context of financial instability, climate change, and with a reversal of structural transformation, a revision and update of the strategy is necessary to confront old and new challenges with a new vision.

1.1 Objectives and organization of the project

The FAO Investment Centre (DPI)[1] has worked alongside the CDB[2] to identify key trends in agriculture in the region and the related opportunities for investments in support of growth, poverty reduction, and sustainability. This analysis will support the CDB in the revision of its Agricultural Policy and Strategy Paper (APSP) by providing technical inputs based on the results of the Study on the State of Agriculture in the Caribbean.

1 The FAO Investment Centre team included Johan Swinnen, Roble Sabrie, Dino Francescutti, Nathalie Francken, Rob Kuijpers and Gilles Mettetal. The annexes to this report have been prepared by FAO thematic experts: Ida Christensen, Rouja Johnstone, Luis Loyola, Jacopo Monzini, Tomoko Kato, and Steven Watkins. An FAO Agricultural Development Economics (ESA) team included Cristian Morales, Adriana Ignaciuk and Carlos Mielitz, who prepared the first draft of the report and provided significant contributions throughout the process.

2 The CDB team included Luther St. Ville (senior agriculture specialist); Maria Ziegler (gender specialist); Lisa Harding (private sector); Stephen Lawrence, (operations officer - engineer); Andrea Power (coordinator-regional cooperation and integration); Anthony George (social analyst); Valerie Isaac (operations officer - environment); Jason Cotton (economist).

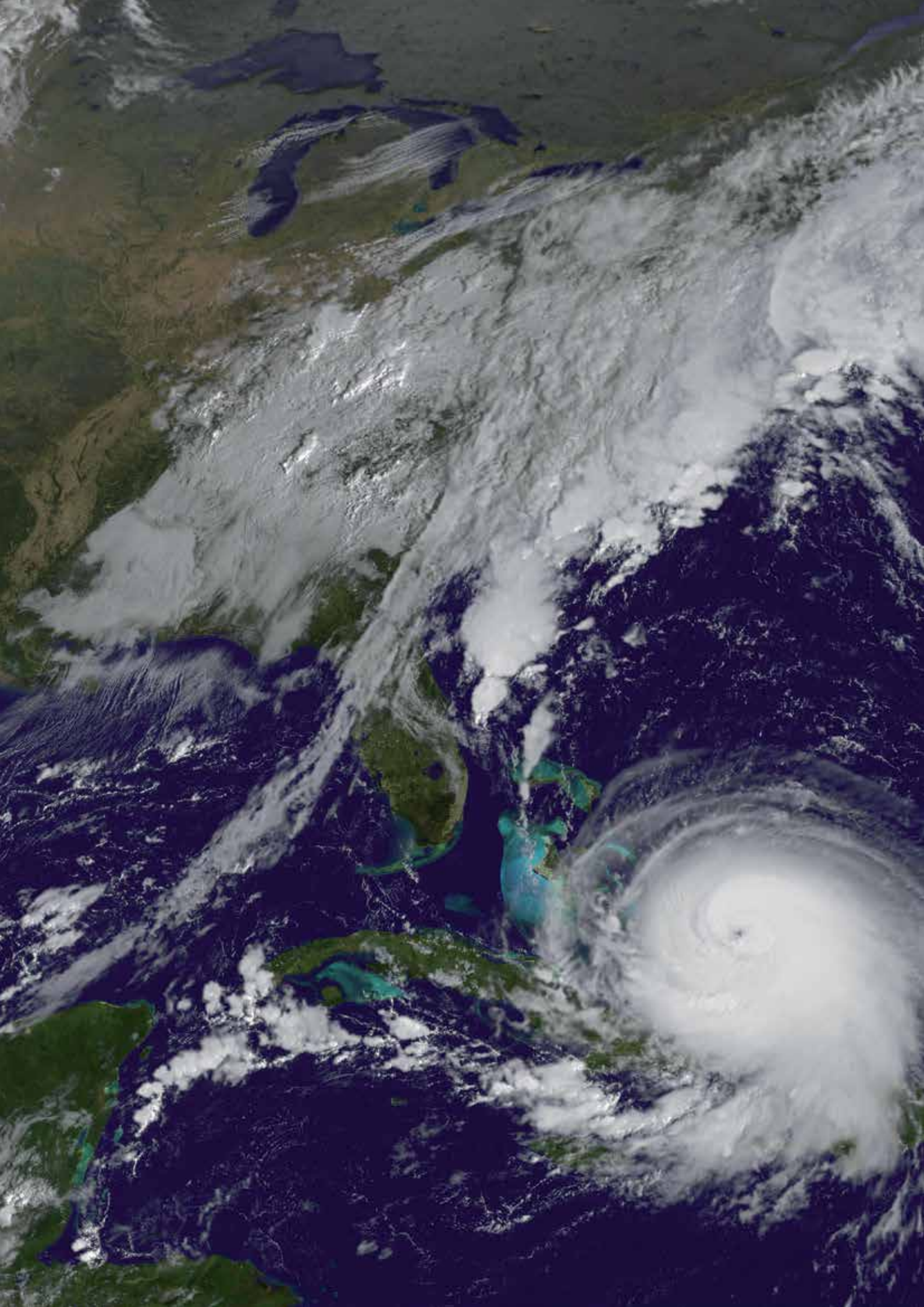
This report presents a sector review of agriculture in BMCs, and identifies opportunities, prospects and gaps; it was prepared by the Investment Center, in partnership with the Agricultural Development Economics Division of FAO (ESA), which is FAO's main division for research and policy analysis on agricultural and economic development.

Using available data and information, the study presents the patterns of agricultural development in BMCs, as well as their challenges and opportunities.

For the analysis (as explained in Section 3), BMCs have been classified into three sub-groups. The review includes an in-depth analysis of four focus countries: one out of each sub-group of BMCs (Jamaica, Grenada and Guyana), as well as of Haiti, the BMC with the largest agricultural sector and the most critical economic condition.

The report provides evidence of the role different factors play in explaining agricultural performance in Caribbean countries. Thus, in addition to the classical input factors approach, it also considers the variables that can influence the evolution and the development of agricultural productivity, such as trade and market access, gender and youth, climate change and extreme weather events, as well as the role of institutions and governance.

Furthermore, as a result of the findings of this study, specific areas have been investigated in more detail. These seven additional investigations, which have been annexed to this study, will be published separately and cover the following areas: climate change adaptation; infrastructure; gender and youth; nutrition; fisheries; fruits and vegetables value chains; and livestock value chain.



2 CDB Borrowing Member Countries: Key characteristics and classification

2.1 Heterogeneity and the role of agriculture

There are 19 Caribbean Development Bank (CDB) Borrowing Member Countries (BMCs). They are a highly heterogeneous set of countries, varying in size, location, income, economic structure, and more. High-income BMCs, such as the Cayman Islands, have incomes above USD 30 000 per capita, while low-income BMCs, such as Belize, Jamaica, and especially Haiti, have incomes below USD 5 000 per capita (see Figure 1).

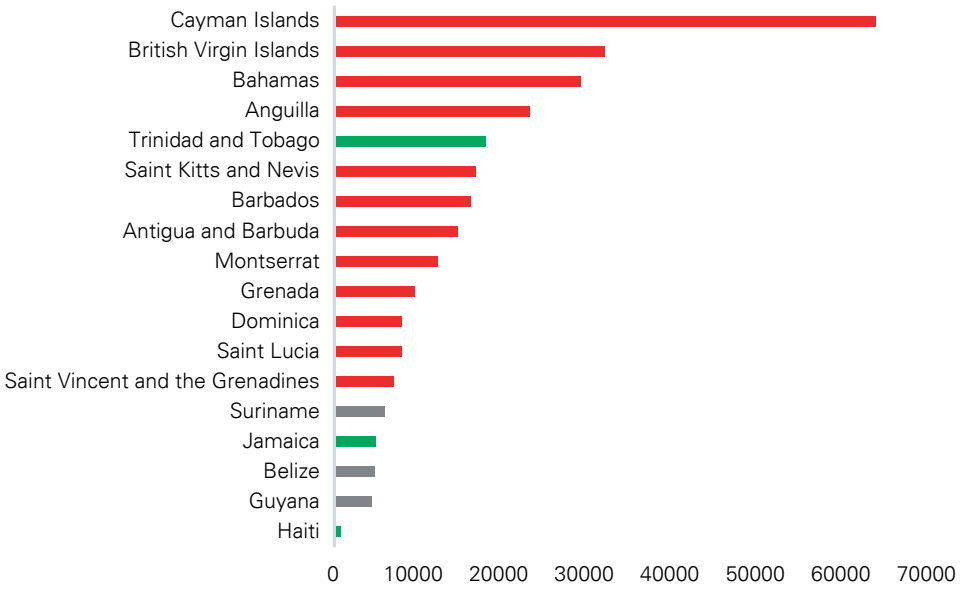
Historically, agriculture has played a central role in the Caribbean economies. Large plantations of especially sugar and bananas produced agricultural commodities for exports, representing an important sector for the economy.[3]

Today, the situation is very different. Caribbean agriculture is more diversified. European Union agricultural policy reforms had a dramatic effect on export demand for sugar and bananas; they catalysed a restructuring of BMC farming systems, and a shift in exports from raw materials (agricultural products) to processed food products. Agriculture also makes up a smaller share of the economy, with growth in other sectors. In several countries – especially among the Islands, such as the British Virgin Islands, the Cayman Islands, and Trinidad and Tobago – agriculture represents less than 1 percent of GDP. However, in other countries (such as Dominica, Grenada, Guyana, and Haiti), agriculture is still an important sector of the economy: It contributes between 7 and 17 percent of GDP, but has a significantly larger share of employment, typically between 10 and 25 percent, and almost 50 percent in Haiti – see Figure 2.

As illustrated in Figure 3, there is an inverse relationship between the share of agriculture in GDP and in total employment, and a country's level of development, measured by GDP per capita. This relationship is not specific to the Caribbean; it is global. More specifically, this inverse relationship is a well-known aspect of the structural transformation of an economy: As an economy develops, the share of its agricultural sector declines. This will be analysed in more detail in Chapter 4.

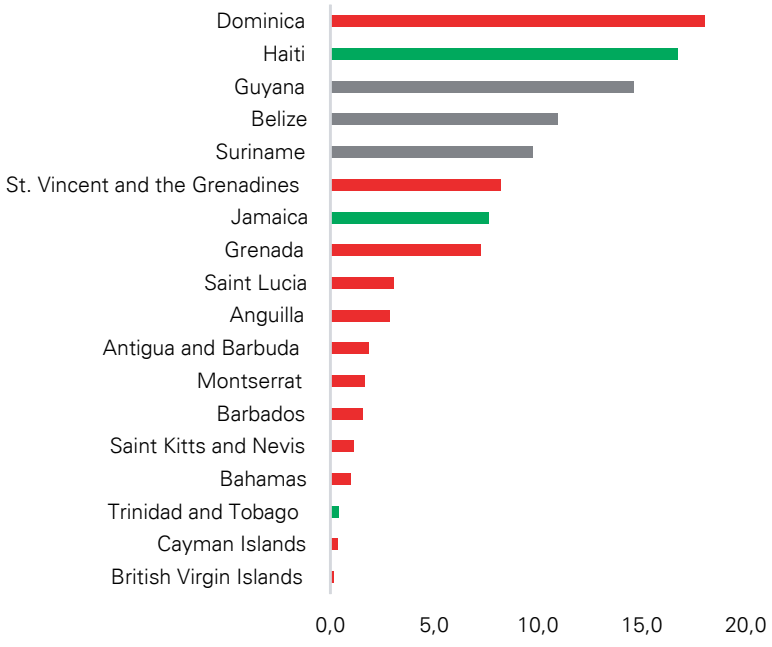
3 See e.g. Beckford and Campbell (2013).

Figure 1. GDP per capita[4] in 2016 in the BMCs (USD)



Source: Adapted from UNSTAT data.

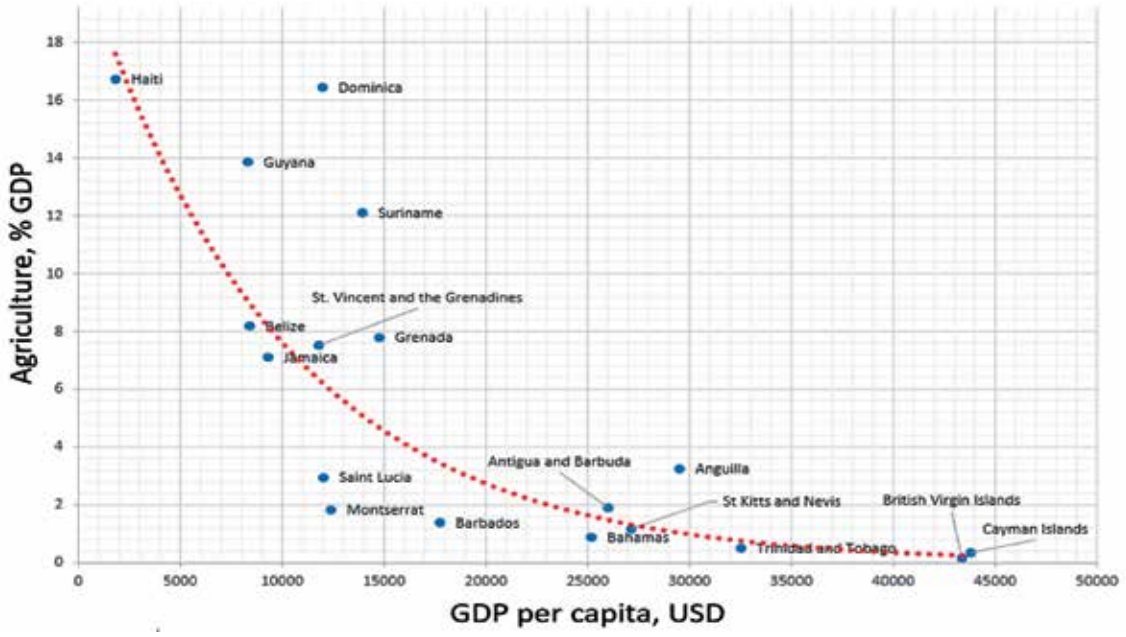
Figure 2. Shares of agricultural value added in GDP in 2016 in BMCs



Source: Adapted from UNSTAT data.

4 Per Capita GDP at constant 2010 prices in USD.

Figure 3. GDP per capita and share of agriculture in GDP in the BMCs (2016)



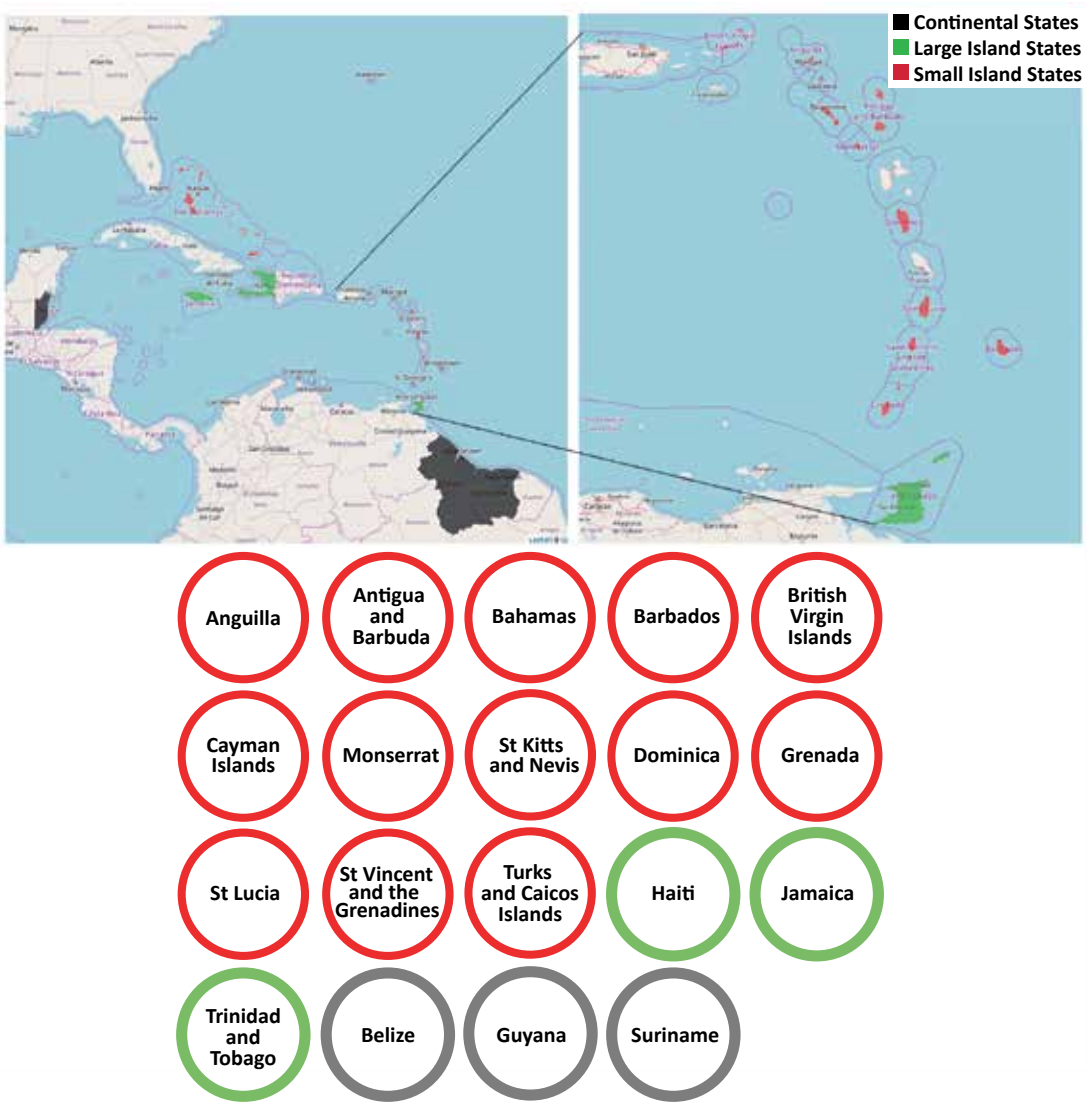
Source: Authors adapted from World Bank Development Indicators.

2.2 Classification and focus countries

To structure this report, and to manage the large heterogeneity among BMCs, we have (a) classified the BMCs into three categories, and (b) identified four focus countries with relatively large agricultural sectors.

The first group of countries are the Small Island States (SIS), identified in red in Figure 4. There are 13 Small Island States, each with a population of less than 400 000 people. The second group are the Larger Island States (LIS), identified in green in Figure 4. There are three Large Island States and their population ranges from 1.4 to 10.8 million people. The third group are the three Continental States (CS), which are not islands, but they all have a coast. They are identified in grey and their population size is between 350 000 and 800 000 people.

Figure 4. Map of BMCs: Small Island States (red), Large Island States (green), and Continental States (grey)



Source: Map source: Google Maps

There is still significant heterogeneity in terms of income and the role of agriculture in the economies within the three groups. For this reason, we have identified four focus countries to help structure the analysis, all of which have a relatively large agricultural sector.

The first focus country is **Grenada**, one of the Small Island States (SIS), and a member of the Organization of Eastern Caribbean States (OECS).[5] Grenada is a midsize country within the SIS in terms of population. However, it is one of the poorer countries of the Small Island States, with a GDP per capita of USD 14 800, and it has a relatively large agricultural sector, representing almost 8 percent of GDP. In 2017, the richest Small Island State, the Cayman Islands, had a per capita GDP of

5 The OECS was established in 1981, with the Treaty of Basseterre, as an inter-governmental organization to foster economic integration and harmonization, reinforce governance, and protect human and legal rights. The Member Countries are Antigua and Barbuda, Dominica, Grenada, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines. Anguilla, the British Virgin Islands, Martinique and Guadeloupe are Associate Members.

USD 43 800, which is four times higher than the per capita GDP in Saint Vincent and the Grenadines – the poorest Small Island State – which is USD 11 790.

The second focus country is **Jamaica**, one of the Larger Island States (LIS). Jamaica is the "middle country" of the Larger Island States, in terms of population size (2.9 million), income (with a GDP per capita of USD 9 300), and the share of agriculture in its economy (7.1 percent). Trinidad and Tobago is the richest of the Larger Island States, with a GDP per capita of USD 32 500. While agriculture contributes very little (only 0.5 percent) to their GDP, the high incomes are sustained by a strong oil and mining sector.

The third focus country is **Guyana**, a member of the Continental States (CS). Guyana is the largest Continental State (with 773 000 people), but also the poorest (with a GDP per capita of USD 8 300). It is the Continental State with the highest share of agriculture in GDP (13.9 percent). The income of Guyana is comparable to that of Belize. Suriname is the richest economy of the Continental States, with a GDP per capita of USD 13 900. Its economy is not only stimulated by gold and oil exports, but it is also heavily dependent on them. The recent discovery of oil resources in Guyana[6] will also likely affect Guyana's future growth and economic structure.

The fourth focus country is **Haiti**, which is also one of the Large Island States (LIS). Being so different and so important in terms of agriculture in the region, Haiti deserves a separate focus. It is by far the largest country, with almost 11 million people, but it is also the poorest, not just of the Large Island States, but of the entire BMC region, with a per capita income of USD 1 800. While agriculture contributes 16.7 percent to GDP, almost half of Haiti's population is employed in the sector. Low incomes, combined with a heavy reliance on agriculture for employment, have been exacerbated by widespread devastation following recent natural disasters, including Hurricane Matthew in October 2016.

6 Experts now estimate that one of its offshore fields alone, known as Liza, could contain 1.4 billion barrels of oil mixed with natural gas, comparable to some of the larger fields drilled in South America.

3 Economic growth, employment, poverty, food security, and gender inequality

Key messages

- BMCs are heterogeneous in terms of economic development and poverty, and other socio-economic factors such as unemployment and food security.
- Haiti is an outlier among BMCs, with significantly lower per capita income, higher poverty and undernutrition rates, and an increasing vulnerability to natural disasters.
- BMCs have had the lowest GDP growth compared with all other developing regions in recent decades.
- The average BMC unemployment rate is around 11 percent. Though unemployment levels had decreased from the very high levels in the 1980s, they rose again following the 2008–2009 global financial crisis.
- The youth unemployment rate in BMCs is significantly higher than the overall average, while female unemployment is systematically higher than male unemployment across the focus countries.
- With the exception of Haiti, the degree of urbanization in BMCs has been relatively stable, increasing only slightly over the past decades.
- Emigration is an important phenomenon in Jamaica and Haiti.
- Undernutrition varies considerably among BMCs, though the average level has fallen slowly over the past two decades. Among the focus countries, undernutrition is especially high in Grenada and Haiti.
- In all BMCs, except Haiti, food availability exceeds the established food energy requirement guidelines. Food access is a key food and nutrition security issue in the poorest BMCs.
- In recent years, several Small Island States and Haiti have become increasingly dependent on staple food imports, with the high value of imports exceeding that of exports.
- Obesity has been on the rise in all BMCs since 2000, as these countries face the *double burden of malnutrition* – when the combination of undernutrition and poor diets leads to obesity.
- The gender equality performance of BMCs fares well compared with other developing regions in the world, though it is still a major concern. Women account for a significant share of the farmers in the region, yet compared to men, they experience lower access to finance, land, networks, information, and decision-making in farmer organizations.

3.1 Introduction

General economic and social developments have been documented and analysed in detail in other reports, such as the World Bank's semi-annual *Global Economic Prospects*, the Inter-American Development Bank's *Caribbean Region Quarterly Bulletin*, and the Caribbean Development Bank's *Annual Reports*. However, this Chapter briefly summarizes key developments and differences among Borrowing Member Countries (BMCs), as economic and social developments play a key role in the transformation of agricultural and food systems. More specifically, this Chapter briefly reviews past and future economic growth and poverty levels (Section 3.2), unemployment (including youth and gender differences), urbanization, and migration (Section 3.3).

Section 3.4 of this Chapter analyses food security in BMCs in greater detail.

3.2 Economic growth

Economic growth is the most powerful instrument for reducing poverty and undernutrition, and for improving the quality of life in developing countries. However, average GDP growth in the BMCs has been lower than in any other developing region during the last 35 years. In this period, the average growth rate was equal to 1.6 percent, which is comparable to the rate of developed countries, but well below other countries in Latin America and the Caribbean, and developing countries in general. Over the same period, countries in Asia[7] and sub-Saharan Africa have grown at 6 percent and 3.5 percent, respectively. In BMCs however, growth over the last 15 years has hovered around 2 percent, compared to the averages of 2.7 percent, 7 percent and 5 percent, respectively, for the rest of Latin America and the Caribbean, Asia and sub-Saharan Africa.

>> BMCs had the lowest GDP growth compared to any other developing region

Economic growth performance has not been even among BMCs. The economies of the Small Island States (SIS) grew on average at a 1.6 percent pace between 1981 and 2016. Since 2000, the economic growth of Small Island States has slowed, as reflected by their GDP growth equal to 0.8 percent. Several factors have contributed to the low performance of their economies. For example, the Small Island States were hit hard by the 2008–2009 global financial crisis, as their economies rely heavily on the financial sector. A downturn in tourism earnings has also been linked to the global economic crisis, as have declines in remittances.

In addition, the 2008–2009 global financial crisis occurred in the wake of the 2007–2008 global food crisis – when food prices soared. The combined effect of these two crises had a negative impact on net food importing countries, such as the Small Island States (ECLAC, 2008). From 2000 to 2011, the prices of imported food products, such as wheat, maize, rice and soybean oil, more than doubled.

Similarly, the economies of Large Island States (LIS) have grown at an average yearly rate of 1 percent over the last 35 years. Trinidad and Tobago has been the fastest growing economy due to the high commodity prices of its main export products, particularly crude oil and natural gas, which account for about 40 percent of the country's GDP and 80 percent of its exports. Jamaica, however, has grown at a substantially slower pace – 1.6 percent on average – making it one of the slowest growing developing countries in the world. Haiti experienced a negative growth rate between 1981 and 2016; yet, growth has resumed somewhat, at 1.5 percent in 2016 and 1.2 percent in 2017.

7 The average excludes Israel and Japan, as these countries performed well above the rest of the region.

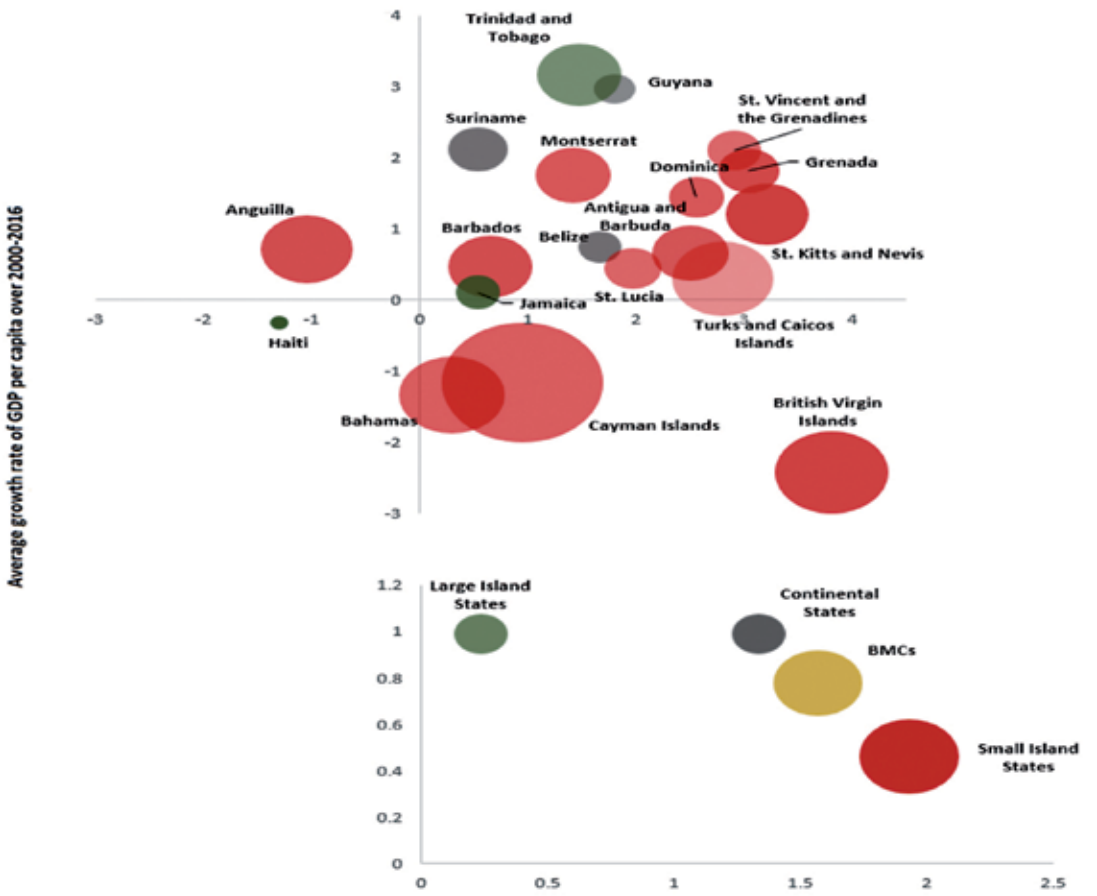
Within the Continental States (CS), Belize's economy has grown at 4.5 percent since 1981, outperforming not just the CS, but most of the BMCs. The economies of Guyana and Suriname have followed the regional pattern, with an average annual growth rate of about 1.8 percent. While overall economic growth in Guyana and Suriname has increased by 3 percent since 2000, Belize has continued to grow at almost 4 percent.

Compared to other countries in the region, Continental States were less affected by the global financial crisis, largely due to their smaller financial sector – especially in comparison with Small Island States. In recent years however, the growth has slowed: Belize's economy grew at a rate of just 0.8 percent in 2016, on account of declining agricultural and fisheries outputs. Similarly, Suriname experienced a recession in 2015 and 2016 because of declining commodity prices, reflecting the country's dependence on the extractive industries. Though growth resumed at 1 percent in 2017.

>> The Small Island States were the most affected by the 2008–2009 financial crisis, while the Continental States were the least affected

Forecasts by the International Monetary Fund (IMF) predict that the BMCs with the lowest level of GDP will grow the most in the coming years. The economies of both Small Island States and Large Island States are expected to grow by 1 to 2.5 percent per year. Among the Continental States, the IMF projects strong growth in Guyana's GDP per capita, due to the discoveries of vast oil reserves in recent years.

Figure 5. Average growth rate of GDP per capita[8] in USD for BMCs and country clusters



Source: Adapted from UNSTAT.

NOTE: Bubble sizes are proportional to GDP per capita in 2016.

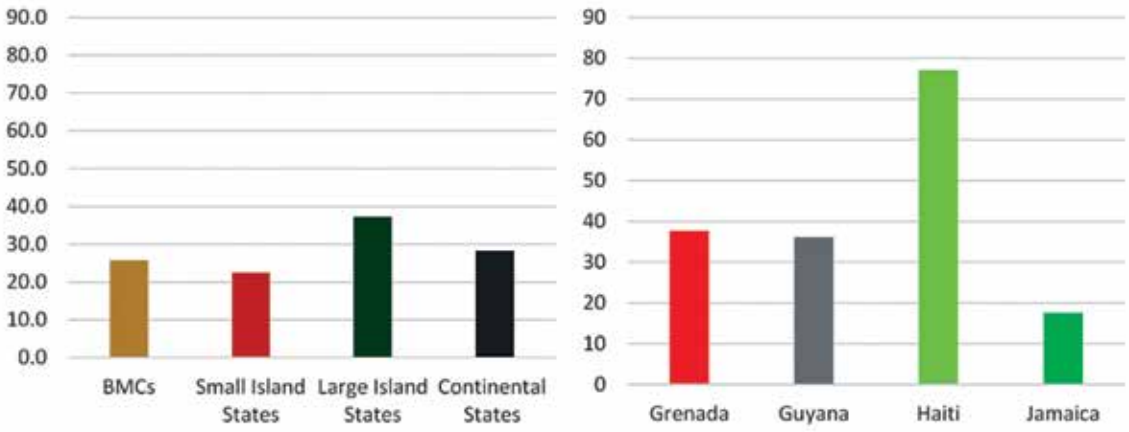
As shown in Figure 5, Haiti has the slowest economic growth rate of the BMCs. The country's low GDP per capita is in fact deeply intertwined with high levels of poverty. Figure 6 illustrates that the average proportion of the population living below the poverty line across BMCs is around 26 percent. Not surprisingly, poverty levels are correlated with average income levels: Poverty is highest in the Large Island States, at 38 percent on average, with Haiti representing the largest share of the poor – no less than 77 percent of the population in Haiti live below the poverty line. Jamaica, another LIS, has the lowest levels of poverty among the focus countries, at 18 percent.

The share of the population living below the poverty line is also high in the other focus countries. About 36 percent of the population in Grenada and Guyana live in poverty. On average, poverty is lower in the Small Island States and Continental States: 22.5 percent and 28.3 percent of the population, respectively, live below the poverty line. While there is some variation – poverty is much lower in the richest BMCs, such as the Cayman Islands – even in relatively high-income countries, such as the Bahamas, poverty is at double-digit levels.

Considering the persistently high poverty rates in BMCs, poverty reduction continues to present a major challenge throughout the region, especially for the focus countries of this report.

8 Per capita GDP at constant 2010 prices in USD.

Figure 6. Proportion of population below the poverty line (last available year)



Source: CARICOM.

As indicted in a recent CDB report on *Poverty and Inequality in the Caribbean*,[9] poverty and vulnerability in the region are more widespread in rural areas than in urban areas, especially where infrastructure and services are inadequate, the geography is unfavourable, and the people are vulnerable to environmental shocks and seasonal exposure. Moreover, poor households depend on occupations in agriculture with incomes derived mainly from the sale of labour, goods and services in the cash economy.

Female-headed households (FHHs) make up nearly 40 percent of all households in some countries, especially in rural areas; they are more likely to be poor, with a household head who is unmarried. While poverty is exacerbated by disparities between men and women, it also causes the gender gap to widen.

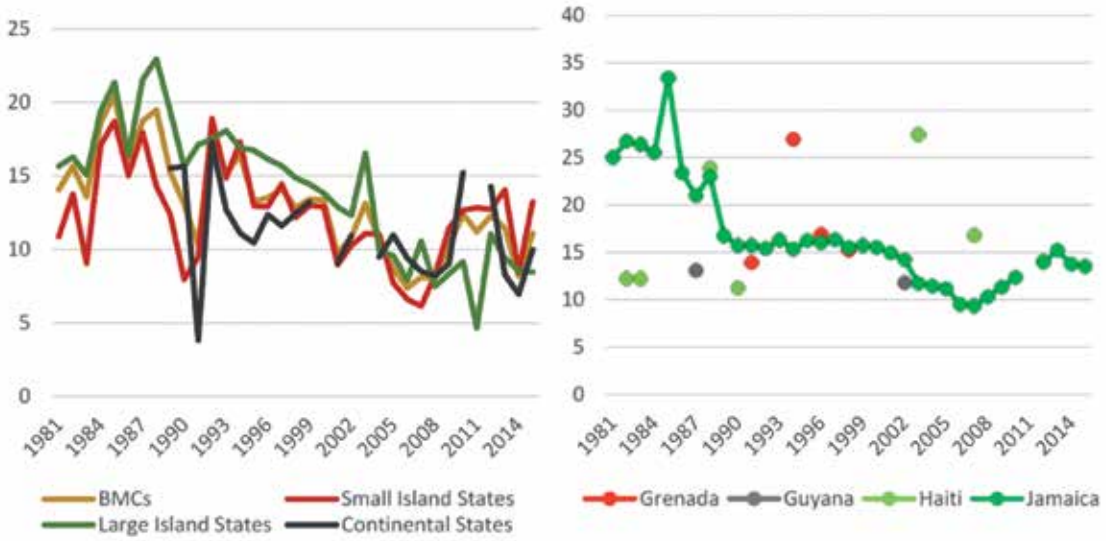
Indigenous peoples, such as those living in Belize, Dominica, Guyana, and Suriname, tend to be among the most disadvantaged and impoverished people, though they may not perceive themselves as poor.

3.3 Unemployment, urbanization and migration

Unemployment in BMCs was high in the second half of the 1980s, averaging between 15 and 23 percent. However, it decreased throughout the 1990s and 2000s, until the 2008–2009 global financial crisis. Since then, unemployment has fluctuated, and its average is currently at 11 percent of the total labour force for BMCs. Averaging 8.5 percent, Large Island States have the lowest unemployment levels, while Small Island States have the highest, at 13.3 percent (see Figure 7).

9 CDB (2016a), *The Changing Nature of Poverty and Inequality in the Caribbean: New Issues, New Solutions.*

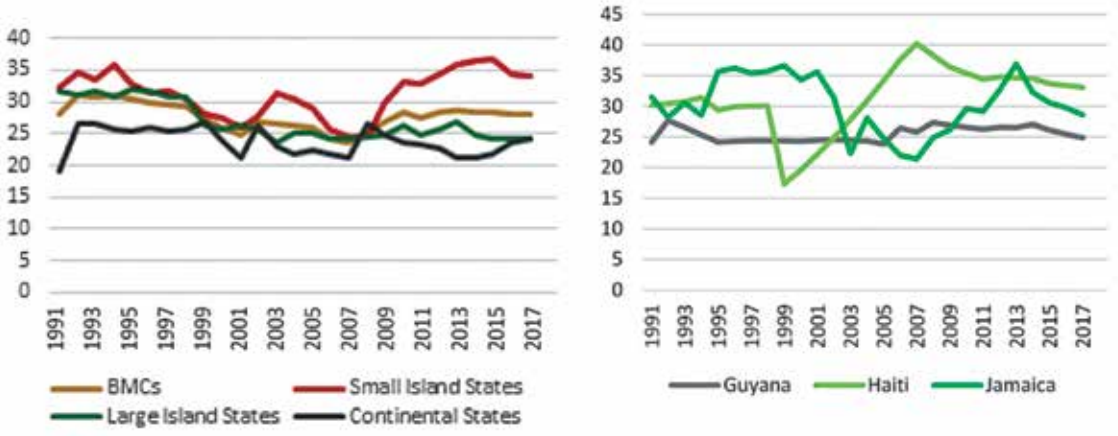
Figure 7. Unemployment rate (% of total labour force)



Source: World Bank; ILO.

Youth unemployment is especially high in BMCs. The average youth unemployment rate is systematically higher than the overall unemployment rate in all the country clusters, indicating that the young experience specific frictions, which hinder their entrance and participation in the labour market. While the average rate of unemployment for working-age youth is around 28 percent in the BMCs, the Small Island States have the highest rate, as shown in Figure 8. Among the focus countries, Haiti's percentage of unemployed youth reaches almost 32 percent, while Guyana's was around 24 percent in 2017.

Figure 8. Unemployment of youth (% of total labour force aged 15–24)

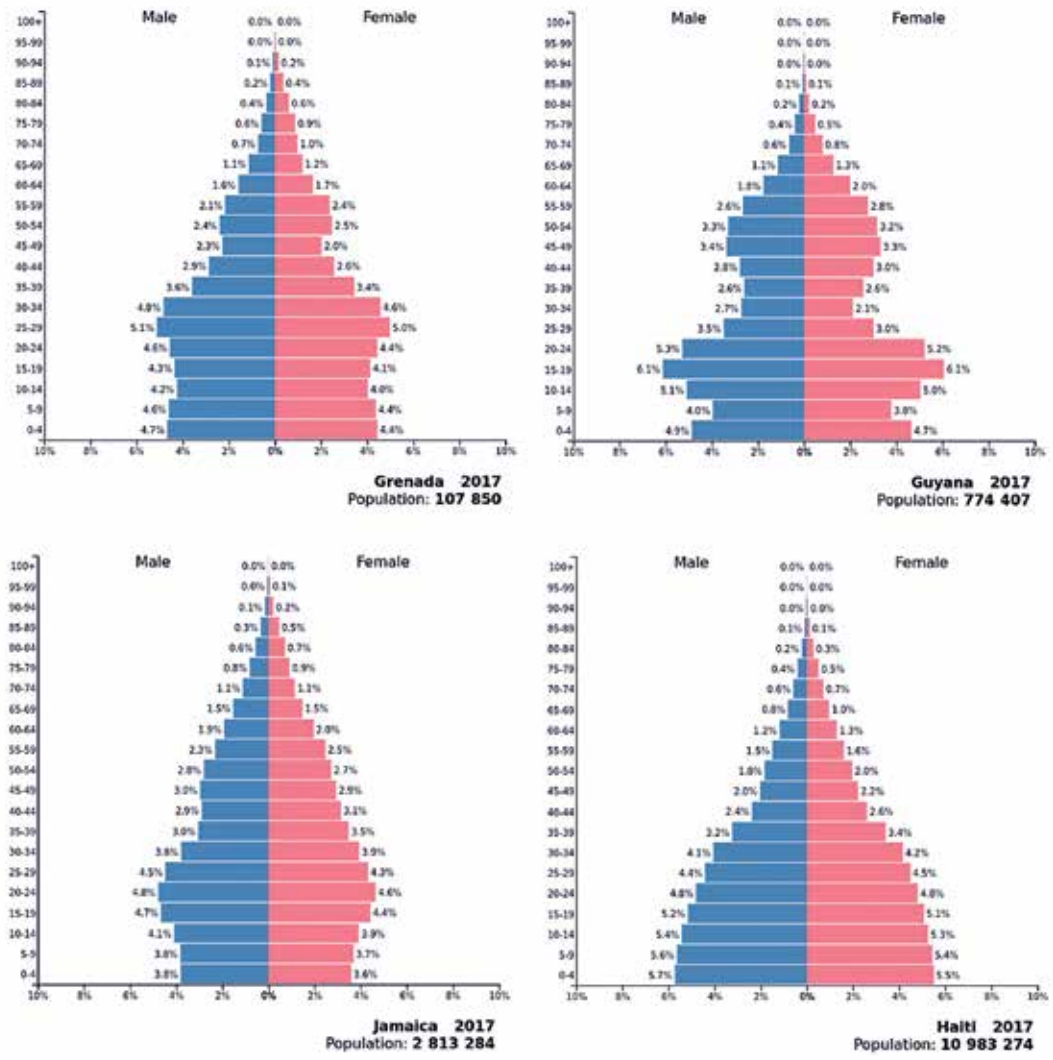


Source: World Bank; ILO.

The alarming levels in youth unemployment suggest how difficult it will be to reach the United Nations Sustainable Development Goals (SDGs), and specifically, Goal 1: to end poverty in all its forms everywhere by 2030. More efforts are needed to achieve sustainable and inclusive economic growth, alongside targeted education and skills development to foster job creation for young people

in BMCs. Youth unemployment is of particular concern in BMCs, as young people make up a large share of the population. Figure 9 shows the large cohort between the ages of 15 and 24, which represents around 20 percent of the overall population in the different focus countries.

Figure 9. Demographic profile of the focus countries in 2017

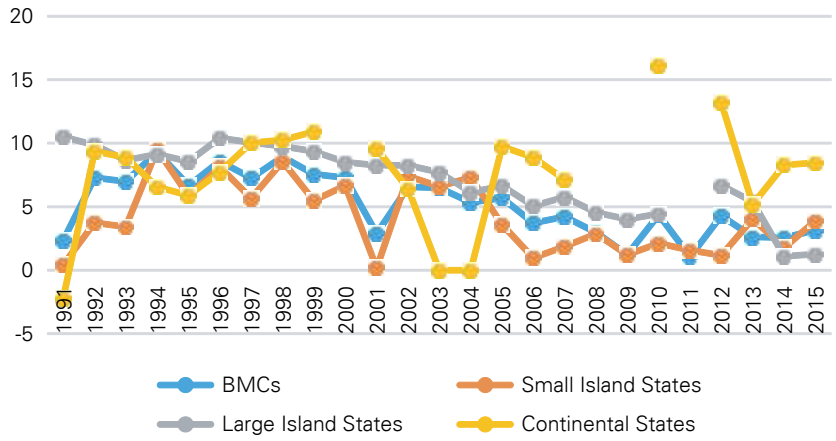


Source: PopulationPyramid.net.

There are substantial gender differences in unemployment. Female unemployment is higher than male unemployment in all the country clusters. In 2015, female unemployment was four percentage points higher than male unemployment in the Small Island States. In the Large Island States, there was a ten percentage point difference between female and male unemployment in 1991, though it decreased to 1.5 percentage points in 2015. In Continental States however, gender inequality in unemployment has widened: Compared with the male population, the difference in female unemployment increased from 2.5 to 9 percentage points during the 1991–2015 period.

>> The average BMC unemployment rate is around 11 percent, though the youth unemployment rate is significantly higher than the overall average, and female unemployment is systematically higher than male unemployment

Figure 10. Gender gap in unemployment



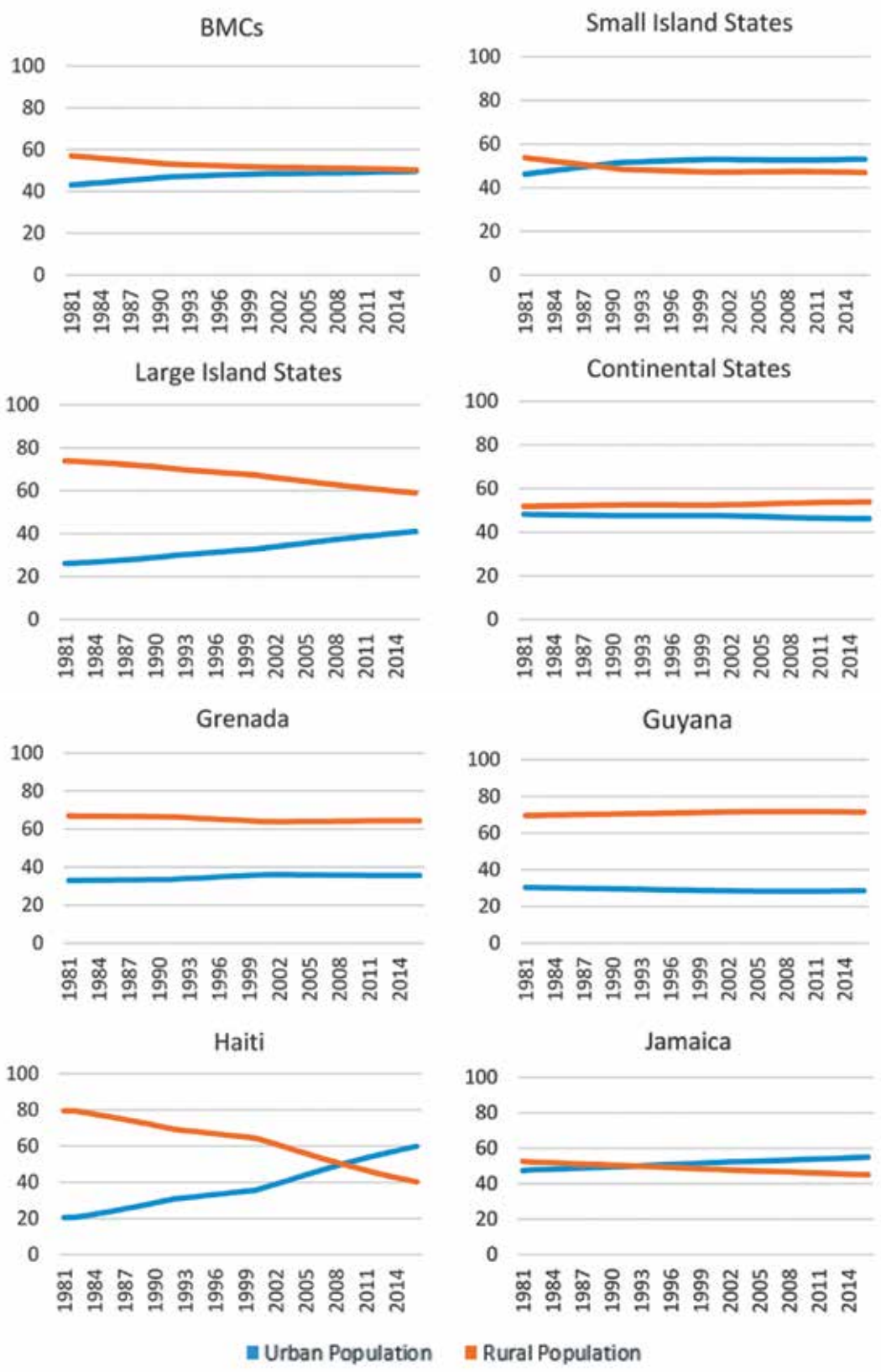
Source: World Bank; ILO.

NOTE: Difference between female and male unemployment in percentage points.

The degree of urbanization in BMCs has been relatively stable over the past years, with the exception of Haiti. Since 1990, the share of the population living in urban areas has stayed at around 50 percent. The same is true for the Continental and Small Island States, where averages are close to 50 percent and stable. However, the shares of the rural population in Grenada and Guyana are close to 70 percent, as these focus countries have larger agricultural sectors.

In contrast, urbanization in Large Island States has increased significantly. This process is driven mostly by growing rural-urban migration in Haiti, and to a lesser extent, in Jamaica. In Haiti, the share of the population living in urban areas increased from 20 percent in 1981 to 60 percent in 2016.

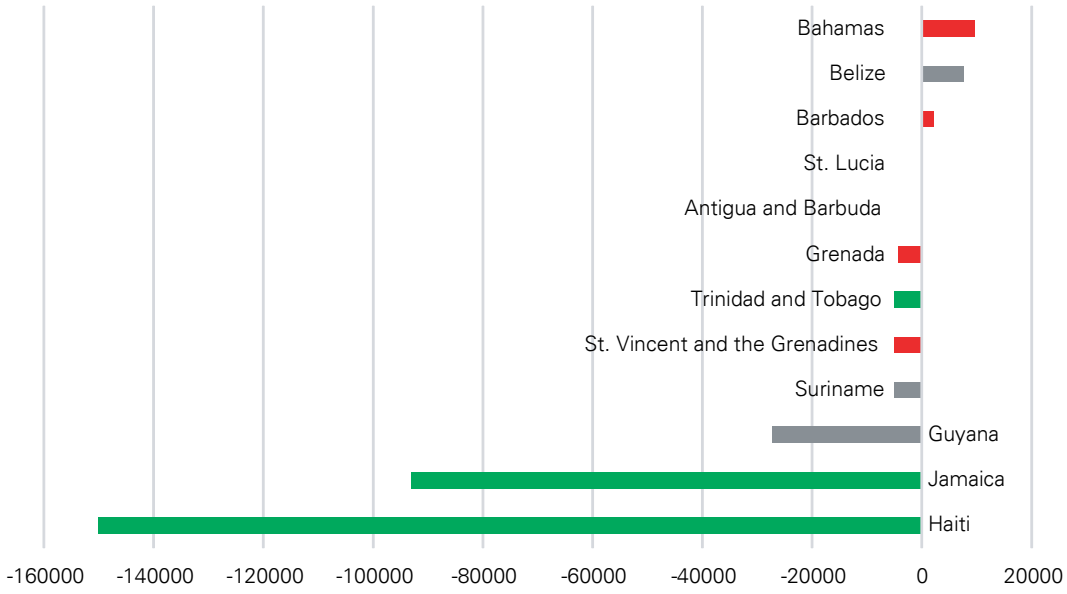
Figure 11. Rural/urban population (% of total population) for country clusters



Source: World Bank.

Migration is an important phenomenon in some BMCs, especially in Jamaica and Haiti, where a large number of people are emigrating. Migration can have a significant impact on the demography of the population, and on finance flows through remittances – and thus incomes. Figure 12 shows available migration statistics for several BMCs. Some BMCs, such as Barbados and the Bahamas, receive more migrants compared with the number of people that leave the country. In terms of the number of people emigrating, two Large Island States stand out. In 2012, the latest year with available data, more than 90 000 people emigrated (net) from Jamaica, mostly migrating to the United States of America, the United Kingdom of Great Britain and Northern Ireland, and the Bahamas.[10] Around 150 000 people emigrated from Haiti, going primarily to the United States of America, the Dominican Republic and Chile.

Figure 12. Net migration in 2012



Source: World Bank.

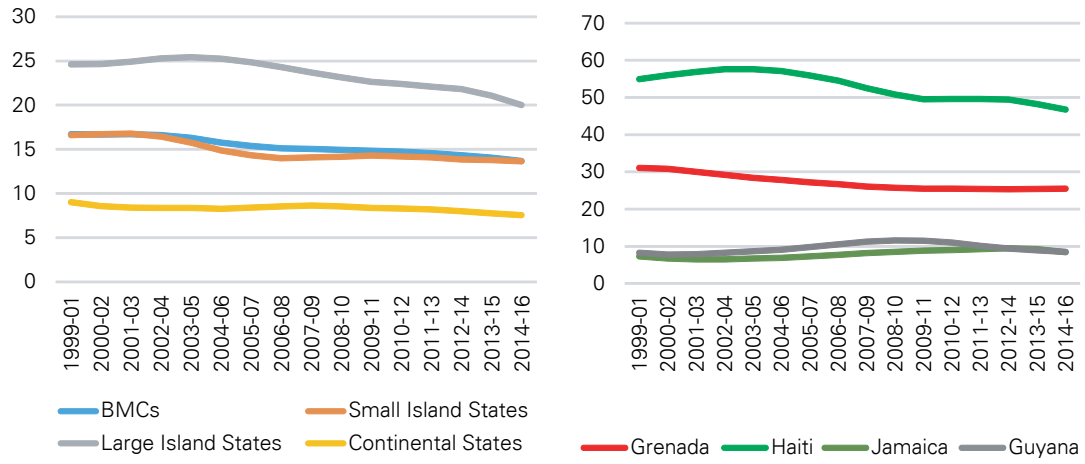
NOTE: Net migration is the net total of migrants during the period, that is, the total number of immigrants less the annual number of emigrants, including both citizens and noncitizens. Data are five-year estimates.

3.4 Food security and malnutrition

Undernourishment is widespread in BMCs. In Haiti, undernourishment levels are as high as 77 percent, pulling up the averages in BMCs. However, the average in the Small Island States – including many of the richer BMCs – is close to 15 percent. As Figure 13 illustrates, undernourishment has decreased slowly in the region over the past 20 years.

10 It should be noted that the data is not available for all countries; therefore, country clusters cannot be calculated properly.

Figure 13. Evolution of undernourishment in BMCs



Source: Adapted from FAOSTAT data.

NOTE: The prevalence of undernourishment expresses the probability that a randomly selected individual from the population consumes insufficient calories to cover her/his energy requirements for an active and healthy life. The indicator is computed by comparing a probability distribution of habitual daily dietary energy consumption with a threshold level called the minimum dietary energy requirement. Both are based on the notion of an average individual in the reference population. The indicator is calculated in three-year averages, from 1990–1992 to 2014–2016, to reduce the impact of possible errors in estimated DES, due to the difficulties in properly accounting for stock variations in major food.

What is a cause of even greater concern is that, while undernutrition indicators have declined only slowly over the past 20 years, other forms of malnutrition and its consequences (obesity) are on the rise. This suggests that the BMCs are increasingly vulnerable to "the double burden of malnutrition".

To provide more insights into the food security situation in BMCs, in the rest of this section we use the well-known FAO concepts of food security, addressing the four dimensions of food security: **availability, access, utilization and stability.**

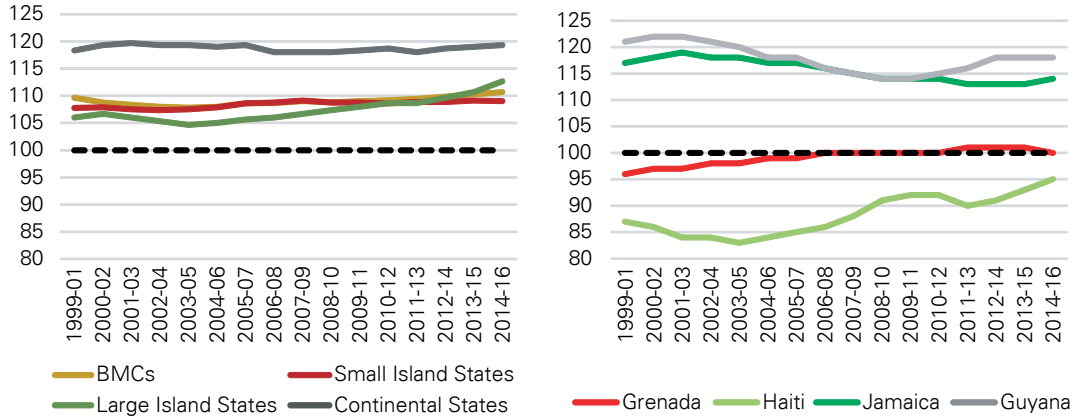
3.4.1 Food availability – Dietary energy supply adequacy

Food availability is measured by the *dietary energy supply* (DES) as a percentage of the *average dietary energy requirement* (ADER). Being a country-specific measure, the ADER captures the average dietary energy requirement for the population of a given country. The dietary energy supply indicates how the food supply, in terms of calories, deviates from this country-specific required level.

As illustrated in Figure 14, the DES exceeds the required ADER in all the country clusters. People in the Continental States have, on average, 20 percent more calories than recommended in the ADER guidelines. In the Large Island States and Small Island States, the DES is about 10 percent higher than the reference value. Grenada, Guyana, and Jamaica follow the same pattern of their clusters. The exception is Haiti, for which the indicator has been below 100 for the past two decades.

At first glance, these excesses of food energy availability may appear contradictory given the difficulty of CARICOM countries to satisfy the Sustainable Development Goals and the World Food Summit hunger targets (FAO, 2015). There are several potential reasons why food availability is not always closely related to hunger. One reason is that food availability is often not directly translated into food consumption. Another reason is that the concept of food availability does not account for food losses during storage, preparation and cooking, among others. In addition, there might be an unequal distribution of food among the population that can be associated with higher levels of poverty or inequality.

Figure 14. Average dietary energy supply



Source: Adapted from FAOSTAT data.

3.4.2 Food access

Food access is a key food security issue in the region. It depends on income, food prices, food distribution systems and other factors, such as economic growth, climate change, and environmental degradation. These factors play a role in limiting household's access to food. As shown in the previous subsection, poverty in some BMCs is relatively high, which will have implications for food access.

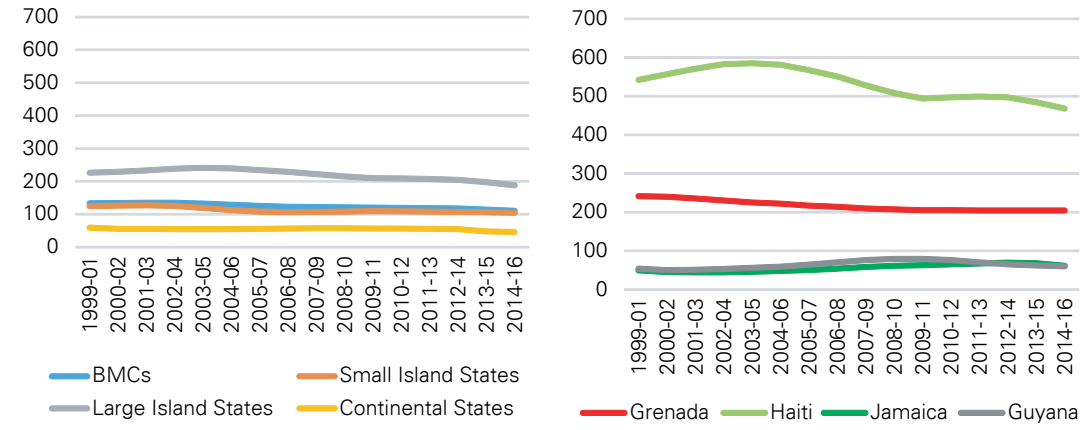
The indicator adopted to value the degree of access to food is the depth of the food deficit. This indicator measures how many calories are needed to help the undernourished escape from their status, all things being equal.[11] Figure 15 illustrates how Large Island States are characterized by a higher food deficit compared with the other clusters in the region; this deficit can be attributed to the higher prevalence of undernourishment in Haiti. However, in Grenada the food deficit is also relatively large (200 Kcal), while Guyana and Jamaica have lower caloric deficit levels.

>> Food access is a key food and nutrition security issue in the Caribbean

Food access, or more specifically, a lack of access to food, is strongly related to poverty. As shown in Figure 15, food access is low in countries such as Haiti, where a large share of the population lives below the poverty line. Though high unemployment rates can explain poverty levels to a degree, low wages can also exacerbate poverty levels, even with low unemployment.

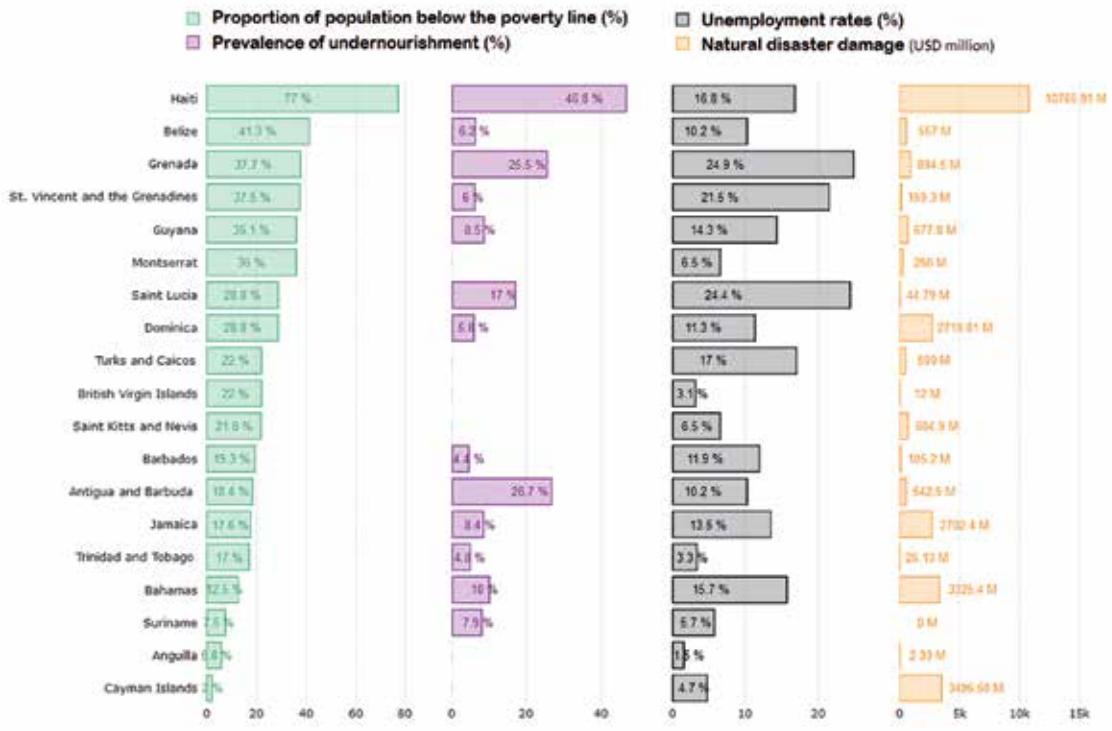
11 According to FAOSTAT, the average level of food deprivation of the undernourished, computed as the difference between the average dietary energy requirement and the average dietary energy intake of the undernourished population, is multiplied by the number of undernourished to provide an estimate of the total food deficit in the country, and normalized by the total population.

Figure 15. Depth of the food deficit



Source: Adapted from FAOSTAT data.

Figure 16. Poverty, under nutrition, unemployment and disaster management by BMCs



Source: Adapted from FAO (2015), FAOSTAT, and EMDAT data.

3.4.3 Food utilization

Food utilization in the region has been characterized by unhealthy food regimes. According to FAO (2015), a high proportion of the imported food in BMCs is calorie-dense, high in fat, and high in sugar. These products are more affordable than heathier alternatives. The World Health Organization (2010) finds that obesity levels in the region are increasing, as poorer households are more likely to make less nutritious food choices in the absence of affordable, healthier alternatives.

The prevalence of obesity in the adult population is measured as the share of adults whose body mass index (BMI) is more than 30 kg/m2. The condition of being overweight may represent a

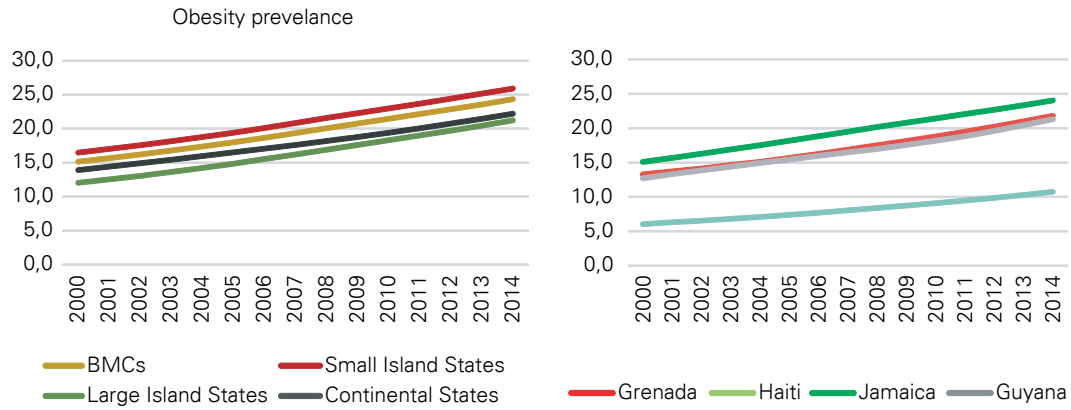
concern, as it can contribute to an increased level of chronic, non-communicable diseases. Figure 16 illustrates that, on average, obesity has been on the rise across the region over the last 15 years. For example, obesity affects about a fourth of the population in Small Island States.

Continental States and Large Island States have similar figures, as on average, around 20 percent of their population is obese. The obesity prevalence rate is almost 25 percent in Jamaica, whereas in Grenada and Guyana, it is around 20 percent. Though Haiti has lower levels of obesity, the percentage of people who are overweight in the country has almost doubled over the past 15 years.

These observations suggest that the "double burden of malnutrition", defined as the simultaneous occurrence of undernourishment and poor diets leading to obesity, is an increasing problem in some BMCs.

>> Food consumption in all BMCs, except Haiti, exceeds the established food energy guidelines. Rising levels of obesity reflect the way food is utilized in the region

Figure 17. Prevalence of obesity in the adult population (18 years old and above)



Source: Adapted from FAOSTAT data.

3.4.4 Food stability

Food stability indicators describe whether a country is exposed to volatility in food access over time. The FAO food security measurement approach uses the ratio of food imports over total exports and the cereal import dependency as indicators for food stability.[12] The ratio of food imports over total exports reflects the sufficiency of foreign exchange reserves to pay for food imports, and is a proxy for a country's capacity to pay for imported food.

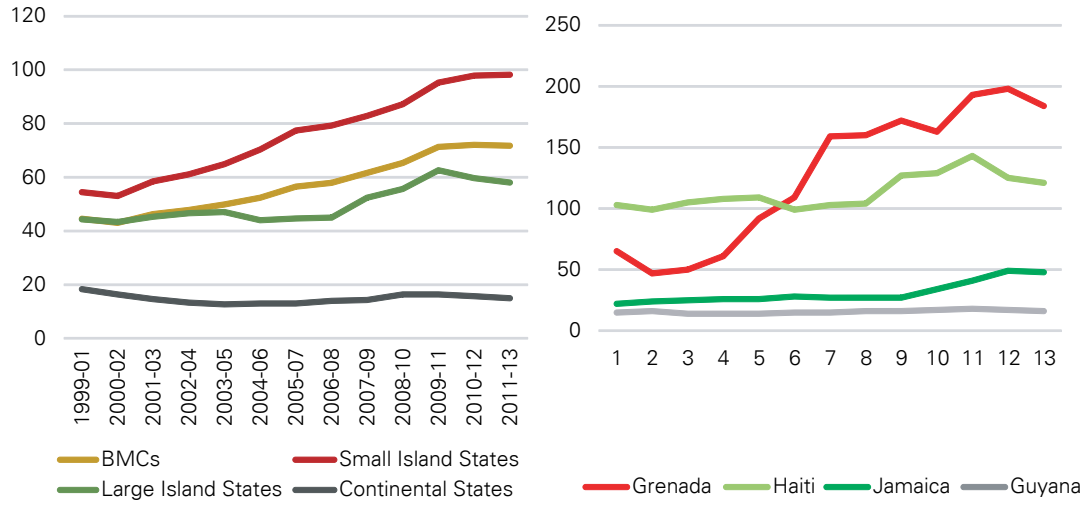
Since 2003, BMCs have spent more than half of the value of total exports on food imports, and this share has been increasing (Figure 18). The value is relatively low for Continental States, but has increased to very high levels in recent years for the Small Island States. Grenada and Haiti have the highest values of the indicator among the focus countries, and they depend heavily on their foreign exchange revenues to purchase their imported food.

12 Chapter 5 further discusses the ratios between food imports and net national food production, and food imports and national food consumption.

>> The ratio of food imports over total exports is increasing in BMCs, and is very high in some of the poorer Small Island States and Haiti

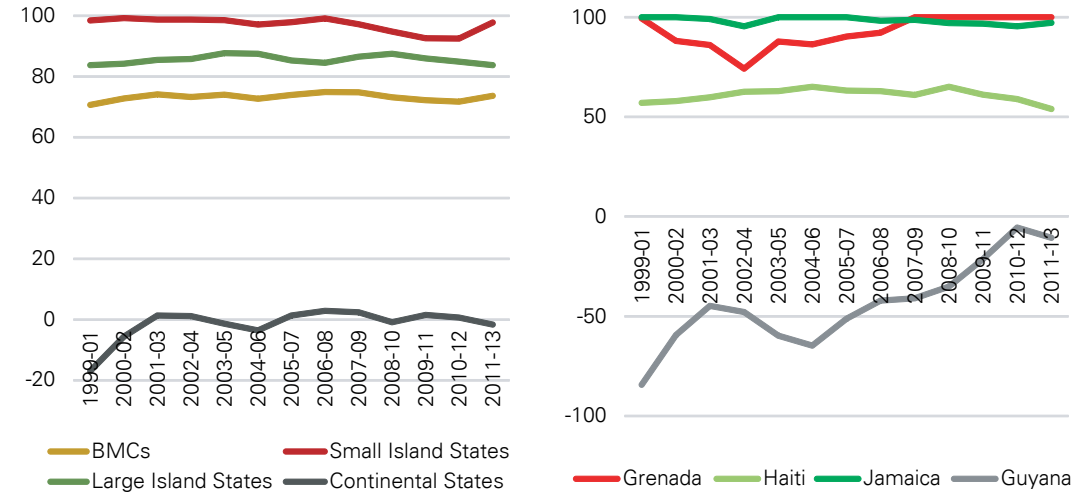
A second indicator, the cereal imports dependency ratio, indicates to what extent the available domestic supply of cereals is derived from the country's own production.[13] On average, the cereal import dependence is high in BMCs, but there are large differences between the Continental States and the rest of the BMC clusters. Guyana and the Continental States are net exporters of cereals. The Small Island States and the Large Island States almost fully import their cereals for consumption.

Figure 18. Value of food imports in total merchandise exports



Source: Adapted from FAOSTAT data.

Figure 19. Cereal import dependency



Source: Adapted from FAOSTAT data.

13 It is computed as follows: (cereal imports – cereal exports)/(cereal production + cereal imports – cereal exports) * 100. Negative values indicate that the country is a net exporter of cereals.

3.5 Gender inequality[14]

Figure 10 documents important gender gaps in unemployment. In global gender statistics, the Caribbean appears to fare better in terms of gender equality, with a high Gender Parity Index (GPI) and good rankings reported in the most recent *Global Gender Gap Report*. However, only four BMCs are included in such statistics – Barbados, Belize, Jamaica, and Suriname – of which only Jamaica is among the focus countries of this study. Most importantly, while such data provide a general comparable average on countries' gender-based disparities, they do not give a focused picture of rural realities where agriculture is an important part of people's livelihoods.

Agriculture is an important source of employment and income for many women in the BMCs. Women account for 22 to 30 percent of registered farmers, ranging from 22 percent in Grenada,[15] 25 percent in Trinidad and Tobago,[16] and 30 percent in Jamaica.[17] Though, the number of women registered as farmers is lower in Dominica (15 percent),[18] and in Belize (6 percent).[19] The CDB Country Gender Assessments (CPAs) suggest that women's low participation in agriculture in the Caribbean is linked to gender-based inequalities in accessing land, labour, financial capital, technology and market information, which renders them ill-equipped to face the challenge of transitioning from subsistence to commercial agricultural production.

3.5.1 Access to land and other productive resources

Access to land and other productive resources depend in part on a country's land tenure system. In many Caribbean countries, these systems can be complex, including informal tenure, both through legitimate but unregistered possession of interests in family land, and through illegal occupation on state or private land. Bynoe et al. (2014) find that land administration systems may not have the resources to sufficiently secure tenure rights for both poor men and women, which affects their ability to invest in farming and disaster risk and resilience measures. In this context, women are further disadvantaged compared to men in accessing land and other productive assets (CDB, 2016). Women lack legal titles to land[20] and ownership of agricultural properties (Peebles, 2012), and their contributions to family farming are often not recognized, as the "principal farmers" – captured in national statistics – are predominantly male (IDB, 2014). According to Jamaica's Rural Agricultural Development Authority (RADA), Agribusiness Information System, 11 percent of the land under cultivation is attributed to 30 percent of registered female farmers, whereas 89 percent of the land is documented as being under the purview of male farmers.[21]

3.5.2 Access to credit

While both male and female small and medium entrepreneurs face challenges in accessing credit, women tend to receive fewer business loans than men, and smaller values, despite their stronger track record of loan repayment. Obstacles to accessing credit include the lack of access to collateral, such as land. In *Guyana* for example, the demand for high levels of collateral and interest rates puts formal credit beyond the reach of many women. An estimated 90 percent of the women who head

14 For more details, see the expert background report on gender equality and youth empowerment (see online Annex).

15 Fitzroy James, *Grenada National Agricultural Plan, 2015.* http://agricarib.org/images/docs/COUNTRIES_GRENADA_National_Agriculture_Plan_Final_Aug25_2015_Final_Edit_(002).pdf

16 Interview with Ministry of Agriculture personnel, Trinidad and Tobago, 28 March 2017.

17 Rural Agricultural Development Authority (RADA), Jamaica, Agribusiness Information System.

18 Rawwida Baksh and Associates, CDB Country Gender Assessments (CGAs) Synthesis Report, 2016.

19 CDB (2016b).

20 Belize is one example where women hold less titles to land than men. See CDB (2016b).

21 In Trinidad and Tobago, under the government's agricultural land lease programme, only 12 percent of leases have been acquired by women. In St. Kitts and Nevis, 80 percent of farm holdings are owned or occupied by men, compared to 20 percent by women.

farm households in the country do not hold land titles; therefore, their ability to access credit from lending institutions is non-existent.[22] This poses obstacles to expanding and improving their farming and leads to low productivity levels. Similarly, women who had accessed government-supported technical training to start or expand their rural business enterprise, were either denied credit by financial institutions due to a lack of collateral, or had to have their husband's approval to utilise the collateral presented.[23]

3.5.3 Access to information, knowledge and decision-making

With limited access to and control of resources, women have more difficulties accessing training, improved technology, market information, and agricultural inputs, such as fertilizer and irrigation to improve production. For example, access to irrigation water often depends on tenure of property, which female farmers are less likely to have. Rural women, youth and vulnerable groups are also more likely to lack access to the knowledge and resources required to meet rapidly evolving phytosanitary and food safety standards – enforced by local, regional and international markets for processed products. Agriculture extension services in most BMCs are not sufficiently sensitized to the importance of gender-equitable service provision, which can lead to the exclusion of women in accessing benefits and participating in decisions.

There are indications that gender roles are changing in many indigenous farming communities, with men seeking employment outside of agriculture (including through migration), leaving women in charge of farms and as the sole supporters of their families.

3.5.4 Workloads and time poverty

There is a lack of recognition for unpaid reproductive activities (unpaid care work), which are carried out by women, girls, men and boys in the family, and unwaged workers on family farms and in family businesses. [24] Women's unpaid care work in the home, as well as their work in the informal economy and in subsistence agriculture are not quantified or taken into account in economic and social policymaking; neither is the resulting time poverty that limits women's ability to effectively pursue opportunities in education and training and engage in waged work in the labour market.

It is important to note that gender-based constraints are highly context-specific and vary considerably between and within BMCs. In Haiti in particular, gender inequality is pervasive. A recent analysis of the gender gap in the country by the Inter-American Development Bank (IDB) concluded that: (a) women are underrepresented in producers' associations and tend to participate, if at all, in informal, unstructured groups; (b) formal information channels do not reach most women unless a special effort is made to reach them specifically; (c) workload distribution in the household disproportionately burdens women (2 hours a day are spent fetching water, on average), reducing the amount of time they dedicate to agricultural production; (d) rural women are less educated than men (55 percent versus 30 percent never attended school, respectively); (e) female-headed households have smaller plots and less access to land; (f) female-headed households have lower income levels (USD 176 versus USD 347); and (g) more female-headed households face severe food insecurity (86 percent versus 71 percent male-headed households).

22 *Shaping Programmes Based on the Realities of Women and Youth in Agriculture in Guyana: Report on the Multi-stakeholder Consultation Forum on Sustaining Women & Youth Participation in Agricultural Markets, October 2017.*

23 Testimonies from the implementation of the IFAD-funded *Market Access and Rural Enterprise development Project (MAREP).*

24 Rawwida Baksh and Associates, CDB Country Gender Assessments (CGAs) Synthesis Report, 2016. The report covers findings from ten BMCs: Anguilla, Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Montserrat, Saint Kitts and Nevis, Saint Lucia, and Saint Vincent and the Grenadines.

3.5.5 Gender-based violence

There are many complex gender issues in domestic and family life in the Caribbean, not only in relation to the use of time, accumulation of savings, distribution of food, access to and control over money and other resources, but also in relation to violence perpetrated on those who are most vulnerable. Gender-Based Violence (GBV) is widely perceived as a persistent and pervasive issue, which threatens resilience and severely damages the human capital base of BMCs. Statistical data indicate a large prevalence of men as perpetrators of GBV and other forms of violence.[25] This data is, however, limited to cases that are reported to the police. Violence against men is likely to be under-reported because of norms related to manhood and masculinity, and the lack of supportive institutions, including shelters for male victims.[26]

3.5.6 Women's role in food value chains

Women in the Caribbean are active in all steps of the value chain. As producers, they engage in subsistence backyard gardening, contributing significantly to securing food for their households and the community. The *Eat What We Grow, Grow What We Eat* campaign in Jamaica has catalysed a renewed pride among even urban women, who are increasingly engaging in producing food at the household level.

Women are also heavily involved in the marketing of agricultural crops – whether produced by them, their spouses, or purchased from others. Often, they travel from rural areas to urban municipal markets. In some BMCs, women engage as "higglers" (intermediaries), purchasing directly from farmers and reselling to various markets, including overseas. Agro-processing activities by rural women are becoming more and more popular, and are being encouraged by the Rural Agricultural Development Authority (RADA) in Jamaica, and other developmental partners in the Region. Women agro-processors work on value addition at different levels, from the cottage industry (businesses run from their homes) to micro, small- and medium-sized businesses. Women are also employed as casual labourers in factories in rural areas. There is clear evidence from attendance records from agricultural institutions (such as the College of Agriculture, Science and Education, or CASE, in Jamaica), that women are venturing more into agriculture, which is generally considered a male-dominated discipline.

3.5.7 Women's role in the fisheries sector

The fisheries sector is strongly associated with poverty and low-paid hard labour, which makes it an unattractive choice of employment for young people. While there is an absence of data on youth participation and on women's roles in fish value chains, there is strong evidence that women are active and recognized in the post-harvest part of the chain.

A recent study carried out by the Centre for Resource Management and Environmental Studies (CERMES),[27] indicates that short value chains, where fishers with low capital investment sell directly to institutional buyers (such as spear fisheries, small lobster and conch diving), are heavily male dominated, as is the harvest sector in fisheries worldwide. However, as fish value chains become longer and more complex, the role of women becomes more evident. Women are found to tackle shops in Jamaica and dispense diesel fuel in Barbados. In some African countries, declining opportunities in farming have driven women to be more actively involved in fisheries, including in post-harvest activities. Yet, it is not clear whether the same is occurring in the Caribbean.

25 See http://caribbean.unwomen.org/en/caribbean-gender-portal/caribbean-gbv-law-portal/gbv-country-resources.

26 Rawwida Baksh and Associates, CDB Country Gender Assessment: Synthesis Report.

27 Gender scoping preliminary report: Caribbean fisheries in the context of the small-scale fisheries guidelines, CERMES Gender in Fisheries Team (GIFT), Technical Report No. 86.

There is little documentation on fisheries tenure rights and tenure systems in the BMCs. An exception is the Grenada beach seine fishery, where men appear to determine the rule systems for access rights, while women are engaged in beach seine post-harvest fish selling.[28] Finlay *et al.* (2013) find that men often make major value chain decisions, such as deciding whether women can obtain the small pelagic fish from beach seines for selling or subsistence (food security and nutrition), or whether that fish is used as bait on tuna longlines (foreign exchange earnings). In terms of organizational leadership, most fisherfolk organizations in the BMCs (with few exceptions, such as Barbados)[29] are male dominated by boat owners and fishermen.

3.6 Challenges and opportunities

This Chapter discussed economic growth and poverty, youth unemployment among the BMCs and between men and women, migration, rural and urban population dynamics, and food security dynamics.

Data from Chapter 3 show that BMCs are lagging behind in terms of economic growth compared to other developing regions. In low-income BMCs, slow economic growth is accompanied by high levels of poverty and undernourishment.

Employment opportunities are lacking for the working population, particularly for young people and women, who have considerably higher unemployment rates. Migrants, many from Jamaica and Haiti, leave their countries in search of better job prospects, and to secure a better future for themselves and their families.

According to economic growth forecasts made by the IMF, it is expected that the BMCs will grow on average between 1 and 2.5 percent per year, considering the current policies, and absence of external shocks. The projected economic growth in BMCs is much lower than the world average, which is expected to grow at 4 percent per year. This slow expected growth in BMCs, especially compared with other developing regions, poses a major challenge for poverty reduction, job creation and food security in the region.

Undernourishment is widespread in BMCs, though trends vary depending on the country. Most countries in BMCs have levels of undernourishment between 10 and 20 percent. Haiti is the exception, with undernourishment levels reaching 77 percent. Studies show that a lack of access to food is strongly related to poverty; not surprisingly, food access is low in countries such as Haiti, where a large share of the population lives below the poverty line.

Imports of food have grown. In recent years, BMCs have spent more than half of the value of total exports on food imports, and this share is increasing over time. The value is relatively low for Continental States, but has increased to very high levels in recent years for the Small Island States and larger islands, such as Grenada and Haiti. These countries depend heavily on their foreign exchange revenues to purchase their imported food.

It is worrying that undernourishment has decreased slowly over the past 20 years, which likely reflects the slow pace of economic growth.

28 A seine net, used in fishing, hangs vertically in the water with floats at the top and weights at the bottom edge, the ends being drawn together to encircle the fish.

29 In Barbados, two of the three national fisherfolk leaders are women. The current leadership on the Barbados National Union of Fisherfolk Organizations (BARNUFO) board of directors is mainly female.

What is a cause of even greater concern is that, while the undernutrition indicators have declined only slowly, other forms of malnutrition and its consequences (obesity) are on the rise. This suggests that the BMCs are increasingly vulnerable to "the double burden of malnutrition".

In global gender statistics, the Caribbean appears to fare better in terms of gender equality; yet, gender inequality is still a major concern. Women account for a significant share of the farmers in the region but, compared to men, experience lower access to finance, land, networks, information, and decision-making in farmer organizations.

Gender equality and youth empowerment in agriculture can be promoted more actively. It is important to acknowledge male and female complementary roles in agriculture and rural development. It is also key to increase equitable access to productive resources and decision-making so that women and youth can take entrepreneurial action.

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4 Structural transformation in the agriculture sector

Key messages

- BMCs have undergone a significant structural transformation of their overall economy, with agriculture becoming a less important part of GDP and employment.
- The structural transformation process of the overall economy away from agriculture has not coincided with a significant change towards a highly productive agriculture sector.
- Agricultural yields as well as output value per worker are low throughout BMCs in regional and global comparisons.
- Smallholder producers constitute the largest share of the farming population across BMCs.
- Smallholder farmers with limited financial resources for investments and restricted access to credit, require improved technologies and extension services that fit small farm sizes and low volumes of on-farm investments. Agricultural extension policy should provide targeted support to reduce the large technology and productivity gap of small producers throughout the Caribbean.
- In the past, BMCs largely produced similar agricultural commodities, particularly for export. In recent years, BMCs have developed more heterogeneous production systems, which reflect their regional and international competitive advantages. Investments should be channelled to strengthen this specialization process.
- With changing market opportunities and an altered trade environment, many agricultural products are no longer profitable, while others have increased in value. Agricultural policy should facilitate farmers to be reactive to structural, long-term changes in market conditions and to shift towards profitable production systems.
- Natural resource degradation of the aquatic ecosystem and coastal resources may become an increasing challenge and economic constraint for doing business in tourism and fisheries. Targeted resource conservation measures can strengthen the long-term economic perspective of both sectors, generating synergy.
- The livestock sector has been characterised by healthy and stable growth in the region and provides ample profit opportunities. Yet, small livestock producers are often unable to make use of existing market opportunities, owing to their lack of access to capital, low adoption of efficient technologies, and the high cost of feed.

4.1 Introduction: Theories of structural and agricultural transformation

Structural transformation is commonly defined as a long-term process, involving the gradual reallocation of major shares of the national economy from agriculture to manufacturing and eventually to services. It occurs simultaneously with modern economic growth and increasing productivity (Herrendorf et al. 2013); a common characteristic is the transition from labour-intensive economic activities to capital- and eventually skill-intensive activities, which go hand in hand with an increase in total factor productivity (UN-Habitat 2016).

As part of such structural change, the share of agriculture in national GDP declines, as does the amount of labour and capital dedicated to agriculture. There are many interrelated drivers of such change, which we present in this Chapter. The aim is to explain national and regional trends in agriculture in BMCs arising from and accompanying the structural transformation process.

>> The defining element of structural transformation is a decrease in the share of agricultural GDP and employment, alongside increases in productivity and gains in economic growth

Classical theories of agricultural transformation (Timmer, 1988) underline the potential of the agriculture sector to function as an endogenous driver of structural change. Within a closed economy that is predominantly based on agriculture, increases in agricultural productivity – driven for example by technological innovation, improved physical and institutional infrastructure, and changes in the structure of markets – can function as an essential source of financial and labour resources for the development of other economic sectors. Johnston and Mellor (1961) find that agriculture can contribute to economic development by increasing the food supply for domestic consumption, enlarging the size of the market for industrial products, and increasing foreign exchange earnings. In such contexts, increases in agricultural productivity are considered the preconditions for structural transformation and economic growth (Timmer, 1988).

However, when analysing the economic development of BMCs in recent decades, such classical considerations may only partially explain the main experienced trends and transition processes, as agriculture no longer features as one of the most important drivers of structural change in the overall economy of many BMCs. In fact, not all countries experience high agricultural productivity growth prior or during the transition away from an agricultural economy.

Countries that establish large export industries, which are not reliant on purchasing power from national consumers, may develop manufacturing and services largely based on exogenous drivers, such as foreign market demand, foreign capital investments, international technology transfer, and large differences between international and local factor prices. This may, for example, be the case for exports in natural resources (oil, gas, minerals), garments, electronics, as well as the tourism industry. Under these circumstances, a structural transformation of the economy is not necessarily driven or accompanied by increases in agricultural productivity. Some countries may thus undergo a thorough structural transformation, with agriculture constituting only a small share of overall GDP at the end of the process, while the agriculture sector itself may experience little structural change in the form of increased productivity, augmented profitability, or improved input and output market access. Such a pattern may be referred to as structural transformation without agricultural development. However, the people who depend on agriculture for their livelihoods often struggle in such contexts, constrained by low incomes and limited socio-economic opportunities.

>> Structural transformation may occur with or without delayed agricultural development, particularly in export-led economies. The common pattern of an agriculture-driven transformation process does not hold for all countries

This Chapter discusses the following main points:

1. The extent to which BMCs have experienced a thorough structural transformation of their economies away from agriculture, and whether they have established the manufacturing or services sector as a main source of their national GDP. This is closely connected to Chapter 3 of this report on the performance of economic growth across BMCs, and considers the common characteristic of a structural transformation process identified by Timmer (1988) in the classical literature: a high rate of economic growth.
2. The extent to which BMCs have achieved the transformation of the agriculture sector towards high levels of productivity. This includes an evaluation of whether high growth rates of agricultural productivity were realized prior to the development of other sectors – technological innovation, improved physical and institutional infrastructure, changes in the structure of markets, and so on. Alternatively, agricultural productivity may have increased in subsequent periods, possibly aided by higher levels of development in the services and manufacturing sectors.

The literature on structural transformation examines which drivers lead the proportion of labour in agriculture to decrease, a phenomenon observed in many countries along their path of economic growth and development. We summarize the literature according to three strands: The first strand comprises growth models, the second strand introduces the impacts of climate change, and the last strand examines the role of institutions.

Growth models provide two explanations for decreased agricultural employment within closed economies. The first describes the transition from a pre-industrial to an industrial economy. In pre-industrial economies, when real incomes are low, consumers spend a large share of their income on agricultural goods to satisfy a minimum consumption level (Kongsamut et al. 2001). With real incomes increasing beyond the amount needed to cover basic food needs, demand for non-agricultural goods increases at a faster rate than for agricultural goods.[30] Consequently, labour demand and wages increase faster in the non-agricultural sectors than in the agricultural sector, and agricultural employment eventually declines. The economic boom experienced in the United States of America during the nineteenth century is a typical example of industrialization within a closed economy.

The second explanation provided by growth models analysing the closed economy context is linked to the supply side. Matsuyama (1992) formalizes this theory using a model in which agricultural technological progress increases labour productivity.[31] Such technological progress explains the trends observed in the Green Revolution (Matsuyama, 1992); however, other processes altering the agricultural production function and production costs could play the same role in the model, with a similar effect on agricultural employment and productivity.

30 This is because the income elasticity of demand is lower for agricultural goods than for non-agricultural goods.

31 In Matsuyama (1992), agricultural employment declines because – with increasing income – consumers are similarly biased towards spending larger shares of their income on non-agricultural goods, as mentioned previously. However, there are models in which this bias in preferences is not assumed: Echevarria (1997), Ngai and Pisarrides (2007) and Acemoglu and Guerrieri (2008).

Growth models also consider the open economy case, where international factors drive declines in agricultural employment. Murata (2008) pinpoints such drivers, which are absent from closed models, as the costs of trade – transportation costs, trade tariffs, and other trade barriers.[32] As trade costs for manufactured goods fall, so do their prices, thus increasing demand. The subsequent impact on agricultural employment is similar to the earlier consideration of increasing incomes: labour is reallocated from agriculture to non-agriculture. Thus, trade may be a driver of structural change because it expands non-agricultural market access.

In countries with strong agriculture sectors in terms of international competitiveness, trade may also have the opposite effect, leading to increased agricultural employment.

The second strand of the literature analyses the impact of climate change on structural and agricultural transformation. In the literature, very few studies are available that link both strands in a theoretical growth model of structural change (Engström, 2016). Mendelsohn, Nordhaus and Shaw (1994) study the impact of climate change on agriculture. In their Ricardian model, changes in temperature and precipitation exogenously affect agricultural productivity, resulting in a reallocation of crops based on their relative profitability. Countries that experience such declining productivity in the agriculture sector may cover food needs by increasing imports and reallocating production factors to more efficient sectors, if they provide sufficient absorption capacity.

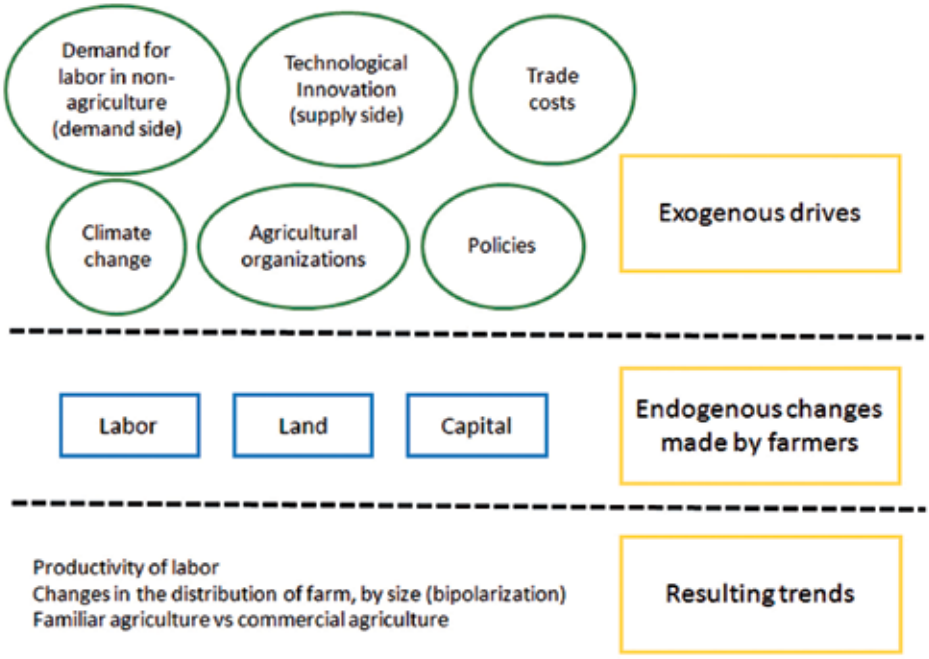
Finally, the last strand of the literature considers the role of institutions, such as the routines that govern compliance with food safety standards, or the mechanisms that control access to formalized agricultural output markets, such as the supermarket industry. Agricultural producers who are small or are not organized as part of farmers' organizations commonly face challenges throughout BMCs to access formalized commercialization channels. This may be due to non-compliance with food safety standards or good agricultural practices, limited capacity to respond to quantity and timing requirements of supermarkets or large traders, or weak linkages to adequate communication channels and marketing networks. Consequently, some agricultural households may remain disconnected from national input and output markets, and thus excluded from the agricultural transformation process.

Institutional effects are bidirectional in their impact on structural change. The integration of value chains, which are an alliance-based governance structure to improve logistics and the flow of products, have reduced risks and increased profits, thus affecting the share of labour in agriculture, as well as farm sizes (Boehlje, 1999). However, Chavas (2011) argues that establishing agricultural organizations may, in certain conditions, stabilize agricultural prices and reduce income uncertainty to the extent that investment in the sector decreases. Institutional factors may also play an important role, such as aspects of property rights, contract regulations, (in)formal enforcement mechanisms, and financial organizations.

Figure 20 summarizes the drivers of structural change: demand for labour in non-agriculture sectors, technological innovation, trade costs, climate change, and agricultural organizations. In addition, in our overall analysis, we account for the role of public policies, as they can affect any of the other drivers, intentionally or inadvertently. According to Timmer (2017), agricultural transformation takes place within the sector, while the relationship of agriculture with the rest of the economy changes.

32 Also, Matsuyama (1992) develops some consequences of structural change in the context of open economies. However, the question he answers is how structural change affects the growth of the non-agricultural sector if the economy is open and has comparative advantage over agriculture.

Figure 20. Conceptual framework of agricultural and structural transformation



Source: FAO and CEPAL (2018).

Once an overlooked aspect, a transformation of dietary patterns is now found to be associated with structural transformation processes in a surprisingly robust manner – mainly driven by income growth and urbanization. Engel's Law[33] describes the declining share of food in the budget of households as they become richer. Bennett's Law[34] describes the reduced role of starchy staples (cereals and root crops), and the increased diversity of calorie and protein sources in the diets of richer households. However, aspects of increasing rates of overweight and obesity have only recently been taken into consideration in a structural manner.

Diets change in parallel with the structural transformation of the economy, as consumers become wealthier; this nutrition transition represents a shift, not only away from a heavy reliance on cereals, but also towards greater consumption of fruits and vegetables, livestock products and vegetable oils, as well as processed food and sugar. These changing consumer demands can be met through international trade or production diversification within the country. It is important to understand the scale at which diversification occurs, especially in countries with disparities in economic growth between rural and urban areas. This diversification can occur at farm level – an approach often advocated as a way to improve the economic resilience of smallholder farmers, and to increase agro-biodiversity. It may also be beneficial from an agro-ecological point of view, allowing a shift towards stronger closed nutrient cycles and the utilization of waste from one production process as input into other production processes. However, diversification might also occur exclusively at national level, with increasing specialization for individual farms in line with the principle of (local) comparative advantage based on agro-ecological conditions.

33 'Engel's Law' states that as incomes rise, the proportion of consumer expenditure spent on food falls, even if food expenditure rises in absolute terms (Murata, 2008).

34 Bennett's law states that the starchy staples ratio declines as household income rises and households can afford to buy more meats, pulses, fruits and vegetables (http://www.cepii.fr/PDF_PUB/wp/2017/wp2017–05.pdf).

The structural transformation of economies away from agriculture (in relative terms), is accompanied by the transformation of the agricultural sector, and farming systems in particular. This is mainly reflected in technology use, land use, farm size, and crop diversification. How farm size changes during the transition is crucial, as it affects farmers' marketing costs and their ability to participate in more formalized agricultural value chains. In addition, changing farm sizes and farming systems require different forms of agricultural extension and technology diffusion campaigns, such as targeting increases in profitability, productivity or better environmental outcomes at the farm level. Changes in farm size are not likely to be uniform at subnational level, as different areas are characterized by different degrees of market access as well as potential for economies of scale, – such as through machinery use.

Evidence suggests that the average farm size is increasing in some parts of Latin America (especially in land surplus countries). However, in dynamic areas near urban centres, and in particularly land-scarce production locations, such as Small Island States, total farm area may be stable or decreasing, even when the share of agricultural employment is decreasing due to increased non-farm employment opportunities.

Technology is a key part of the agricultural transformation process, with implications for labour productivity, post-harvest losses, and more. The evidence available suggests that technological innovation in most Caribbean countries is limited to a smaller share of agricultural producers. Data availability on technology use at farm level is, however, scarce, especially for specific crops and at subnational level.

Another issue that is related to and interlinked with the agricultural transformation process concerns the increasing number and importance of food safety standards, which will be discussed in the later Chapter on governance and institutions.

This Chapter will first discuss the extent of the structural transformation in BMCs, and will then present an analysis of the structural change in the agriculture sector. This will be followed by an investigation of the extent to which commodity and farm transition occur, and will end with an overview of the recent transformation processes in the fisheries sector.

4.2 Structural transformation of Caribbean economies

The relative importance of agriculture as a contributor to national GDP varies across different BMCs. When considering data from 1980 to 2016, Small Island States are characterized by a low contribution of agriculture to the overall economy, whereas, in both Continental States and Large Island States, agriculture has played a more important role.

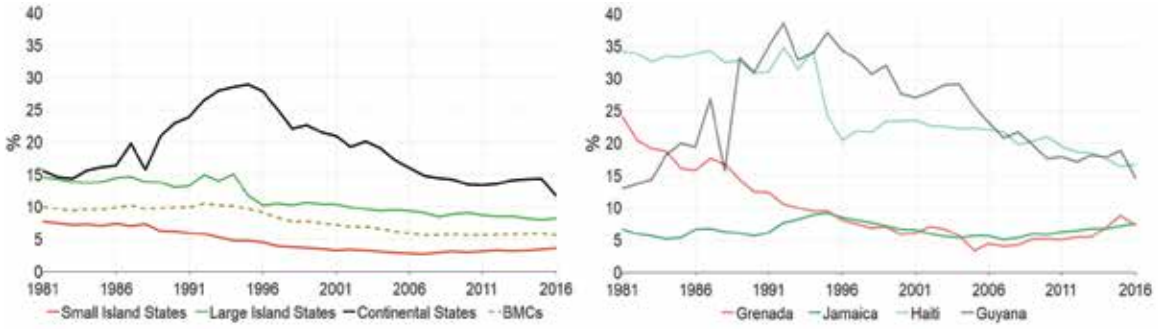
4.2.1 The changing importance of agriculture for national GDP

When considering the changes in the share of agriculture in national GDP (Figure 21), a process of structural transformation away from agriculture can be identified for Small and Large Island States. In both country groups, the average share of agriculture in GDP has dropped by roughly 50 percent. Continental States are characterized by a less clear trend: Prior to the mid-1990s, the relative share of agriculture in GDP had increased significantly; though it has since fallen, today's share of agriculture in GDP is only slightly lower than it was in 1980.

>> A reduction in the average share of agriculture in GDP, as part of an overall structural transformation process, has continued to take place in Small and Large Island States over recent decades, to varying degrees

However, when identifying trends in single countries, great diversity is found within the BMC country groups. For example, the role of the agriculture sector in both Grenada and Haiti shows a very clear downward trend. In Jamaica however, the role of agriculture has been stable. In contrast, the share of agriculture in Guyana's GDP increased until the mid-1990s, but has declined ever since.

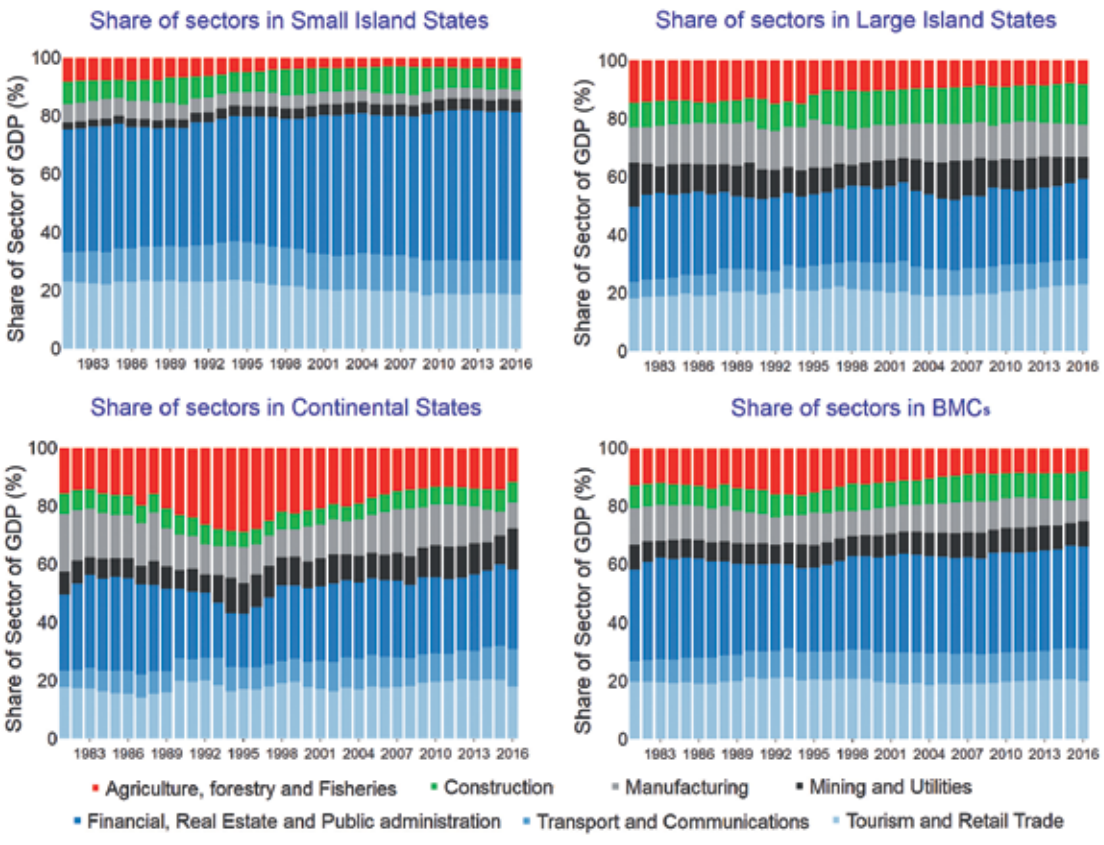
Figure 21. Share of agriculture in national GDP (nominal values)



Source: Adapted from UNSTAT data.

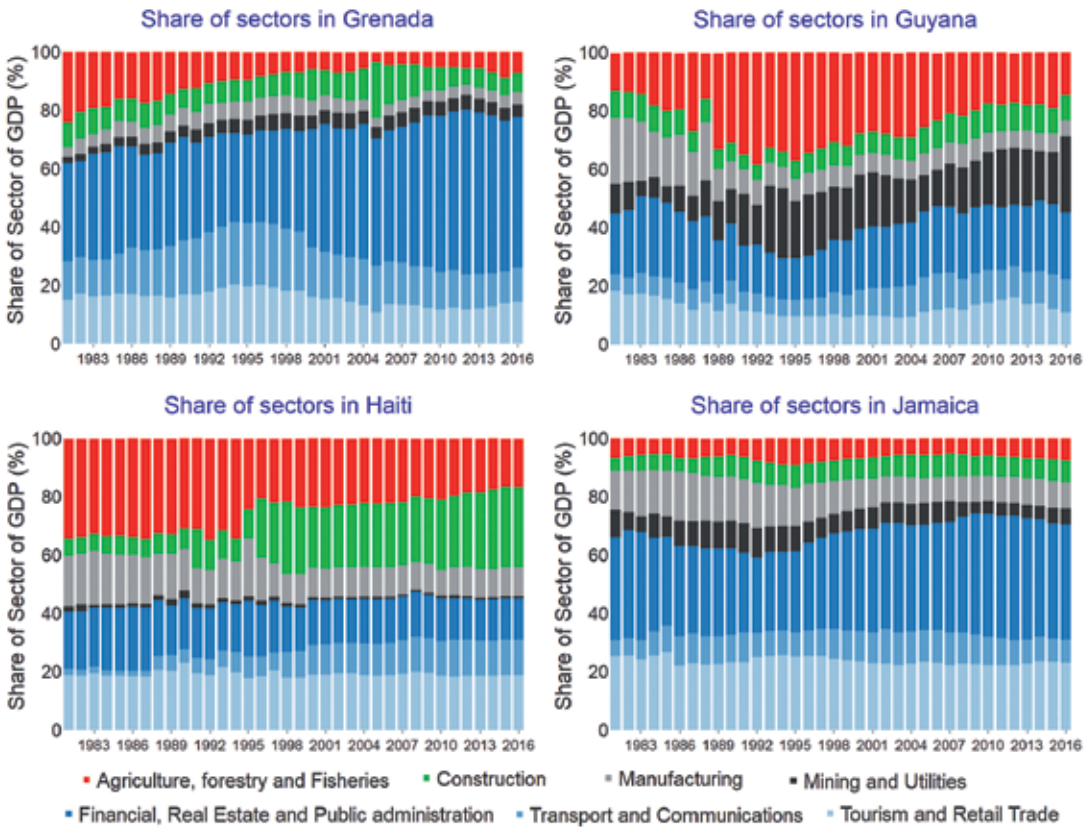
When observing not only the changing share of agriculture, but of all sectors in the economy, as shown in Figure 22 and Figure 23, there is a continuing trend towards an increase in the share of the service sector across most BMC country groups and focus countries – excluding Haiti. Financial services, real estate and public administration constitute a particularly relevant subsector within all services.

Figure 22. Share of sectors in GDP across BMC groups (nominal values)



Source: Adapted from UNSTAT data.

Figure 23. Share of sectors in national GDP in selected countries (nominal values)



Source: Adapted from UNSTAT data.

4.2.2 Changes in agricultural employment

Another key characteristic of the structural transformation process is the reduction of the agriculture sector's share in national employment. Figure 24 and Figure 25 identify the employment shares for agriculture, industry and service sectors across BMC groups and focus countries.

While the level of agricultural employment varies in BMCs, all country groups and focus countries, with the exception of Haiti, have experienced some reduction in the overall share of agricultural employment. However, when quantifying these changes since 1990, nearly all country groups and focus countries show gradual and comparably small changes in the share of agricultural employment. This indicator does not thus provide further evidence that BMCs have experienced substantial structural change in recent decades – at least not to the extent of creating lucrative employment opportunities for a large share of agricultural workers. Guyana is in part an exception, as it has reduced its share of agricultural employment more drastically.

>> Agriculture remains an important employment source, though all countries – except Haiti – have experienced a significant transition of employment opportunities away from agriculture

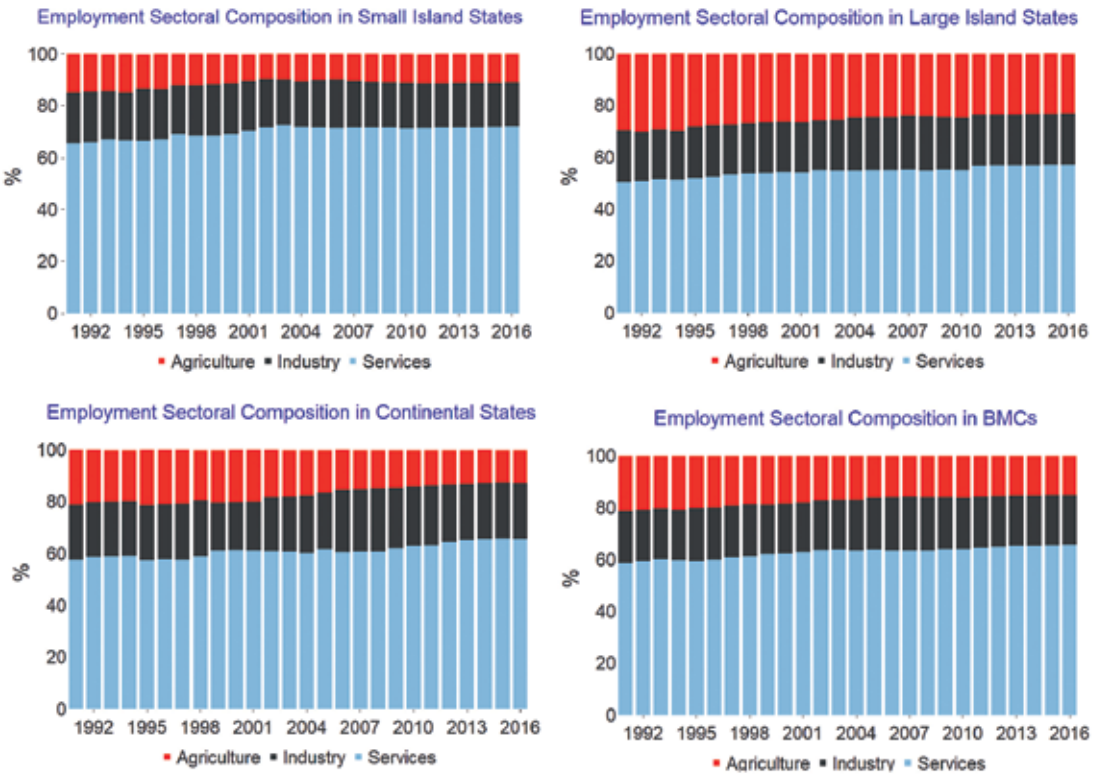
In his classical article, Timmer (1988, p.281) proposes as a relevant threshold when the share of agricultural labour force falls below 20 percent. Apart from Haiti, no country group or focus country reported a radically higher employment share in agriculture for 2016. While agriculture remains

an important source of employment in many BMCs, with between 10 and 20 percent of the workforce employed in the sector, all BMCs have experienced a relevant structural transformation of employment opportunities towards the service sector.

With roughly 50 percent of the workforce employed in agriculture, Haiti can be characterized as having experienced significantly less structural transformation of employment opportunities than any other BMC.

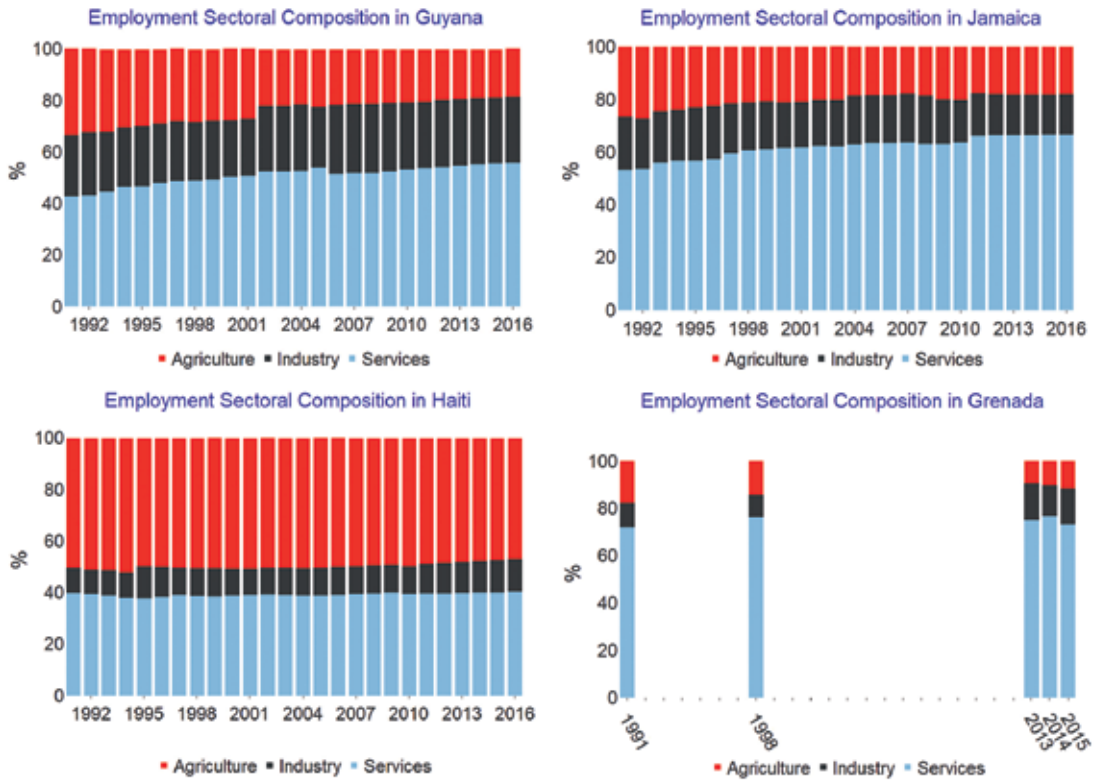
However, when considering labour statistics, it is important to bear in mind that self-employment in general, and agricultural employment in particular, are often underreported (Palacios-Lopez *et al.*, 2017; Cai and Pandey, 2015). The actual level of agricultural employment may thus be higher than the officially reported shares, which are found in this report.

Figure 24. Employment shares by sectors across BMC groups



Source: Adapted from ILO data.

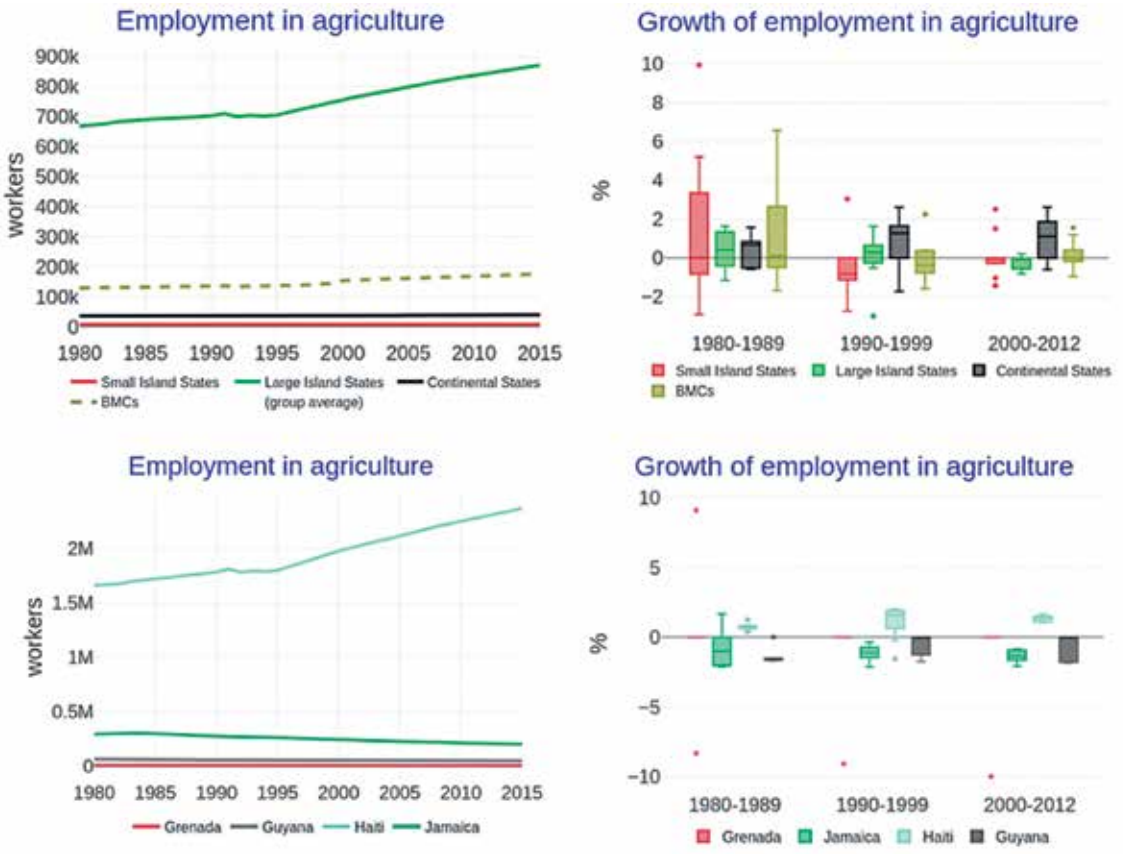
Figure 25. Employment shares by sector in selected countries



Source: Adapted from ILO and National Labour Force Survey, Grenada.

Figure 26 shows that the total number of people employed in agriculture in most BMCs has been relatively stable. Jamaica, and to some extent Guyana, have experienced a slow reduction in the number of people employed in agriculture over time, while Haiti has been characterized by significant growth since 1990.

Figure 26. Number of workers and growth rate of employment in agriculture



Source: Adapted from FAOSTAT data.

4.3 Structural transformation of agriculture

The shift away from agriculture as a main component in GDP and employment is a key characteristic of the structural transformation process. Another important feature is the increase in productivity in the agriculture sector. As the relative importance of agriculture in the overall economy decreases, the sector itself transforms, with labour and other productive resources shifting from low-productivity to high-productivity economic activities, which may both drive and be reinforced by productivity increases in other sectors of the economy.

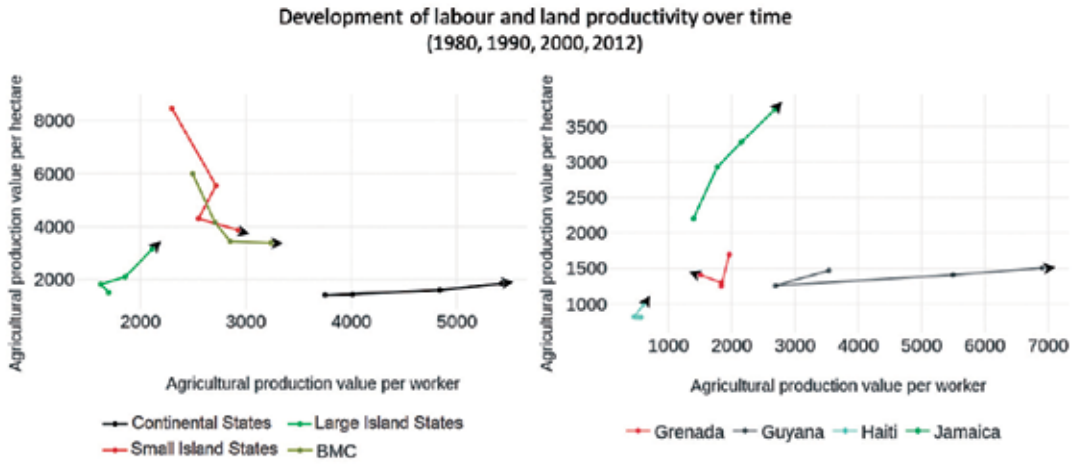
Figure 27 illustrates the development of labour and land profitability over time, indicating changes in the development of the value of production per land and labour in the agriculture sector from 1980 to 2012. A path on the main diagonal in Figure 27 describes an equal increase in land and labour profitability over time. A "flatter" path depicts larger increases in labour profitability, while a "steeper" path suggests stronger increases in land profitability. Countries and country groups with a short line achieved few changes in their profitability level, while long lines depict large changes in profitability.

When looking at these descriptive statistics by country group, Continental States achieved large increases in labour profitability, while land profitability stagnated. This represents a typical pattern for countries engaging in cropland intensification during a structural transformation process, as the ratio of cropland area per worker increases.

In contrast, Large Island States observe a slightly more balanced path, showing increases in both land and labour profitability, though gains in land productivity are slightly larger. This development is typical of countries experiencing moderate (or no) increases in cropland area, while profitability by hectare is increased due to other drivers.

Small Island States, however, are characterized by negative development in terms of land profitability, with only slight improvements regarding labour profitability. While the causes of the significant reduction in land profitability cannot be determined based on this graph, pressure on prime agricultural lands from urbanization may be a contributing factor.

Figure 27. Development of aggregate labour and land profitability over time



Source: Adapted from FAOSTAT data.

When analysing individual countries, Guyana experiences the exact same development as the average for Continental States, with sharp increases in labour profitability, aided by an overall expansion of cropland area. Thus, Guyana was able to extend areas under cultivation, without drawing additional workers into agriculture. Nevertheless, the average production value per hectare remained low.

Jamaica shows a more balanced and ambitious development path: Profitability for both land and labour has increased significantly. This achievement may be an indication of new technology adoption and increased market opportunities, which allow farmers to increase the financial returns per hectare of cultivated land.

Of the countries analysed, Haiti demonstrates the lowest levels of land and labour profitability. The country has seen profitability levels stagnate since 1980, which may explain the low welfare levels of agricultural-based livelihoods.

Though the level was higher in 1980, land and labour profitability in Grenada has since decreased, likely indicating the absence of new technology adoption.

>> Sizeable increases in agricultural profitability are only observed in selected BMCs: Continental States augment profitability per worker, while Large Island States improve profitability per hectare

In summary, a detailed analysis of productivity increases in BMCs over recent decades shows a mixed picture. With the exception of Jamaica, BMCs do not appear to follow the typical pathway described in the classical theories of structural transformation – which would entail an increase in labour productivity in the agriculture sector, driven by (1) the adoption of modern technologies (such as labour saving machinery), and (2) a reduced agricultural workforce (and an increased labour force in other sectors). However, Continental States such as Guyana are characterized by a sizable increase in labour productivity, which is largely driven by cropland area expansion, with only a moderate reduction in the agricultural labour force.

Jamaica alone observes characteristics that fit the classical structural transformation process: Overall, agricultural employment declines, while labour productivity in the sector increases. In the following section, the development and growth of labour and land productivity are presented individually.

>> Of all BMCs, only Jamaica's development pattern fits the classical structural transformation process: Agricultural employment declines, while labour (and land) productivity in the sector increases

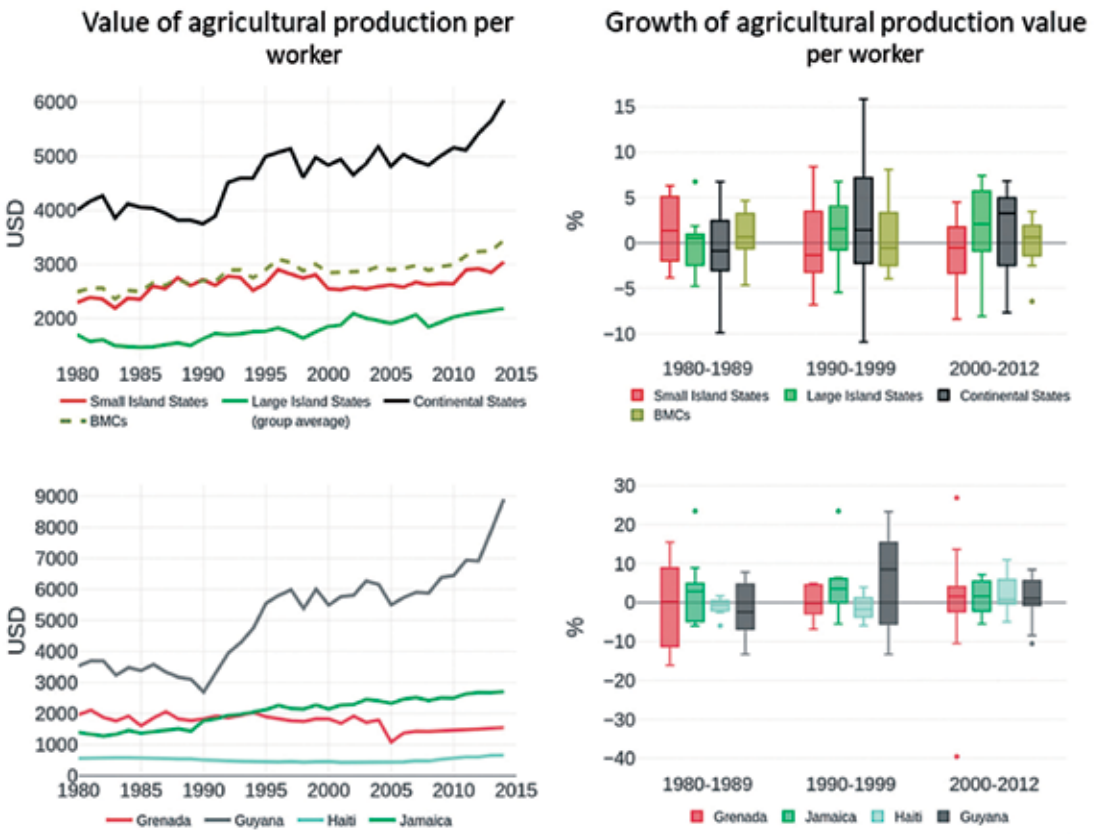
4.3.1 Changes in aggregate labour profitability in agriculture

Labour profitability is measured by analysing the value and growth of aggregate agricultural production per worker. The development pattern of most BMCs can be observed more clearly in Figure 28: The most sizeable and continuous increases in labour profitability have been observed in Continental States, whereas growth rates have been low for Small and Large Island States in recent decades, despite positive development.

Guyana has experienced two rapid growth phases, first during the early 1990s, and again starting from 2005. Although its labour profitability was high in 1980, Grenada has since seen its profitability level decrease over time, eventually being overtaken by Jamaica.

With the lowest level of labour profitability in BMCs, Haiti's agricultural sector is the least competitive in the region.

Figure 28. Value and growth of aggregate agricultural production per worker



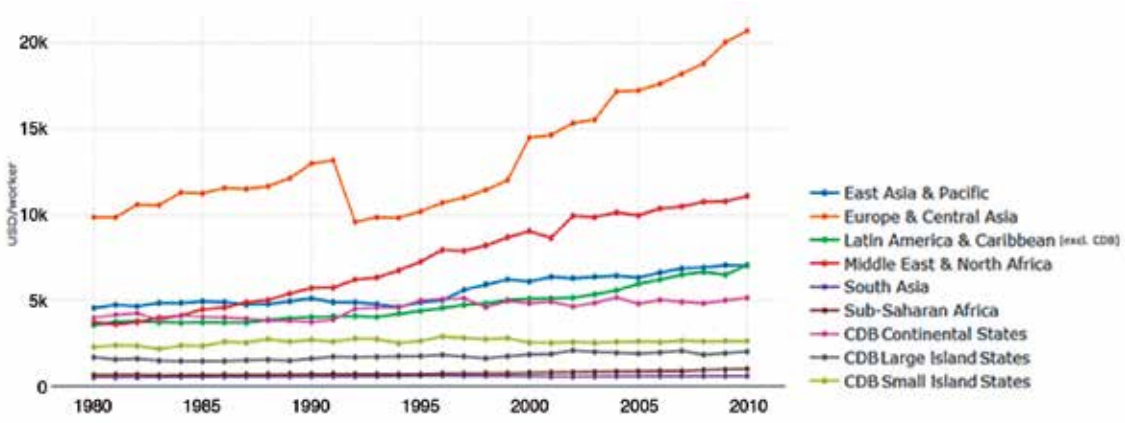
Source: Adapted from FAOSTAT data.

The development of labour profitability in the agricultural sector can also be analysed using interregional and global comparisons, as illustrated in Figure 29. Results show that only South Asia and sub-Saharan Africa are characterized by a lower agricultural production value per worker than BMCs. Large and Small Island States lag far behind other regions, while Continental States have levels of labour profitability which are twice as high as those of Island States.

>> BMCs lag far behind other world regions in global comparisons of labour profitability in the agriculture sector

While most world regions have experienced significant increases in the agricultural production value per worker since the 1980s, Large and Small Island States have not. Missed growth opportunities in agricultural labour profitability in BMCs are likely due to shifts to more profitable and less labour-intensive agricultural products, or a lack of (labour-saving) technology transfer, innovation diffusion and extension, and regional agricultural research and development.

Figure 29. Value of agricultural production per worker in global comparison



Source: Adapted from FAOSTAT and UNCTAD data.

4.3.2 Changes in aggregate land profitability in agriculture

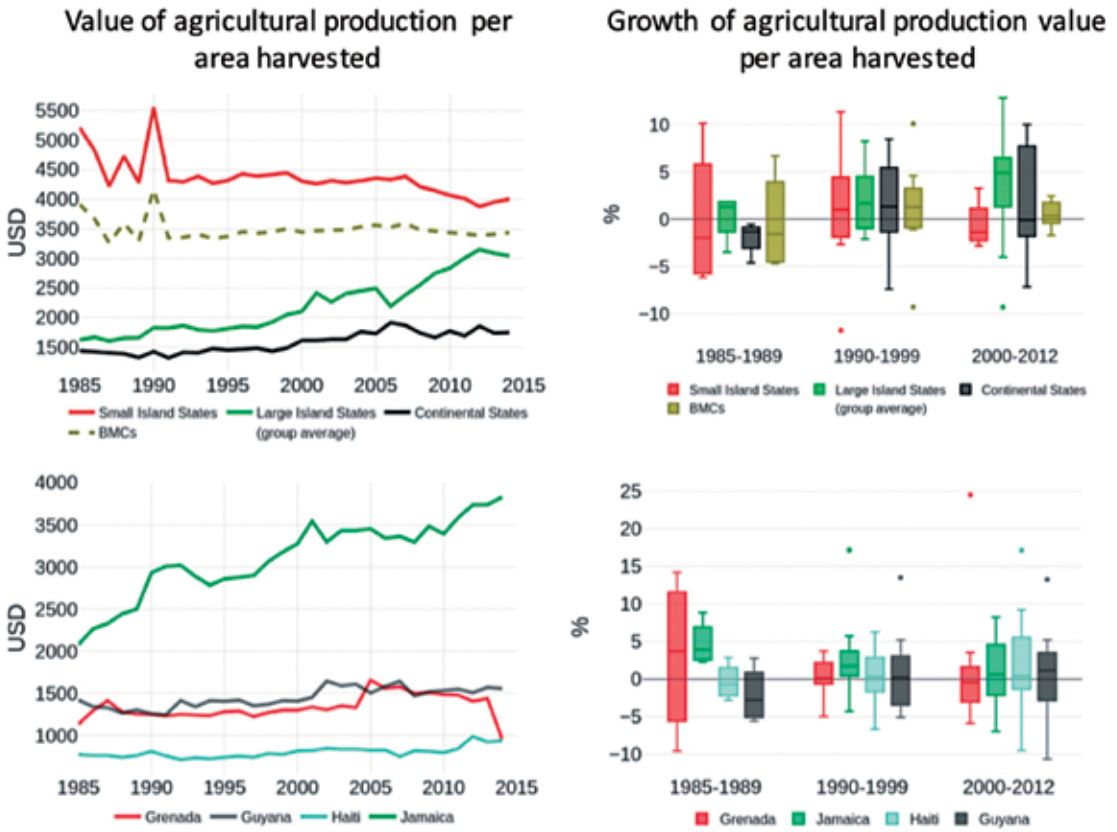
When analysing the development of aggregate production value per hectare – an indication of land profitability (Figure 30) – Large Island States, and particularly Jamaica, show major profitability increases. This indicates that a broad range of measures enabling the generation of higher production value per hectare have been used successfully. This may include shifting to more profitable crops, reducing variability of production (due to climate factors for example), engaging in good agriculture practices, and adopting productive and profitable technologies.

Small Island States are characterized largely by stagnation, or profitability reductions. Despite being observed over a long time frame – from 1985 to 2012 – the reasons for this stagnation have yet to be defined.

>> Large Island States – and particularly Jamaica – are the only BMCs with significant increases in land productivity

Similarly, Continental States such as Guyana are characterized by stagnation of their land profitability, though a moderate increase has been observed since 2000.

Figure 30. Value and growth of aggregate agricultural production per area harvested

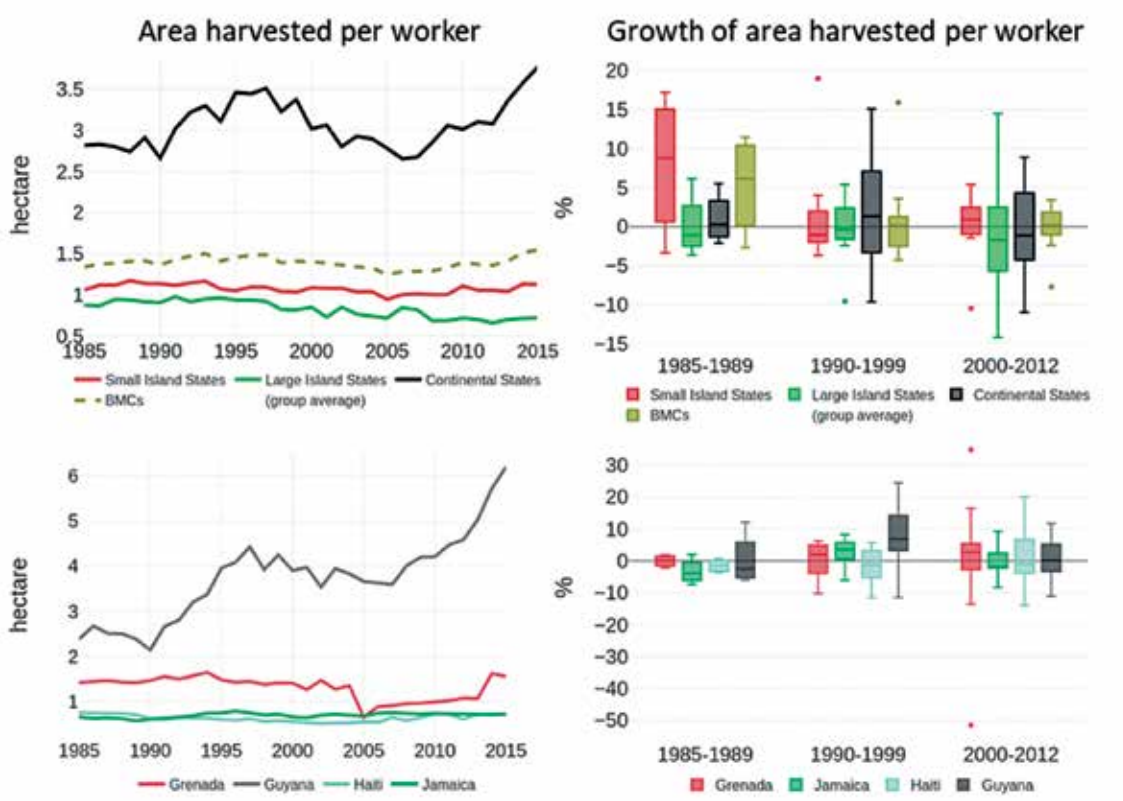


Source: Adapted from FAOSTAT data.

Completing the earlier indicators, Figure 31 identifies the ratio of cropland area harvested per worker, with Continental States showing a sizable increase in the amount of cropland area harvested by each worker.

>> Only Continental States managed to increase the area harvested by each agricultural worker – a development driven, however, predominantly by area expansion

Figure 31. Area harvested per worker and its development over time



Source: Adapted from FAOSTAT data.

Figure 32 illustrates Haiti's sizeable increase in harvested cropland area over the last decade. For Guyana however, growth in this area slowed after the 1990s. On average, Continental States have increased their share of harvested cropland area since 2000. Small Island States and Large Island States – apart from Haiti – are characterized by a more stable share of harvested area, not having experienced any significant expansion in agricultural land.

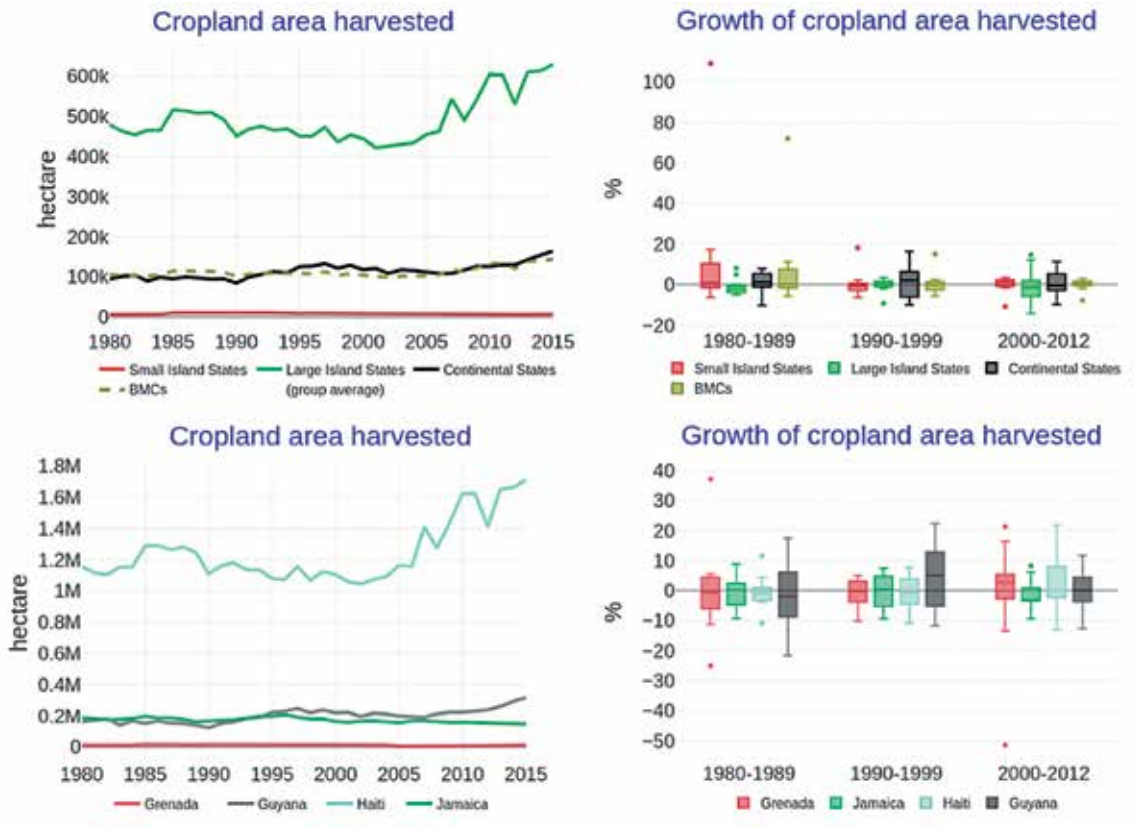
Moreover, agricultural land expansion in areas of low agricultural productivity provides few benefits in terms of increasing production; yet it is accompanied by the loss of natural vegetation and soil carbon storage, as well as the loss of biodiversity and vital ecosystem services. For example, land expansion in Haiti puts increasing pressure on forested areas, which provide key ecosystem services, such as water flow regulation and soil erosion prevention. Forested land and the ecosystem services they provide play a vital role in reducing the risk of mudslides and landslides, both of which affect Haiti.

However, by adopting an integrated land-use strategy, BMCs can ensure the sustainable use of natural resources, while protecting vital, life-sustaining ecosystem services in the long term.

>> Integrated land-use strategies are essential to increase productivity and profitability levels, while ensuring that cropland expansion does not lead to land degradation, the loss of carbon stocks, or biodiversity loss

The encroachment of urban areas into prime agricultural lands, particularly in Large Island States such as Jamaica, presents a growing challenge. Urban areas commonly expand at the expense of particularly fertile production locations, potentially causing land fragmentation. Therefore, urban land expansion into fertile agricultural land can lead to reduced agricultural productivity, unless complementary measures are taken.

Figure 32. Number of hectares and growth rates of cropland area harvested



Source: Adapted from FAOSTAT data.

4.3.3 Total factor productivity in the agriculture sector

In addition to the separate consideration of agricultural value per labour or per land, the estimation of total factor productivity (TFP) [35] serves to evaluate the development of overall sector productivity over time.

Table 1 shows that total factor productivity growth in the agriculture sector varied significantly across BMCs from 1981 to 2012, but was generally lower than in other countries in Latin America (Nin-Pratt *et al.* 2015). The Bahamas, Guyana, as well as Trinidad and Tobago experienced the highest growth rates in TFP, which are close to the average in Latin America and the Caribbean countries. Yet, total factor productivity growth in the agriculture sector has dropped compared to 1981 in Barbados, Haiti, and Suriname.

When differentiating between the relative contribution to TFP growth from efficiency and technical change, the growth in BMCs has mainly been driven by technological change.

35 Total factor productivity is defined as the portion of output not explained by the amount of inputs used in production.

This means that producers far from the efficiency frontier have not been able to catch up with current, best-practices in the sector, whereas the best-practice, efficiency frontier has improved through technological innovation, transfer, research and development, and more.

Table 1. Growth rate of agricultural total factor productivity and its components, 1981–2012

Country	TFP growth rate (1981–2012)	Efficiency component of TFP	Technical change component of TFP
Bahamas	1.5	0.4	1.2
Barbados	-0.6	-0.2	-0.4
Belize	0.5	-0.1	0.7
Guyana	1.3	-0.8	2.1
Haiti	-0.9	-1.8	1.0
Jamaica	0.9	1.0	-0.1
Suriname	-0.1	-0.3	0.2
Trinidad and Tobago	1.2	0.9	0.3
Latin America and the Caribbean	**1.2**	**0.3**	**0.9**

Source: Nin-Pratt et al. (2015).

When further investigating country specific production factor productivity, the results in the literature are consistent with the descriptive statistics presented previously. Table 2 illustrates that the agricultural production on land per country is highest in Guyana and Jamaica, whereas machinery productivity is the highest in Suriname. According to these estimates, Guyana has the most efficient labour force as regards land resources.

Table 2. Country specific parameter estimates for Machinery, Land and Labour, 1961–2012

Country	Machinery	Land	Labour
Bahamas	0.023	0.381	0.145
Belize	0.088	0.358	0.128
Guyana	0.165	0.450	0.159
Haiti	0.115	0.412	0.149
Jamaica	0.064	0.450	0.113
Suriname	0.337	0.432	0.124
Trinidad and Tobago	0.024	0.406	0.156

Source: Lachaud et al. (2017).

4.3.4 Agricultural sector growth

Apart from the transformation process in the agriculture sector, growth in the agriculture sector is an essential indicator of sector performance.

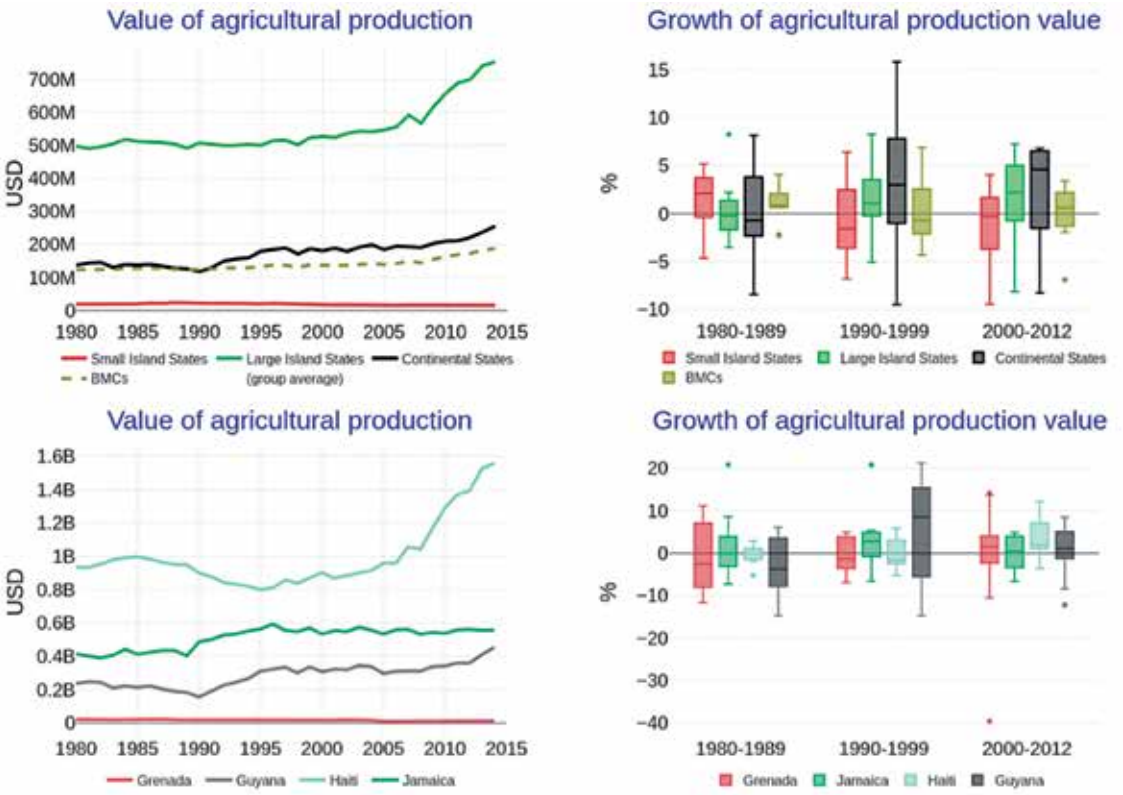
As shown in Figure 33, the average rate of growth of national agricultural production value across BMCs has been low since the 1980s. Since 1990, growth rates of agricultural production value have varied between BMCs. While Continental States have achieved the highest growth rate, Large Island States and Small Island States have seen medium and low growth, respectively.

>> Agricultural sector growth has been highest in Continental States, though Haiti has reported high sector growth since 2000

Haiti reported a significant increase in agricultural production value at national level between 2005 and 2015. According to Haiti's official country statistics, this growth was mainly driven by the increased production of mangoes, yams, bananas and pigeon peas – though a second data source, such as nationally representative household data, is unavailable to support this increase.

In comparison, Guyana was characterized by large growth rates in the 1990s.

Figure 33. Quantity and growth rate of agricultural production value

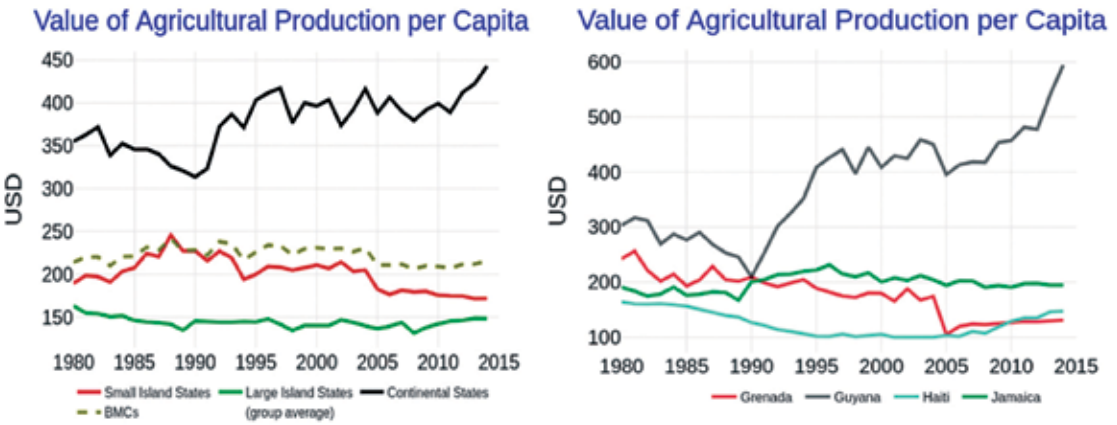


Source: Adapted from FAOSTAT data.

Evidence suggests that the value of agricultural production is relative to population size. Not only have Continental States observed a significantly higher level of agricultural production value per capita, but they have also experienced a higher rate of growth in recent decades. Guyana in particular reports that agricultural production value per capita has increased significantly since 1990.

Despite reports of having experienced a sizeable increase in national agricultural production value, Haiti is characterized by comparably lower growth rates, considering the agricultural production value per capita.

Figure 34. Agricultural production value per capita



Source: Adapted from FAOSTAT data.

4.4 Commodity transformation

The importance of main agricultural commodities in BMCs has changed significantly over time. The decreasing importance of previously predominant crops, such as bananas and sugar, is associated with changes in agricultural trade policies. For example, the economic importance of sugar was reduced as a result of eroding preferential access to the European Union market, combined with an opening of the European Union market to other competitors from Least Developed Countries (LDCs), as part of the Everything But Arms (EBA) initiative. For bananas, preferential access to the European market eroded as a consequence of complaints against import quotas and tariffs under both the General Agreement on Tariffs and Trade (GATT), and the World Trade Organization (WTO). Trade issues are discussed in detail later in this report.

There are many drivers of commodity transformation: changes in export markets; transitions in nutrition preferences; the increasing formalization of agricultural value chains; and to some extent, increasing demand for high-quality products.

The following analysis presents key trends in the changing role of major commodities, by differentiating between the four commodity groups:

- cereals, roots, and tubers;
- traditional crops (bananas and plantain, cocoa, coconut, coffee, cotton, citrus fruit, spices, sugar cane, tea, and tobacco);
- fruits, vegetables, legumes, and oilcrops; and
- livestock products.

4.4.1 The importance of different commodity groups in the agriculture sector

In 1980, traditional crops provided on average the highest agricultural production value across BMCs (Figure 35). Since 2000 however, their relative importance has continued to decline, and today both (1) fruits, vegetables, legumes and oilcrops, as well as (2) livestock products, provide a higher average value of agricultural production value across BMCs.

When considering the average share each product category contributes to the agricultural production value of BMCs, the pattern is similar. While traditional crops provided, on average, about 40 percent

of the national agricultural production value in 1980, the share has since dropped to less than 30 percent. Conversely, the relative importance of livestock products has increased from roughly 25 percent to more than 35 percent.

Although fruits, vegetables, legumes and oilcrops provide, on average, the highest agricultural production value across BMCs, this product group constitutes less than 25 percent of the share in overall agricultural production value. This indicates that most fruits, vegetables, legumes and oilcrops are produced in the larger agricultural economies.

>> Since 2000, the importance of traditional crops has lessened, while livestock products as well as fruits, vegetables, legumes and oil crops, have experienced an upward trend

When differentiating by BMC country group, the declining role of agricultural production value from traditional crops is found most in Small Island States. Similarly, Large Island States and Continental States have experienced a reduction in the share of production value from traditional crops, though less so in terms of the absolute production value from traditional crops.

The abovementioned analysis demonstrates that the declining importance of traditional crops is a robust trend, which has taken shape in different forms across the various BMC country groups. It can thus be identified as one of the shared aspects of the recent agricultural transition in BMCs.

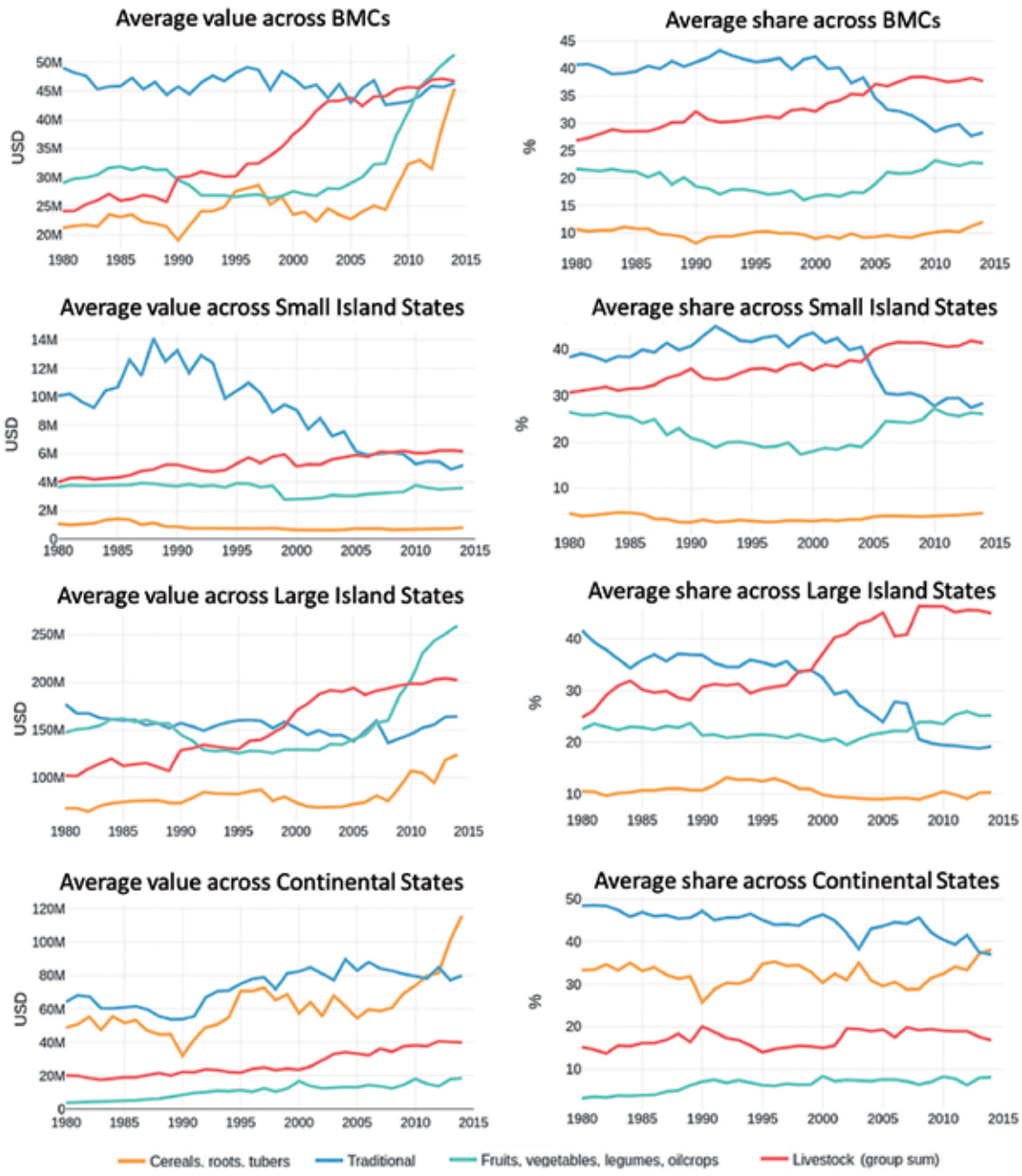
With the decreasing potential to generate agricultural incomes with traditional crops, the role of the next best competitive crop categories has increased. Therefore, individual BMCs have adopted different strategies in an attempt to close the gap generated by the depreciation of traditional crops.

For Small Island States, increasing the average value for any alternative crop category proved challenging, which led to increases in the average value of livestock products. Conversely, Large Island States increased the average agricultural production value of not only livestock products, but also fruits, vegetables, legumes and oilcrops.

Continental States are the only country group to have experienced major increases in average production value from cereals, roots, and tubers. However, their production values for fruits and vegetables has remained unchanged, while increases in the average production value of livestock products have been moderate.

>> While all BMCs suffered from a decline in production value of traditional crops, they follow a strongly different pattern when it comes to identifying alternative market opportunities: Large Island States mainly diversify into fruits and vegetables, while Continental States have developed production systems based on cereals, roots and tubers – though all BMCs show increases in the average production value of livestock products

Figure 35. Quantity and share of agricultural production value by product category



Source: Adapted from FAOSTAT data.

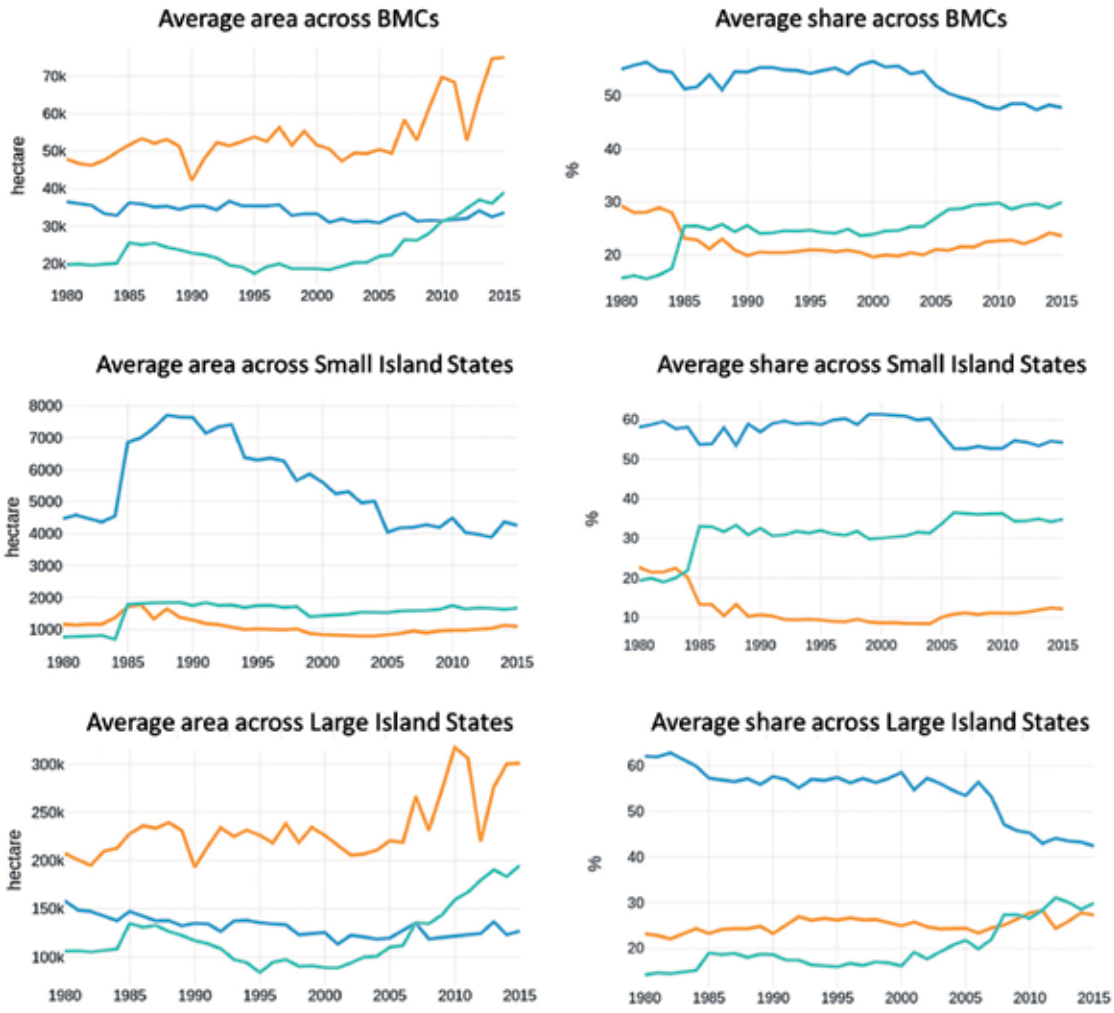
When looking at the cropland area dedicated to each product category, as shown in Figure 36, cereals, roots, and tubers occupy on average the largest harvested area across BMCs. However, when considering the average share of each crop category in total harvested area across BMCs, traditional crops occupy by far the largest share of cropland area. This indicates that the bulk of cereals, roots, and tubers are cultivated in BMCs, with larger land area (such as Continental States), while BMCs with smaller land area focus more on traditional crops (such as Small Island States).

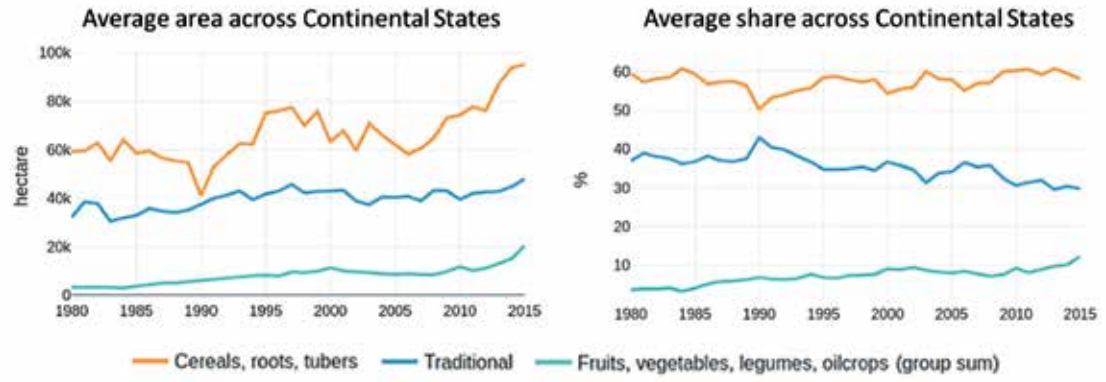
>> Cereals, roots, and tubers occupy a large part of the cropland area across BMCs. While they contribute directly to calorie sufficiency, they are only a significant contributor to agricultural production value in Continental States

In Small Island States, the development of agricultural production value correlates with reported harvested area, indicating that a reduction in production value may be driven by a reduction in harvested area.

In both Large Island States and Continental States, cereals, roots, and tubers occupy on average the largest harvested area. In recent decades, Continental States have experienced increases in the average harvested area of cereals, roots, and tubers, whereas Large Island States have seen considerable increases in the average harvested area of fruits, vegetables, legumes and oil crops.

Figure 36. Harvested cropland area by product category



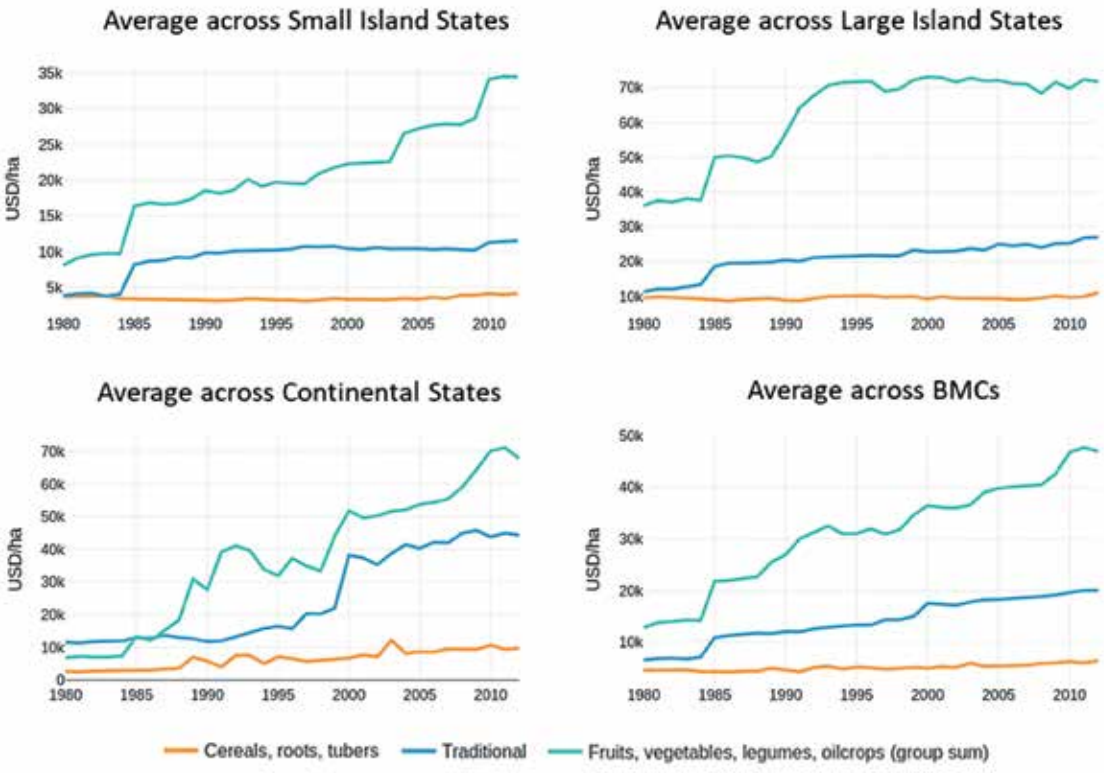


Source: Adapted from FAOSTAT data.

4.4.2 The changing profitability of commodity groups

An important driver of land-use dynamics and cultivation decisions is the profitability of different production systems. While harmonized household data on the profitability of various crops across all BMCs is not available, FAOSTAT data provide a rough indication of the development of the agricultural production value per hectare for different production systems (see Figure 37).

Figure 37. Value of agricultural production per hectare by product category



Source: Adapted from FAOSTAT data.

Evidence suggests that, since 1980, fruits, vegetables, legumes, and oilcrops have consistently provided the highest average production value per hectare across all BMC groups. In addition, most

BMC country groups have experienced sizeable increases in the production value per hectare – over the same time period – for fruits, vegetables, legumes, and oilcrops.

>> On average, the production value per hectare of fruits, vegetables, legumes and oilcrops has increased sizeably over time, indicating an increased market potential for selected crops in this category

Interestingly, the average production value per hectare of traditional crops is not reported to have declined over the last decade, while Continental States were even able to increase the average production value across this crop category. However, the development may look different when focusing on individual crops, such as bananas or sugar cane.

The analysis up to this point indicates that, for Continental States, cereals, roots and tubers account for a large part of their agricultural production value at national level. Yet, Figure 37 shows that Continental States do not realize a significantly higher production value per hectare for this product category, especially when compared to Large Island States. In fact, the competitive advantage of Continental States is estimated to be more driven by lower production costs, particularly for mechanized cereal production, but not by the generation of higher product prices.

In addition, for policymakers it is relevant to identify whether the share of land area allocated to a specific crop category increases as a reaction to gains in production value per hectare.

Across all BMC groups, increases in the harvested area for fruits, vegetables, legumes and oilcrops are associated with rising production value per hectare of this commodity group. This in turn leads to declines in the share allocated to traditional crops – which have not shown similar increases in production value per hectare. The biggest reduction in the average share of cultivated area of traditional crops can be found in Small Island States, though Small and Large Island States have both been responsive to the change in production value per hectare for fruits, vegetables, legumes and oilcrops.

With the exception of Continental States, all other BMCs show significant gains in production value for fruits, vegetables, legumes and oilcrops, as this commodity group outperforms the development of traditional crops. Moreover, the share of cultivated area for fruits, vegetables, legumes and oilcrops does not increase as extensively in Continental States as it does in all other BMC country groups.

When looking at the development of individual countries (right-hand panel of Figure 38), the variance becomes clear: some countries follow paths which do not correspond to predictions and average conditions for their country group.

Jamaica, for example, is characterized by a remarkably stable land-use pattern: neither having reallocated any significant share of its land area to different crop categories, nor seeing a large increase in production value per hectare for fruits, vegetables, legumes and oil crops.

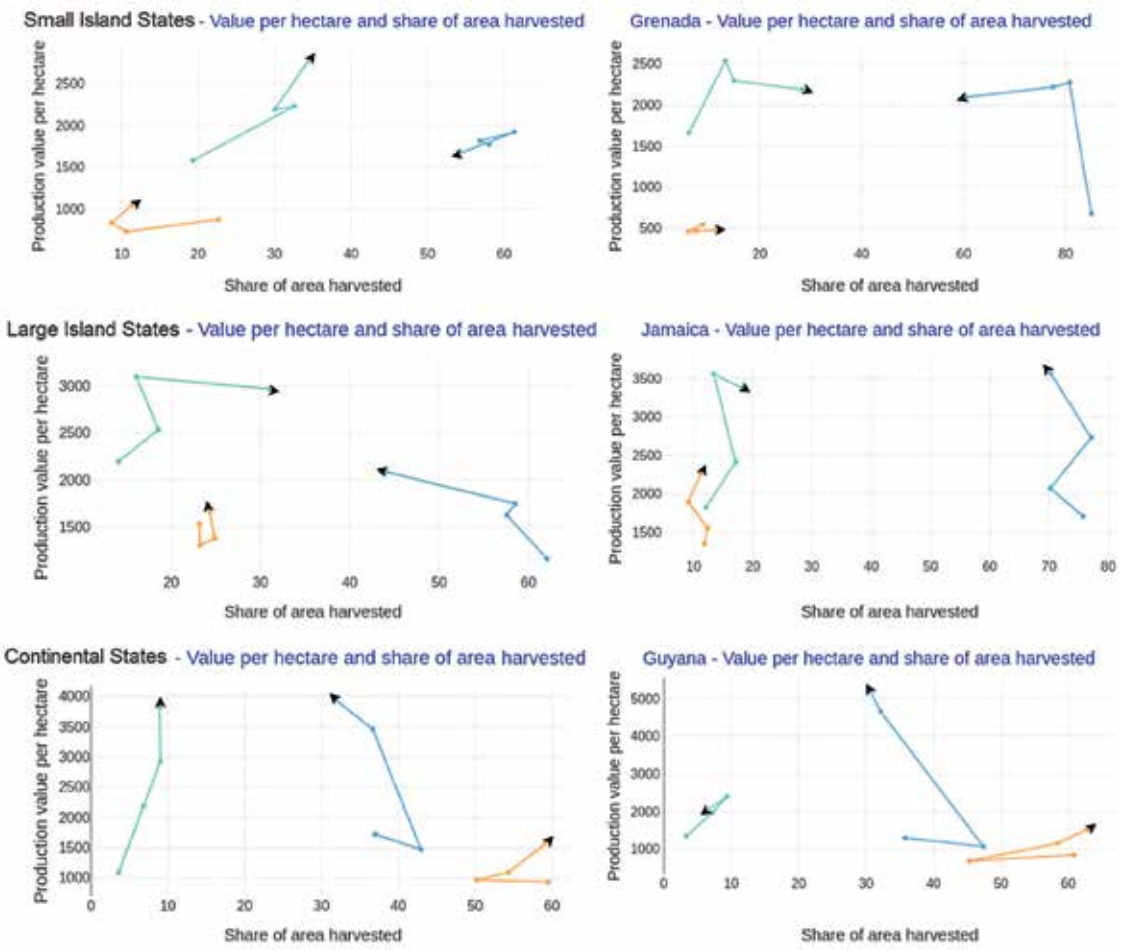
Guyana can be characterized by a stable land area devoted to fruits, vegetables, legumes and oilcrops, though the land area for cereals, roots, and tubers has expanded at the expense of traditional crops. As identified for Continental States in general, this development cannot be explained by a particularly high production value per hectare for cereals, roots, and tubers, which is indeed lower than for traditional crops.

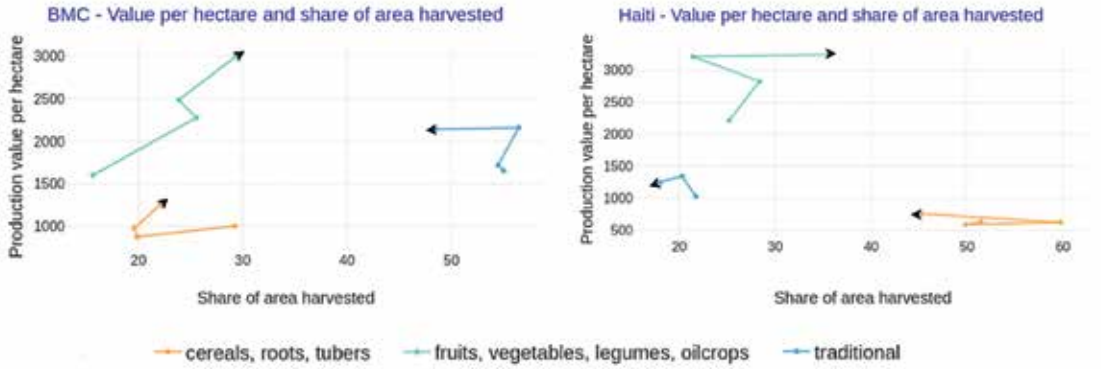
Much like Guyana, Haiti started relying on cereals, roots and tubers in the 1980s, though it reduced a large share of the area in favour of fruits, vegetables, legumes and oilcrops. Grenada's development, however, is largely in line with the average development of Small Island States.

Figure 38 illustrates the development of agricultural production value per hectare, and the share of area harvested for the four points in time: 1980, 1990, 2000, and 2012.

>> For most BMCs, land allocation has increased for fruits, vegetables, legumes and oilcrops, likely as a result of increasing production value per hectare

Figure 38. Development of average production value per hectare and area harvested by crop category over time: 1980, 1990, 2000, 2012





Source: Adapted from FAOSTAT data.

While the previous analysis was focused on crop categories, the following examines the development of the individual crops which contribute the largest total production value within each BMC group.

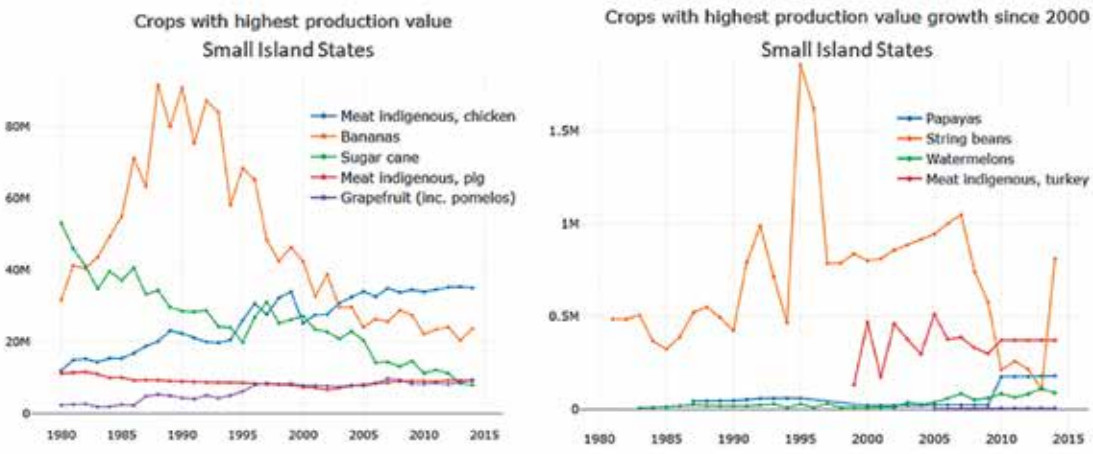
When aggregating data from BMC country groups, bananas and sugar cane continue to be among the crops that provide the highest production value in the region.

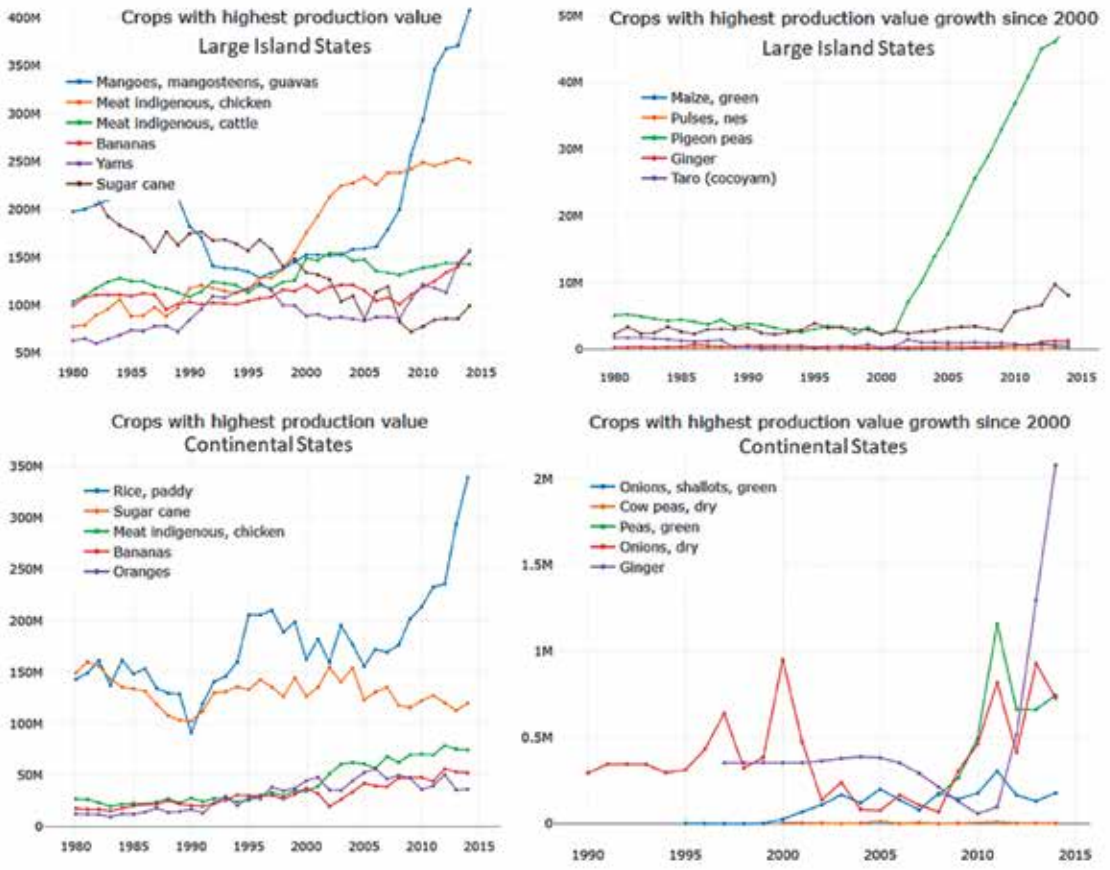
However, the production value of sugar cane has dropped for all three BMC country groups. For Small Island States, both sugar cane and bananas have been among the crops with the greatest losses in production value at national value since 2000.

In all three BMC groups, meat is among the products with the highest production value. Particularly in Small and Large Island States, poultry products contribute a large share of the regional production value from agricultural. In addition, citrus fruits provide a relevant share of production value across all BMC groups.

On balance, both sugar cane and banana crops have been among the crops with the greatest losses in production value since 2000. Despite this continuing downward trend across all BMCs, they are still considered among the most important crops. Conversely, increases in production value have primarily been seen in the meat sector, in the fruits and vegetables sector (such as papaya or ginger), and in the pulses sector (such as pigeon peas).

Figure 39. Crops with highest production value within individual BMC groups in 2012 (left) and highest production value growth since 2000 (right)



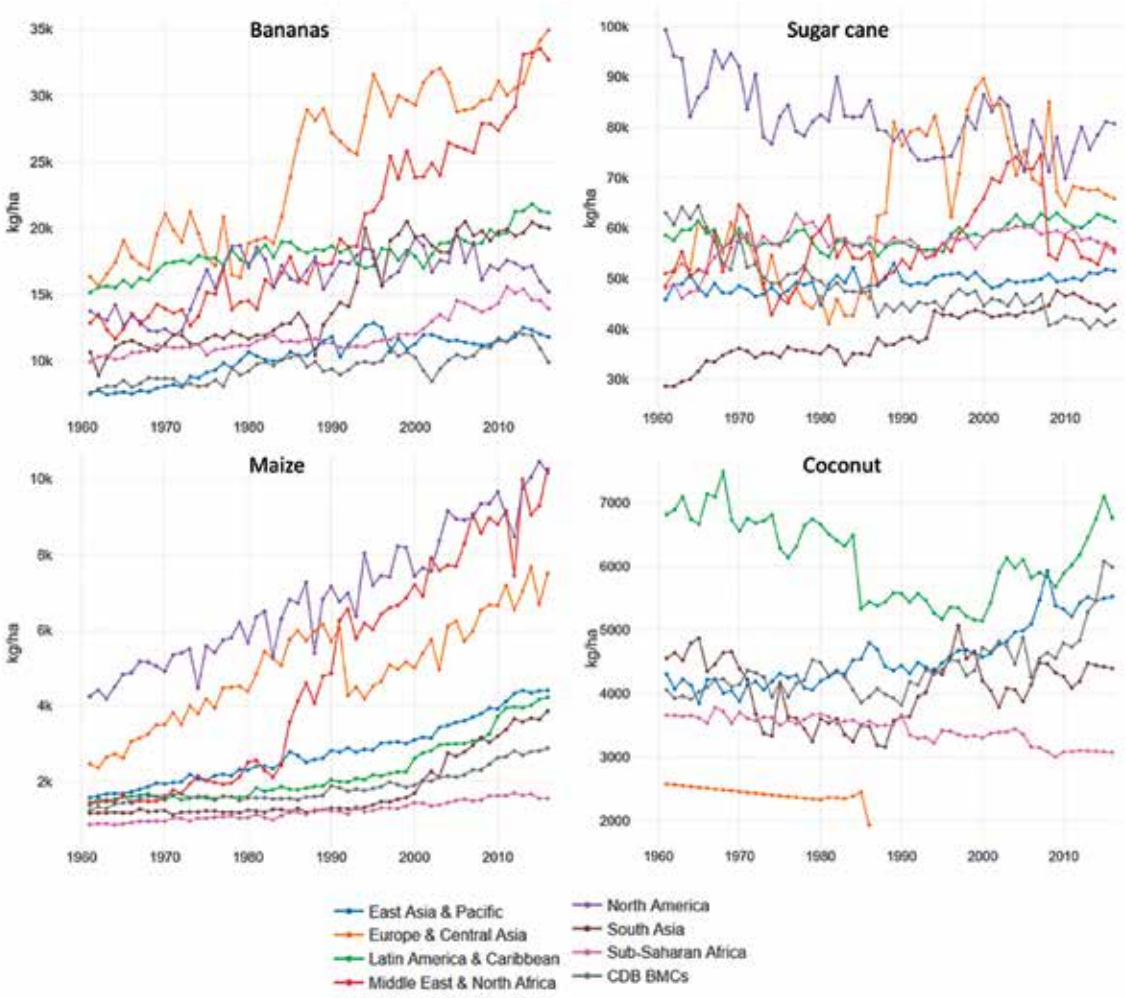


Source: Adapted from FAOSTAT data.

4.4.3 Changes in agricultural yields for main crops

Besides the total value and value per hectare of agricultural production, crop yields are an important productivity indicator. When comparing averages of national yields for main crops in BMCs to yield development in other world regions, BMCs are characterized by sizably lower yields, as well as less favourable yield development over time. Figure 40 illustrates that, compared to yield development for bananas, sugar cane and maize in other world regions, the Caribbean has one of the lowest averages. In addition, sugar cane yields have decreased in BMCs over time, while the yield increases for banana and maize are insufficient to close the gap with other global production regions. Figure 40 also shows that banana yields lag far behind other countries in Latin America. Yet, coconut yields are increasing.

Figure 40. Yield evolution in different world regions for selected main crops grown across BMCs



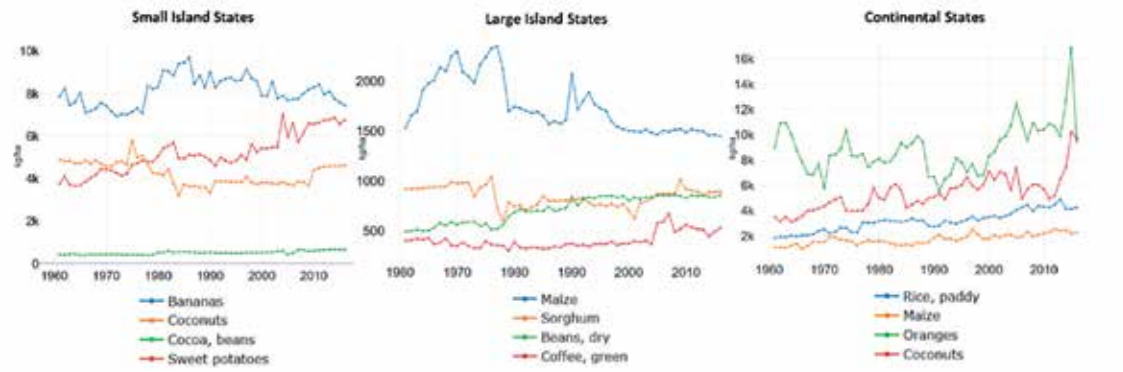
Source: Adapted from FAOSTAT data.

When analysing the yield development for crops with the largest harvested area within each BMC country group, the situation looks similar (Figure 41).

Considering the long time frame, Small and Large Island States achieved surprisingly few yield increases from 1960 to 2010. In addition, Large Island States experienced a reduction in maize yields over the same period.

Overall, Continental States are characterized by a more favourable trend, achieving yield increases for coconuts and oranges, and moderate increases for rice and maize.

Figure 41. Yield evolution for crops with largest harvested area (excluding sugar cane)



Source: Adapted from FAOSTAT data.

NOTE: The development of sugar cane yields is omitted from this graph, as sugar cane yields are considerably higher and would thus not allow for a detailed understanding of the yield development of the crops displayed.

4.5 Farm transformation

Data on the transformation of farms over time is scarce in the Caribbean. The following section presents a brief overview of selected data on farm characteristics.

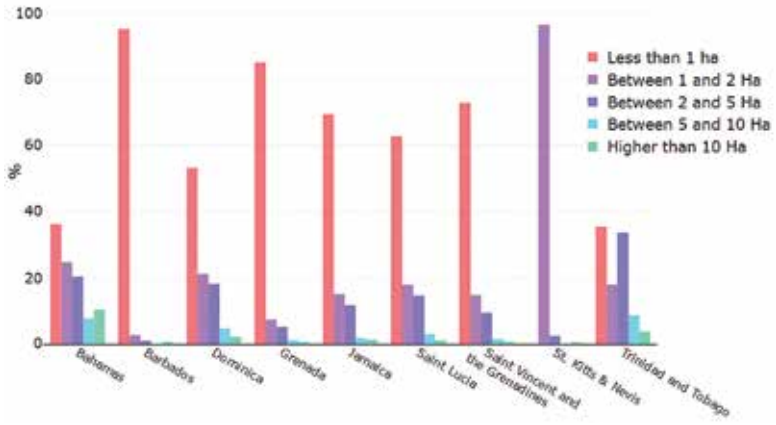
4.5.1 Farm sizes in the Caribbean

Agriculture in Large and Small Island States is dominated by farmers operating small landholdings. Using data from the most recent available census of agriculture from eight countries in BMCs, Lowder *et al.* (2016) identified that more than 80 percent of farms are smaller than five hectares (Figure 42), though most are under two hectares.

FAO (2012a) identified that small farms less than two hectares in size are not only the most frequent farm type in BMCs, but they also occupy 55 percent of the cultivated area. However, due to data limitations, no information is available on how farm sizes have changed over time.

With large land area and low population density, Continental States have fewer small farms below one or two hectares.

Figure 42. Distribution of farm sizes across selected BMCs (in hectares)



Source: Adapted from Lowder et al. (2016).

The majority of farms are owned by individuals, as identified in Table 3. Only Jamaica is characterized by a significant share of corporation-owned farms. Despite the lack of detailed data for all countries, the combination of small farm sizes and individually-owned farms indicates that smallholder producers constitute the largest share of the farming population across BMCs.

Table 3. Ownership structure of farms in selected BMCs

Country (Census year)	Individually-owned	Corporation-owned
Barbados (1989)	16 945	103
Dominica (1995)	8 365	7
Jamaica (2007)	210 853	18 100
Saint Kitts and Nevis (2000)	2 934	110
Saint Vincent and the Grenadines (2000)	7 353	11
Trinidad and Tobago (2004)	18 591	361

Source: IICA (2017).

Table 4 identifies that there are significant differences in the age structure of the farming population. In most countries, more than 50 percent of farmers are between 35 and 65 years old, with a roughly equal percentage of farmers being either older or younger than this age group. Yet, Barbados is characterized by a significantly older farm population, while Dominica reports a significantly younger farm population. According to a 2017 study by the Inter-American Institute for Cooperation on Agriculture (IICA), the pattern of a generally aging farming population is consistent across nearly all BMCs – though more data is needed to support this observation.

Table 4. Age structure of farmers in selected BMCs

Country (Census year)	Aged 35 and under		Aged 35–65		Aged 65 and over	
	No. of farms	%	No. of farms	%	No. of farms	%
Barbados (1989)	2 099	13%	9 355	56%	5 150	31%
Dominica (1995)	18 278	62%	9 243	31%	1 937	7%
Jamaica (2007)	41 226	20%	128 590	62%	38 037	18%
Saint Kitts and Nevis (2000)	572	19%	1 800	59%	654	22%
Saint Vincent and the Grenadines (2000)	1 365	18%	4 897	66%	1 134	15%
Trinidad and Tobago (2004)	2 458	13%	13 840	72%	2 813	15%

Source: IICA (2017).

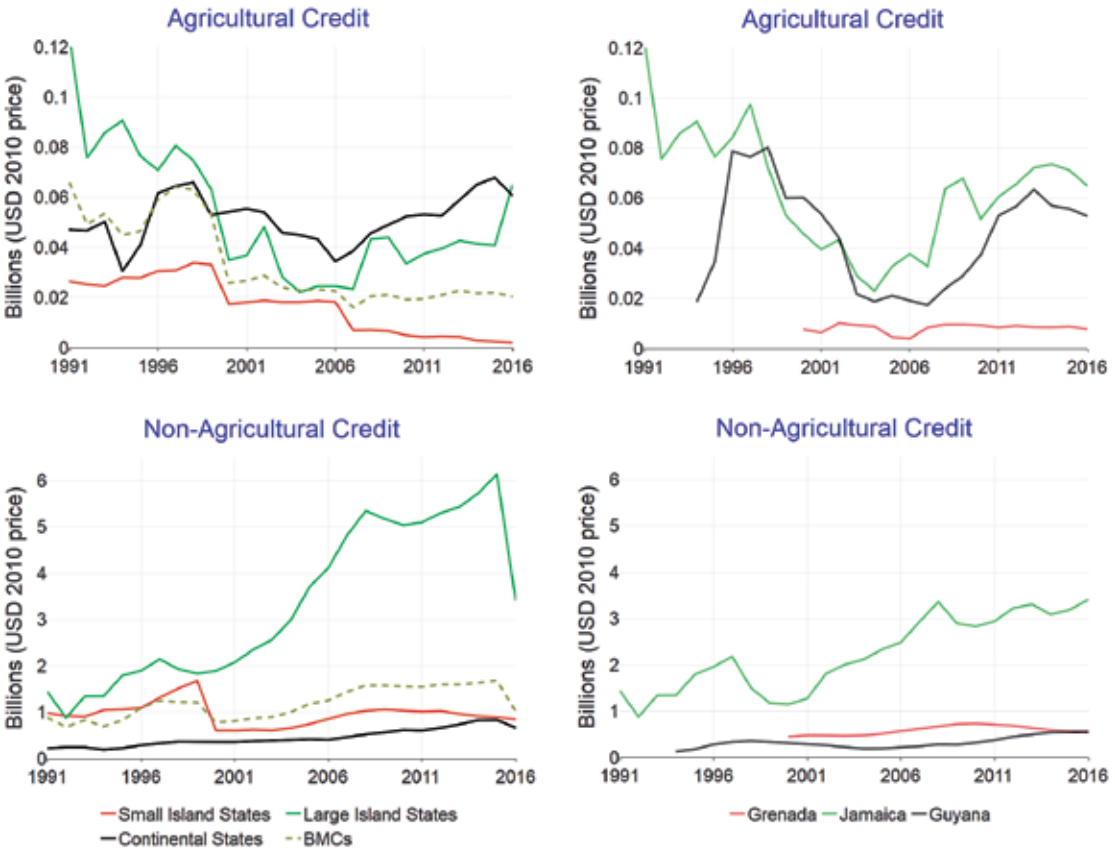
4.5.2 Credit to agriculture

Access to credit is fundamental for entrepreneurs in agriculture. Credit can help build an economic activity, and complement or substitute other financial resources, such as personal savings, or borrowing from relatives and peers, or even informal lenders with high-interest loans. The agricultural sector is generally under-represented in commercial lending compared to other sectors. FAO (2018) reports that, while globally agriculture contributes 4.3 percent of GDP, the sector receives only 2.9 percent of total credit from domestic commercial banks.

Nevertheless, as shown in Figure 43, credit to agricultural sectors from 1991 to 2016 has decreased across most BMCs. However, Continental States have increased the credit volume to agriculture, while Large Island States began increasing credit to agriculture in 2005, following a period of marked decline.

In contrast, credit provision increased over the same time period for non-agricultural sectors.

Figure 43. Provision of credit to agriculture and non-agriculture sectors over time

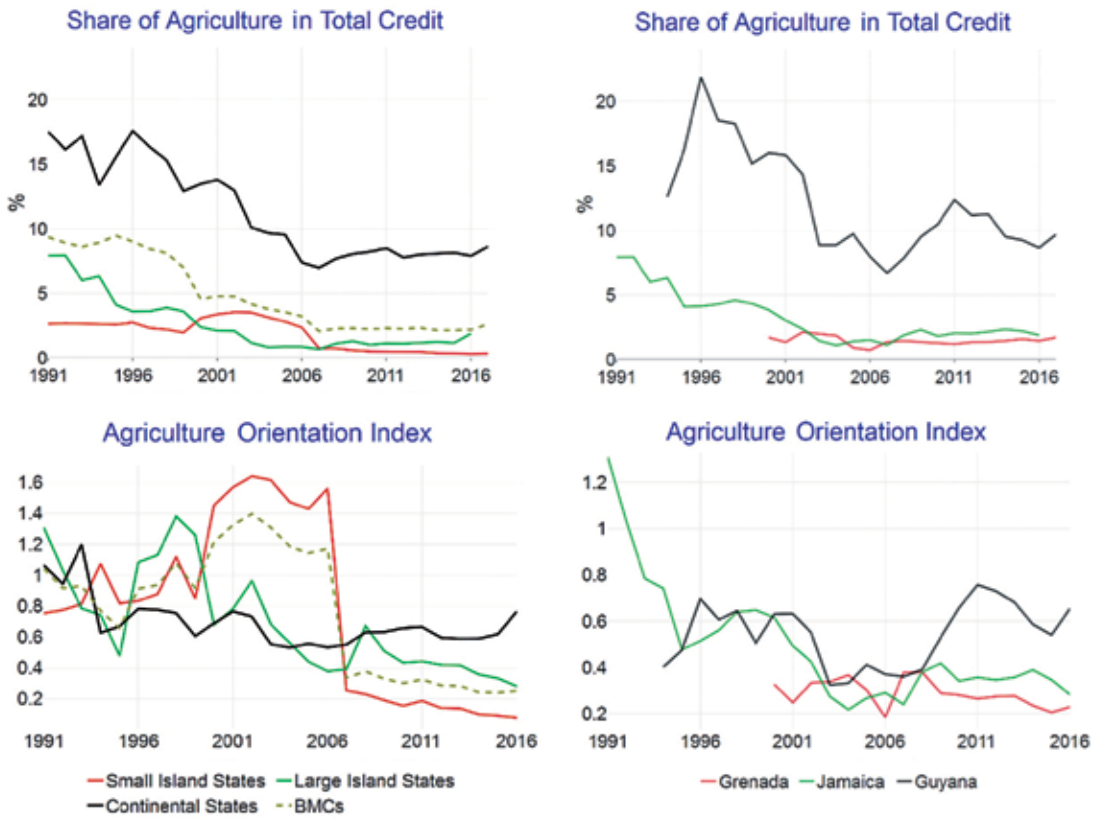


Source: Adapted from FAOSTAT data.

Credit to agriculture in BMCs appears to correspond with the importance of the sector (Figure 44). However, to better analyse credit in agriculture and provide a more accurate measure of the relative importance commercial banks place on financing the sector, the Agriculture Orientation Index (AOI) is used – defined as the share of credit provided to agriculture over the share of agriculture in GDP. This Index normalizes the share of credit to agriculture by taking the economic contribution of the sector into account.

An index value of less than 1 means that the agriculture sector receives a lower share of credit compared to its GDP share; an index value greater than 1 indicates that the sector receives a higher share of credit compared to its economic contribution. A general reduction of the indicator is observed in Figure 44, with a rapid fall in 2007 in Small Island States. The large variability of the Index in Small Island States can be explained by the very low contribution of the sector to the total economy: Any small change produces a large variation in the Index.

Figure 44. Indicators of credit in agriculture



Source: Adapted from FAOSTAT data.

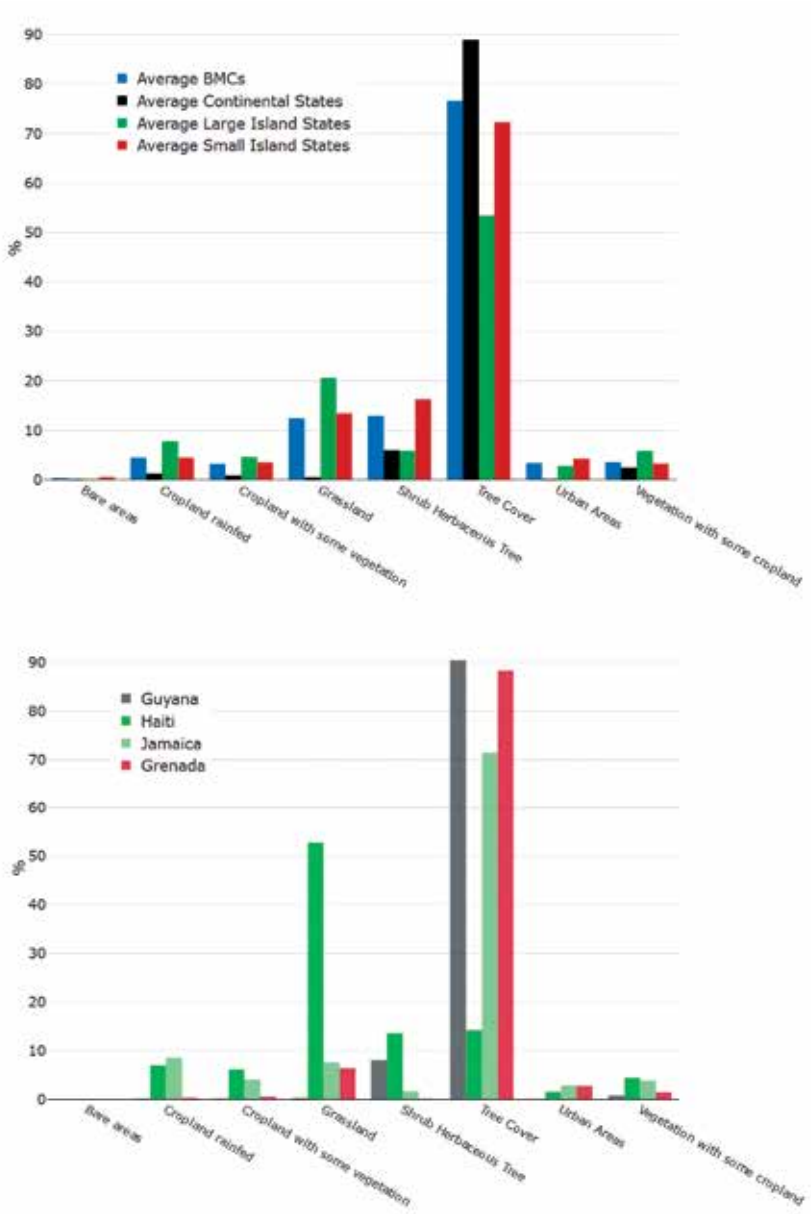
4.5.3 Land use patterns across the Caribbean

More than 75 percent of the land in BMCs is covered by trees. As illustrated in Figure 45 and Figure 46, forests dominate the landscape in Continental States, covering around 90 percent of the territory, with grassland and cropland representing less than 5 percent of the area.

The average share of forest in the total area of Large Islands States is less than Continental States, but still above 50 percent. Large Islands States have larger grassland and cropland areas than the other BMC groups. This is driven to a large extent by forest cover loss in Haiti, as a large share of its forest has been converted to grasslands.

Small Island States have 70 percent forest coverage, though urban areas occupy more land compared to all other BMC country groups.

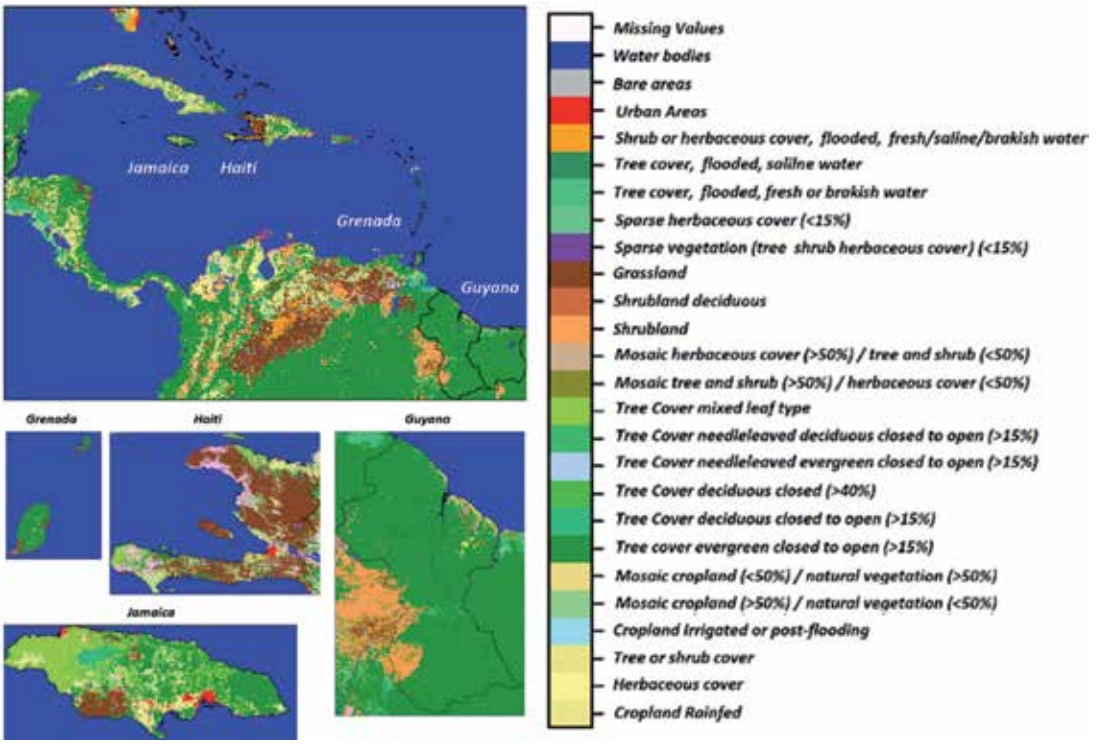
Figure 45. Land use classification (2015) in BMCs and focus countries



Source: ESA and UCLouvain (2010).

Figure 46 provides a more spatially explicit overview of land use within the Caribbean and each focus country.

Figure 46. Land use in the Caribbean (2015)



Source: ESA and UCLouvain (2010).

4.6 Transformation in the fishery sector

The fisheries sector is vital to many people's livelihoods in BMCs. The sector involves a large range of activities, such as capture fisheries, aquaculture, processing and commercialization. The total off-vessel value of products from capture fisheries harvested in so-called "*FAO major fishing area 31*"[36] in 2013 amounts to USD 3.2 billion (FAO, 2016a). While the sector employs 1.3 million people directly, it supports the livelihoods of 4.5 million people: CARICOM countries employ over 182 000 people in fisheries, operate 25 000 boats, and produce 161 000 tonnes for a value of about USD 700 million per year (FAO, 2012b). Post-harvest activities and aquaculture also provide significant employment opportunities in the region.

The small-scale fisheries sector in particular supports a larger share of livelihoods throughout the Caribbean. For example, fisheries activities support the livelihoods of an estimated 200 000 Jamaicans (Van Riel and Wijkstrom, 2005; Waite *et al.*, 2011). Yet, fisherfolk and processors in the small-scale fisheries sector are often poor (Waite *et al.*, 2011).

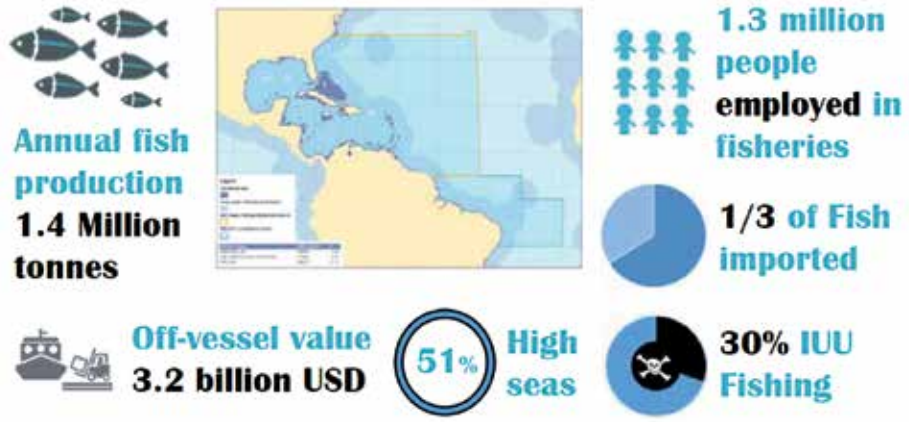
>> The fisheries sector provides an important share of employment and nutrition throughout the Caribbean

On average, the consumption of fish per capita in Caribbean islands is about 20 kg. Fish products provide a vital protein source, which is available all year round and occurs in sufficiently diverse

36 The FAO Western Central Atlantic (major fishing area 31) includes the Caribbean Sea, the southeast coast of the United States of America, the Gulf of Mexico, and the northeast coast of South America (http://www.fao.org/fishery/area/Area31/en).

forms to be accessible to both low- and high-income groups. About seven percent of the protein consumed in the Caribbean is from fish (Trotman *et al.*, 2009).

Figure 47. Infographic on fisheries in the Western Central Atlantic



Source: FAO (2016a).

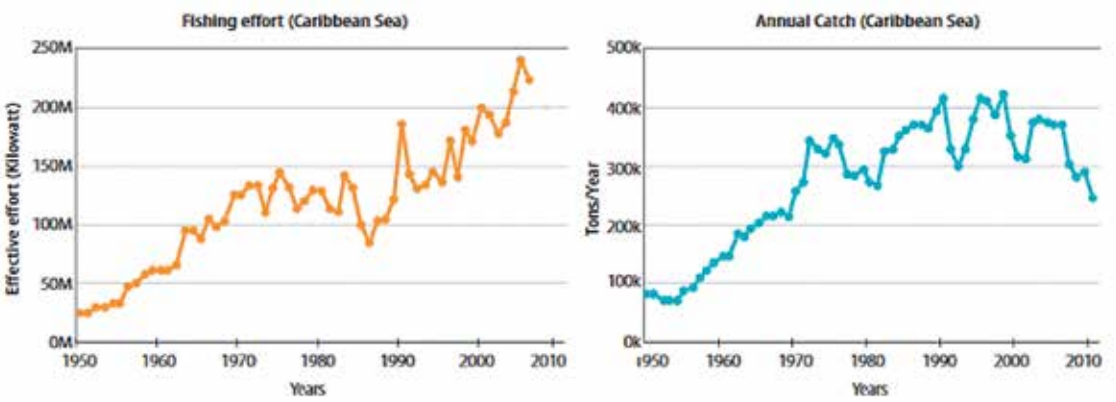
4.6.1 Development of fishery production

Currently, FAO major fishing area 31 produces 1.4 million tonnes of fish annually, while one-third of the fishery products consumed in the area are imported, making the region a net importer of fishery products. In 2009, 56 000 tonnes of fishery products were exported from the BMCs, while 68 000 tonnes were imported. The main exporters in the region are the Bahamas, Belize, Guyana, and Suriname; exports consist mainly of high-value species, such as lobster, conch, snapper, grouper and shrimp.

>> An estimated 60 percent of commercially exploited fish stocks in the Caribbean are overexploited

In its 2015 study, the Transboundary Waters Assessment Programme (TWAP) found that, despite increased fishing efforts in the Caribbean Sea from 1950 to 2010, the annual catch declined over the same time period (Figure 48). This may be an indication of decreasing fish stock density. TWAP (2015) estimates that in the Caribbean Sea, nearly 60 percent of commercially exploited fish stocks are overexploited, with overexploited fish species accounting for 50 percent of landed fish. Patil *et al.* (2016) report that for large pelagic stocks, distant water fishing nations also play a role in overexploitation. In fact, the current 1.4 million tonnes of fish production is 300 000 tonnes below the 30-year fish production average (FAO, 2016a).

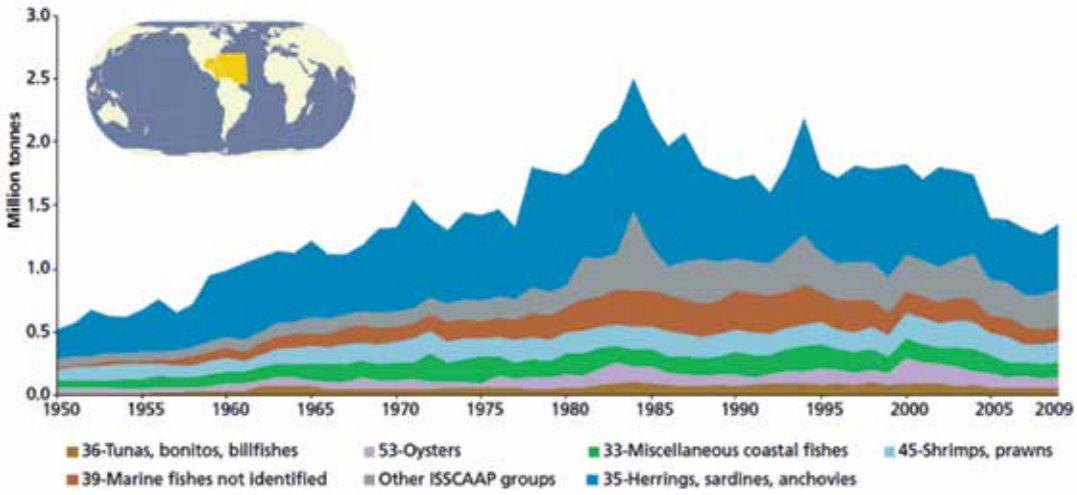
Figure 48. Fishing effort and annual catch in the Caribbean Sea



Source: TWAP (2015).

When differentiating by species groups, Figure 49 reveals a more detailed picture. Total landings in FAO major fishing area 31 increased until its peak in 1984, but was then followed by a gradual decline (FAO, 2011). There are many factors which may have influenced these year-to-year variations and recent declines, including tropical cyclone damage to landing sites and processing facilities, regional fishery regulation, and a net reduction in available fish stocks.

Figure 49. Annual nominal catches by species groups in the Western Central Atlantic



Source: FAO (2011).

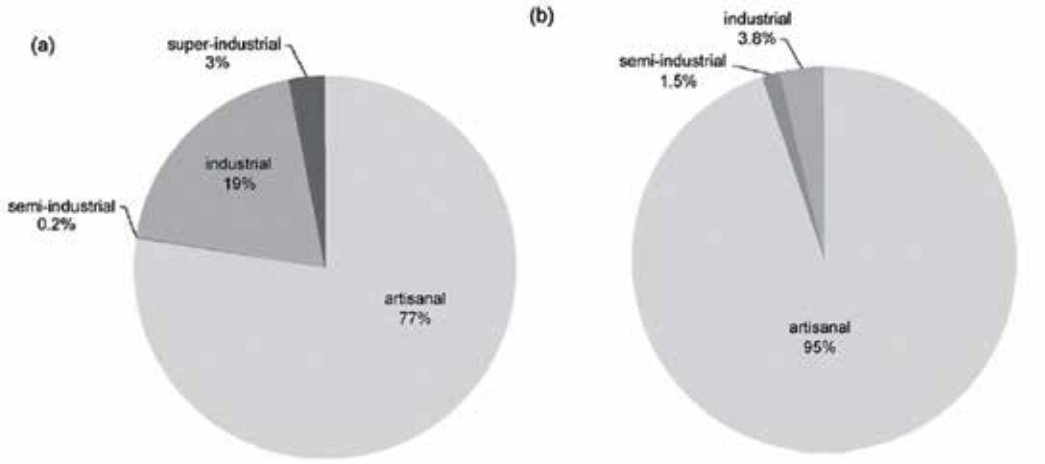
NOTE: Using the International Standard Statistical Classification of Aquatic Animals and Plants (ISSCAAP) for FAO major fishing area 31.

4.6.2 Types of production technology in the fishery sector

When investigating issues of technology and gear use in the sector, major differences can be found between Continental and Island States in the Caribbean. FAO (2016a) reports that in 2013, some 160 000 fishing vessels were operating in area 31, of which an estimated 87 percent were powered, and 13 percent using sails or oars. Figure 50 illustrates that both Continental and Island States are dominated by artisanal fisheries, contributing 77 and 95 percent of total fishing effort respectively (Dunn *et al.,* 2010). However, industrial and super-industrial fisheries constitute a much larger share in Continental States – 22 percent – while they represent only about four percent in Island States.

Figure 51 presents the estimated dominance of different types of fishing gear in the Caribbean, with mixed fishing gear (62 percent) as the main gear type employed by fisherfolk. Other forms of gear include longlines (9 percent), gill nets (7 percent), hook lines (6 percent), trawls (6 percent), and traps (5 percent). No comprehensive data is available on changes in fishing technology use over time.

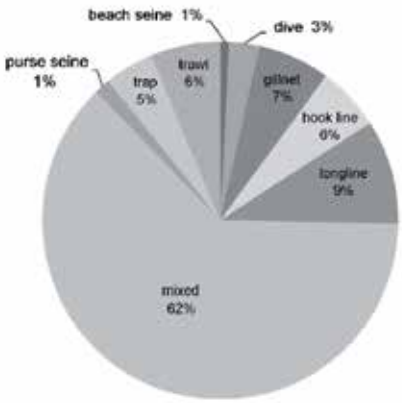
Figure 50. Estimated percentage of fishing effort by type of fisheries for (a) Continental States, and (b) Small and Large Island States



Source: Dunn et al. (2010).

NOTE: Approximate fishing effort by boat meter length.

Figure 51. Estimated percentage of fishing effort by gear type across the Caribbean



Source: Dunn et al. (2010).

4.6.3 Main challenges and opportunities for fishery sector development

The main challenges to fisheries sector development are diverse, covering a range of economic, environmental and social sustainability issues.

In the Caribbean, the main challenges of the fisheries sector include climate change, sea level rise, marine pollution, unsustainable fishing practices, habitat degradation, overfishing, *illegal, unreported and unregulated* (IUU) fishing, rapid population growth, and competition from tourism and oil

extracting industries (FAO, 2012b). Illegal, unreported and unregulated fishing accounts for about 30 percent of overall resource exploitation.

>> Overfishing and natural resource degradation pose a major challenge to the sustainable development of the fisheries sector in the Caribbean

The Caribbean Sea has the highest level of species diversity in the tropical Atlantic, and is considered a global hotspot of marine biodiversity (Patil et al., 2016). Sector development and transformation is influenced by many management decisions: quantity, location and timing of resource extraction; patterns of investments in fleets; landings and processing facilities; and the feedback mechanism from the overall marine ecosystem – in the form of fish stock depletion or replenishment, and the health of the coastal and marine ecosystem. Patil et al., (2016) identify some of the main concerns and drivers of marine degradation in the Caribbean, including overfishing, coastal development, pollution, the introduction of invasive species, and the impacts of climate change.

>> Marine degradation is driven in particular by overfishing, coastal development, pollution, the introduction of invasive species, and the impacts of climate change

Overfishing is prevalent in near-shore fishing, though it has increased in selected offshore fishing grounds, such as the Pedro Banks of Jamaica (FAO, 2012b). The informality of the sector, particularly small-scale fisheries operations, complicates matters.

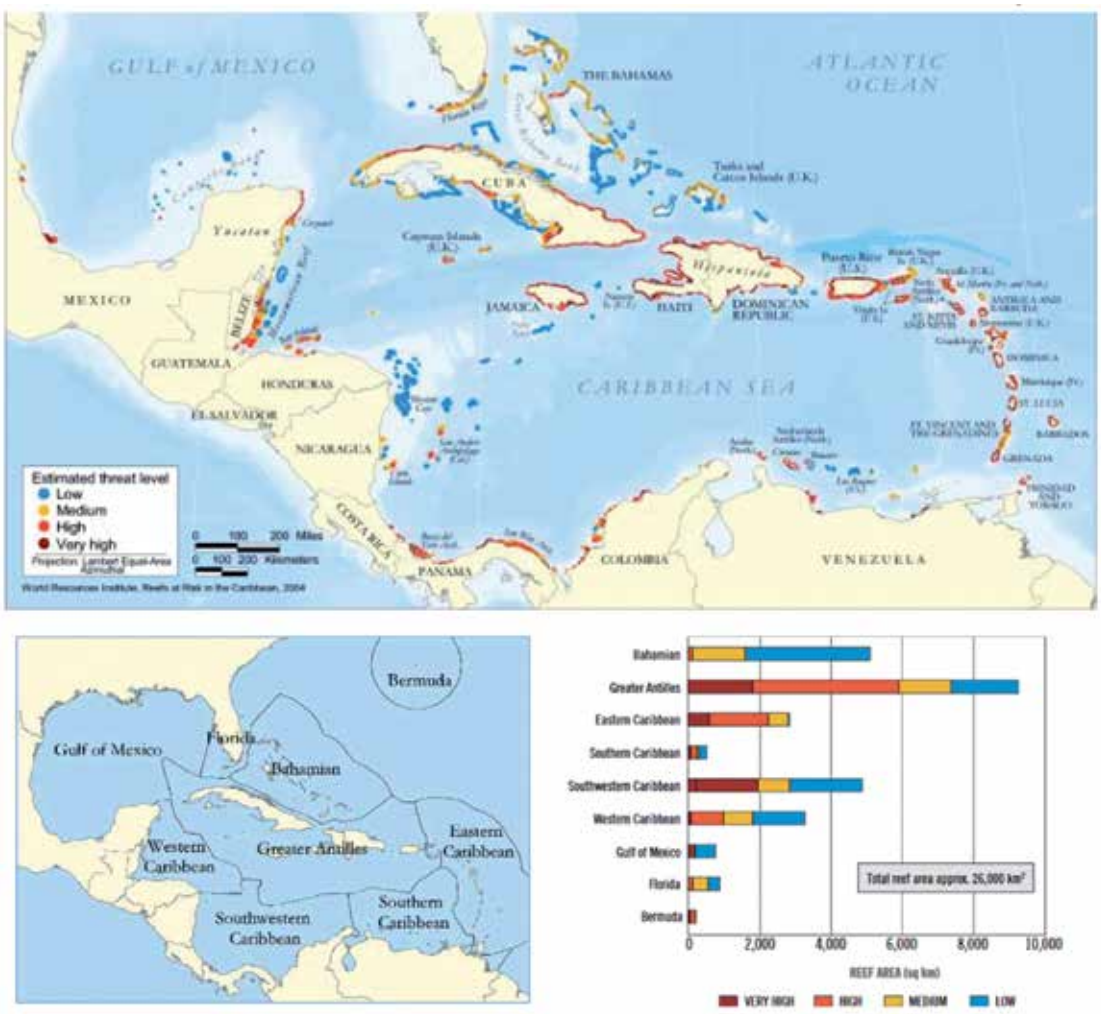
Overfishing is a main concern for the overall sustainability of the sector. For example, red snapper (*Lutjanus campechanus*) and the Atlantic bluefin tuna (*Thunnus thynnus*) are among the threatened species on the International Union for the Conservation of Nature (IUCN) Red List. Overfishing has a negative impact on all aspects of sustainability in the sector: the economic viability of small-scale fishers; the aquatic food web and overall marine ecosystem; and incomes, especially for those who depend on fisheries for their livelihood.

WRI (2004) estimates that nearly two-thirds of coral reefs in the Caribbean are threatened by human activities, which – in addition to overfishing – include development, sediment, and pollution from inland sources. Coral reefs are also exposed to many marine-based threats: discharge of wastewater from cruise ships, tankers and yachts; leaks or spills from oil infrastructure; and damage from ship groundings and anchors (WRI 2004).

>> An estimated two-thirds of coral reefs in the Caribbean may be at risk from degradation through human activities

Figure 52 identifies the spatial location of reefs at risk, such as in the Greater Antilles, the Eastern Caribbean, and the southwestern Caribbean.

Figure 52. Coral reefs at risk of degradation from human activities – the reefs at risk threat index



Source: WRI (2010).

Climate change impacts on the marine ecosystem will be discussed in detail in Chapter six.

Another key sector challenge concerns the social impacts of the fisheries sector. While the fisheries sector is a central contributor to livelihoods and well-being in the Caribbean, it comprises a set of labour-related challenges, including prevailing informality, seasonality, remoteness, hazardous working conditions, and value chain complexity (FAO, 2016b). These sector challenges require targeted policy responses, as they may otherwise prevent sustainable sector development. One important policy initiative concerns the development of implementation strategies for the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines). The SSF Guidelines address the diversity of development issues surrounding small-scale fisheries in an integrated manner. This also includes the consideration of social protection mechanisms for fisherfolk – an issue commonly overlooked in past sector development plans.

Another important policy initiative for which implementation actions are currently under design in the Caribbean refers to the Agreement on Port State Measures (PSMA). The PSMA is the first binding international agreement to specifically target illegal, unreported, and unregulated fishing (IUU). Its objective is to prevent, deter and eliminate illegal, unreported, and unregulated fishing by preventing vessels engaged in IUU fishing from using ports and landing their catches. In this way,

the PSMA reduces the incentive of such vessels to continue to operate, while it also blocks fishery products derived from IUU fishing from reaching national and international markets.

>> A set of labour-related challenges are associated with the fisheries sector, including prevailing informality, seasonality, remoteness, hazardous working conditions, and value chain complexity

Governance issues are a further challenge to regional sector development (FAO, 2014). For a prolonged period, the Caribbean region was one of the very few regions in the world without a regional or subregional fisheries management plan in effect (FAO, 2014). Regional fisheries bodies are currently collaborating to close the governance gap in regional fisheries. At national level, many countries in the region do not have formally adopted fishery management plans in place. Moreover, fisheries laws and regulations that are in place are often outdated and do not allow for effective enforcement of these regulations.

Fisheries management information systems are also lacking, though they are needed to provide policymakers and decision-makers with essential information and statistics. Institutions in the region, established in support of fisheries management, generally have insufficient human and financial resources to carry out their duties and functions. A more detailed institutional analysis of regional and national governance issues is provided in the FAO's 2014 Issue Brief: Securing fish for the Caribbean.

There are five main regional fisheries bodies in the Caribbean, which facilitate cooperation and international coordination:

- International Commission for the Conservation of Atlantic Tunas (ICCAT);
- FAO/Western Central Atlantic Fishery Commission (FAO/WECAFC);
- Caribbean Regional Fisheries Mechanism (CRFM);
- Latin American Organization for Fisheries Development (OLDEPESCA); and
- the Central American Fisheries and Aquaculture Organization (OSPESCA).

There is also a regional fisherfolk network called the Caribbean Network of Fisherfolk Organisation (CNFO). Moreover, Caribbean organizations have taken part in the past development and current implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Alleviation (SSF Guidelines).

In general, the fisheries sector offers many sustainable development opportunities. Natural resource conservation and sustainable tourism development can be combined in a synergistic manner, as indicated in the Blue Economy approach, which arose from the 2012 United Nations Conference on Sustainable Development.

>> The targeted development of tourism and the conservation of the aquatic ecosystem in a synergetic manner offers an important sector development opportunity

The Blue Economy model aims to achieve economic growth, social inclusion, and livelihood development in harmony with the environmental sustainability of oceans and coastal resources. It underlines the need and ways to decouple growth in economic sectors that rely on maritime resources from environmental and ecosystem degradation. The Blue Economy also takes into consideration that the health of oceans and maritime ecosystems has significantly declined due to anthropogenic activities, and it calls for a more sustainable management of natural resources.

4.7 Transformation in the livestock sector

The livestock sector in the Caribbean is a major contributor to agricultural GDP. Substantial growth in recent decades has been seen across BMCs: Small ruminants and poultry are important production systems throughout the region, while cattle production systems are more important in Continental and Large Islands States, which have more land resources.

Generally, BMCs experience notable trade deficits in livestock products; they import large shares of their consumption. Import deficits particularly prevail for small ruminant and beef products, while less so for poultry. In some countries, the lower trade deficits of poultry products are attributed to trade protection measures, such as in Jamaica. A larger share of the trade deficit appears to stem from domestic consumers, as compared to demand from the tourism sector for fruits and vegetables.

The high production value of livestock products in the Caribbean makes it an attractive commodity for income generation by farmers. However, the higher cost of production, when compared to many cropland products, is an effective entry barrier for small-scale farmers. In this context, small ruminants are often considered best adapted to non- and semi-commercial smallholders: Ruminant production systems do not require large grazing land area or substantial initial investments (as is the case for cattle), nor do they require investments in advanced production facilities (as is the case for commercial and semi-commercial poultry).

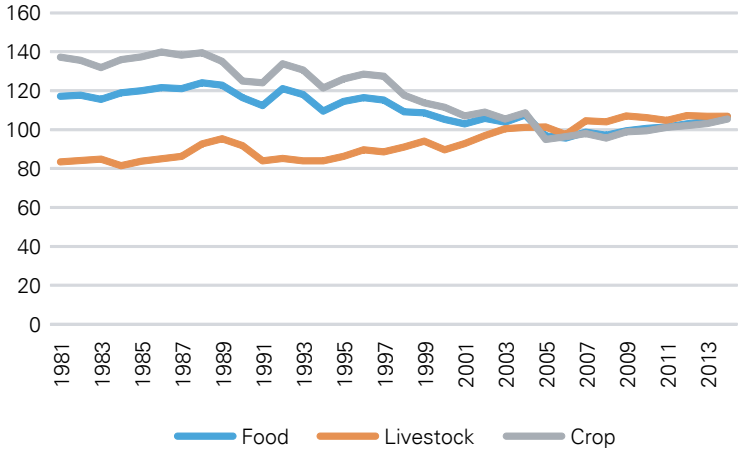
The section that follows is an overview of the development of the production value of different livestock products. Subsequently, characteristics of main production systems are discussed, with a depiction of the most important challenges and opportunities for livestock sector development.

4.7.1 Development of livestock production

Since 1997, crop and food production have decreased in BMCs; since 2005, they have stagnated, hovering at levels comparable to livestock production in 2014. However, livestock production has seen rapid growth since 2000, as shown in Figure 53.[37]

37 The food production index covers food crops that are edible and have nutritional value. The crop index includes all crops except fodder crops. The livestock production index includes meat, milk, eggs, cheese, honey, raw silk, wool, hinds, and skins.

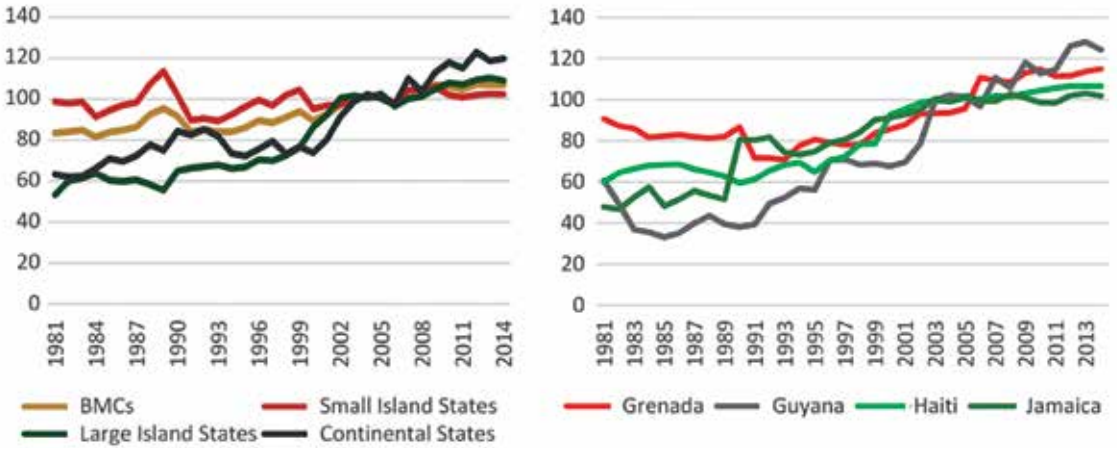
Figure 53. Production Index (2004–2006 = 100) for BMCs



Source: Adapted from WDI data.

NOTE: The FAO indices of agricultural production show the relative level of the aggregate volume of agricultural production for each year in comparison with the base period 2004–2006.

Figure 54. Livestock production Index (2004–2006 = 100) for country clusters and focus countries



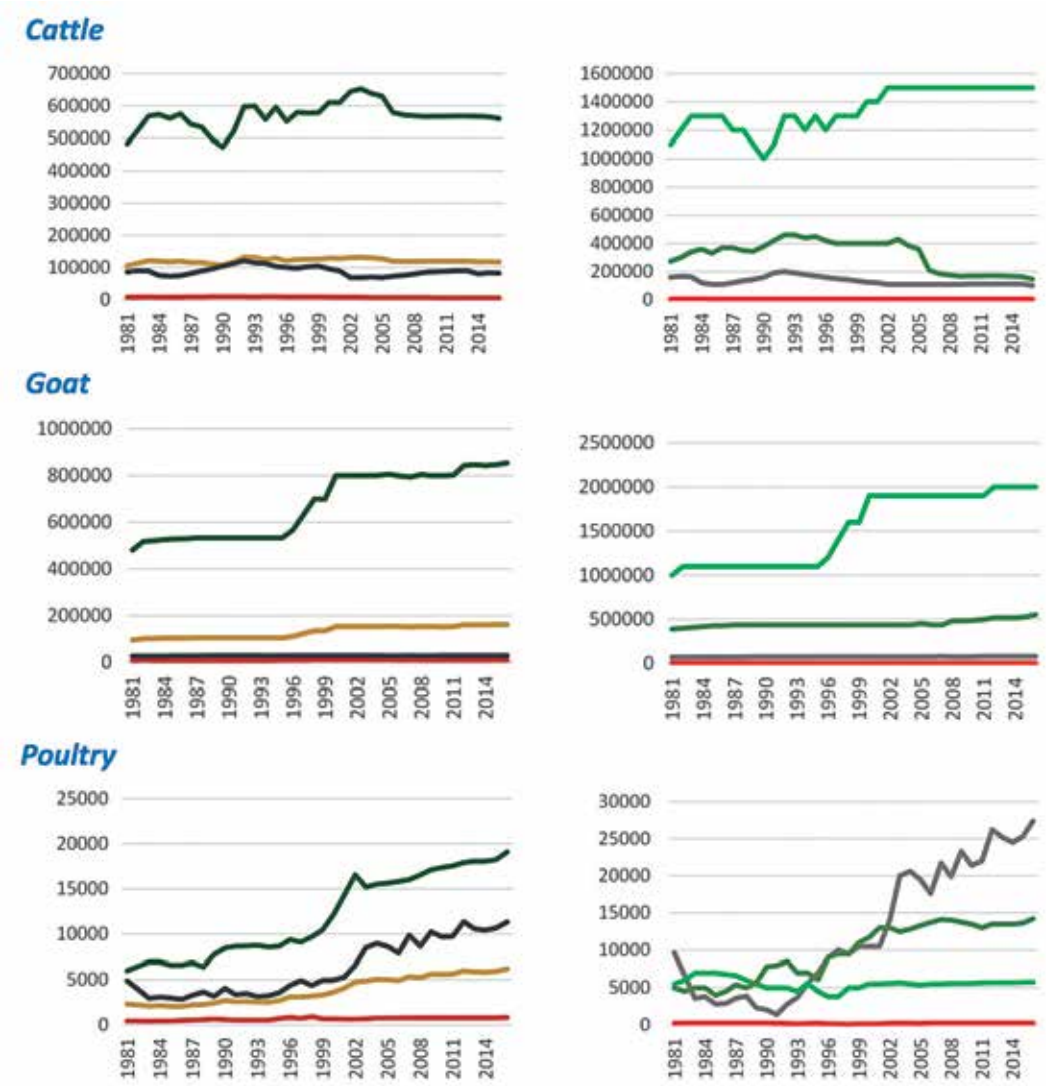
Source: Adapted from WDI data.

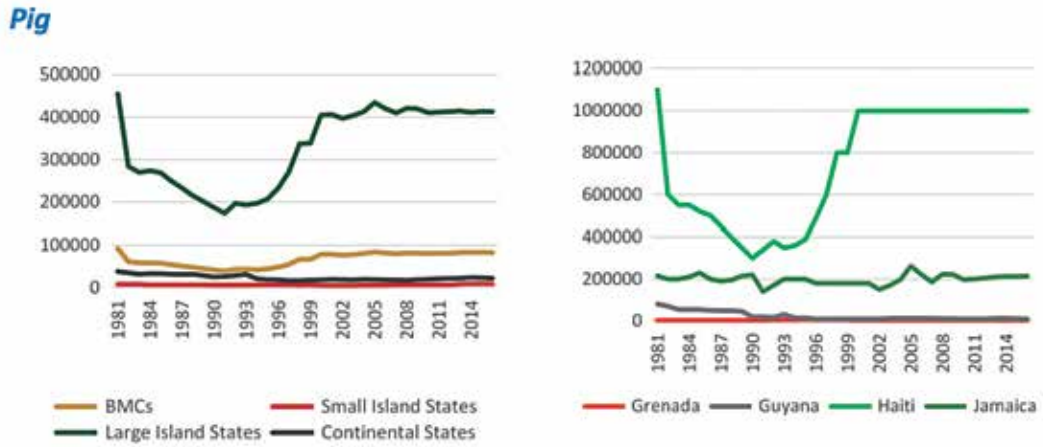
Across the different country clusters, livestock production has continuously increased over the past decades (Figure 54). Continental States have been characterised by the highest rate of increase of livestock production, whereas Small Island States show the same level of production in 1981 as they do in 2014. When observing the countries individually, livestock production has increased consistently, with Guyana showing the highest rate of growth.

The leading livestock subsectors in the region are cattle, goat, poultry and pig production. As shown in Figure 55, the poultry subsector has been expanding since 2000, with a remarkable increase being observed for Guyana and Jamaica, as well as for Large Island States. A similar trend is observed for the goat subsector in Large Island States and in Haiti, whereas the sector's production remains stable for the other country clusters and focus countries. Cattle production is the highest in Large Island States, especially in Haiti, but was stable over the period studied. Between 1981 and the 1990s, pig production decreased for Large Island States, but has since recovered.

Figure 55 illustrates that, overall, Large Island States have the highest levels of livestock production in the three subsectors – cattle, poultry and pig. However, in Continental States, the total livestock production is most important: meat and milk from all sources, dairy products such as eggs and cheese, honey, wool, hides and skins. Therefore, livestock production plays a crucial role in the agricultural sector, particularly for Continental States and Large Island States, and to a lesser extent for Small Island States.

Figure 55. Value of Livestock production for country clusters and focus countries





Source: Adapted from FAOSTAT data.

4.7.2 Types of production systems in the livestock sector

Globally, economic growth and the adoption of new technologies have been drivers of profound structural change in the livestock sector. According to FAO (2009), this change has included a shift from smallholders raising livestock on mixed farms, towards large-scale, capital intensive, and specialized livestock production systems. Lowitt *et al* (2015) indicate that Caribbean smallholder farmers, including livestock farmers, are characterized by low innovation potential, having less access to technology and international best practices. Therefore, smallholders in BMCs have been unable to close the gap on international competitors, who have shifted to highly productive, capital intensive and large-scale livestock production systems.

Lowitt *et al* (2015) argue that the main contributing factors to the low innovation of smallholder farmers in the Caribbean are limited access to credit, insufficient access to formalized output markets, and the absence of functioning knowledge networks. According to the United Nations Conference on Trade and Development (UNCTAD, 2017) smallholder livestock systems often suffer from unscheduled livestock sales for consumption smoothing, which creates disincentives for farmers to invest in productivity technologies and veterinary services. BMCs are generally perceived to have realized less rapid adoption of new technologies in the livestock sector – particularly with regard to smaller producers. For Small Island States, the lacking potential to achieve economies of scale functions as a structural disadvantage compared to Continental and Large Island States.

>> Technological innovation in livestock systems throughout BMCs is constrained by Limited access to credit, high barriers to formalized output markets, and few knowledge networks

When focusing particularly on productivity improvements and innovations of small-scale livestock producers, García-Martínez *et al.* (2016) propose to differentiate between innovations in (1) management, (2) feeding, (3) genetic resources, (4) reproduction, and (5) animal health. For each of these five dimensions, García-Martínez *et al.* (2016) identify a set of innovation areas, depicted in Table 5, which can support national and sub-national diagnostics to identify innovation strength and deficits in BMCs.

At regional level across all BMCs, the high cost of animal feed remains a concern, though this is partly structural, due to limitations in large-scale feed production, and limited availability of grazing lands. However, there are many areas which are not subject to structural limitations in BMCs, such as improvements in extension services for animal genetic resources, reproduction and health services, as well as animal management. Therefore, there are many opportunities to promote innovation and increase productivity in livestock production systems which have yet to be fully explored.

Table 5. Livestock innovation areas in small-scale production systems in developing countries

Management	**Feed**
Record system	Green fodder
Grazing native pasture	Silage
Grazing of crop residues	Hay making
Type of milking	Processed feed
Animal identification	Concentrate
Breeding management	Molasses/urea
Grazing planting	Grains and oilseeds
Milking season	Multi-nutritional blocks, processed
Genetics	Manufacture of multi-nutritional blocks
Use of breeds and crosses	Common salt
Use of genetically tested bulls	Mineral salts
Calves selection criteria	Mineral blocks
Female selection criteria	Vitamin provided
Sire selection criteria	Agro-industrial by-products
Crossbred system	**Animal Health**
Reproduction	Health planning
Evaluation in bulls	Vaccination program
Semen evaluation	Parasite diagnosis
Female evaluation	Internal deworming control
Oestrus detection	External parasite control
Pregnancy Diagnosis	Mastitis diagnosis
Mating	Sanitary milking programme
Breeding policy	

Source: García-Martínez et al. (2016).

A key constraint of livestock production systems in BMCs is the high cost of production, which reduces the international competitiveness of domestic producers. Production costs also vary greatly between BMCs, as do the different kinds of production systems within the same country.

>> High production costs of livestock production systems in BMCs are mainly driven by feed and labour costs, limiting their competitiveness with regard to imports

As part of their overall country comparison throughout CARICOM countries, CARDI (2013) found Guyanese sheep production systems to be the most internationally competitive. A large price-competitiveness gap for Jamaican goat production systems was not observed compared to imported products, whereas, livestock producers in Trinidad and Tobago were identified as being the least competitive throughout CARICOM.

4.7.3 Main challenges and opportunities for livestock sector development

To support small ruminant policy throughout the Caribbean, FAO (2016c) surveyed stakeholders in six BMCs to identify the priority challenges and constraints for small ruminant development in particular, and livestock sector development in general.

Based on a wide range of potential challenges, the following issues were reported as being the most limiting for small ruminant sector development:

a. praedial larceny;

b. lack of improved pastures and high cost/low quality of concentrate feeds; and

c. limited/poor quality breeding stock and programme.

FAO (2016c) identifies that these priority issues do not only function as structural, long-term barriers to sector development and growth, but they also limit producer profits and productivity in the medium and short term.

>> Praedial larceny, low-quality feed and pastures, and limited breeding stock affect both the short-term profitability and long-term competitiveness of the small ruminant sector in BMCs

In order to address these priority issues for policy intervention, a catalogue of measures is proposed to ensure the development and increased competitiveness of the small ruminant sector in BMCs.

Praedial larceny can be reduced by direct and indirect measures. The standardization and nationwide application of an Animal Identification and Registration System is a key step in ensuring full traceability of animals – both during their life span and across the initial processing stages and the value chain. Together with the enforcement of exclusive slaughtering in formal abattoirs, this largely reduces the range of possibilities to economically valorise stolen livestock.

The lack of improved pasture and the high cost/low quality of concentrate feeds can be addressed by the promotion of national legume and forage species, and the development of related agricultural extension services. A thorough screening of marginal lands, which are potentially available for fodder production, may further contribute to a relaxation of high feed costs. In addition, to reduce costs and improve the quality of concentrate feeds, market development and trade in concentrate feed between BMCs can be improved.

Limited and poor quality breeding stocks – particularly for small ruminants – can be counteracted by strengthening the institutions that support breeding programmes at both national and regional level. This would allow more emphasis to be placed on enhanced artificial insemination and embryo transfer capabilities.

Apart from enhancing the capacity within centralized breeding programmes, artificial insemination and better practices in terms of animal health management require targeted communication strategies as part of agricultural extension programmes.

The abovementioned challenges illustrate the ongoing concerns that face livestock production systems in BMCs; they are exacerbated by the lack of technology adoption and innovation in the sector, and the divide between capitalized, larger-scale producers versus low-productivity, smallholder production systems.

For small-scale producers, limited access to credit translates into the absence of both productive, stable facilities, as well as the lack of efficient feed, health and breeding management. Support programmes that aid a share of these semi-commercial, small producers to transition to medium-sized, commercial producers would enable them to increase productivity and efficiency.

4.8 Challenges and opportunities

This Chapter provided an overview of the structural and agricultural transformation processes in the Caribbean over the last decades. The analysis shows that Caribbean countries have been successful in their attempt to initiate and continue a thorough structural transformation process, in which the role of the agriculture sector in GDP and employment declines.

>> Agriculture is lagging behind in the overall transformation process of Caribbean economies

However, BMCs have yet to achieve a level of transformation which sustains a highly productive and profitable agriculture sector. Agriculture is thus lagging behind in the overall transformation process. This becomes particularly clear when analysing the development of agricultural yields as well as production value per worker. In this regard, BMCs underperform when compared to their regional neighbours in Central and Latin America, as well as many other regions around the world (of which some have lower per capita income).

>> With the low productivity and profitability of agricultural production systems, BMCs are prevented from harnessing internal market demand and establishing new export niches beyond sugar and bananas in a competitive world market

Despite many constraints and great diversity within BMCs, some countries, such as Jamaica and Guyana, have achieved major improvements in aggregate labour and/or land profitability.

The main challenges facing livestock sector development in BMCs were discussed in depth, with low productivity and profitability found to be at the core of the sector's low competitiveness.

Targeted efforts are needed to both increase productivity and decrease production costs. In terms of agricultural extension, campaigns are needed to promote technology use, while agricultural credit schemes and output market linkages can also support the sector's development. However, policymakers should consider the small sizes of farms in BMCs when formulating development strategies.

>> Small farm sizes make it more challenging to enable producers to increase productivity, adopt improved technologies, and tap into more formalized markets. Policies and investments have to correspond to the farm-level economics of small producers

Moreover, the actual amount of private capital available for investment in the farm may be considered low if compared to commercial agri-business actors in the Caribbean. Policy initiatives have to take into consideration that high rates of technology adoption are only likely if farm-level costs are low or if costs and benefits can be shared across farms due to clear institutional arrangements.

However, the evolution of production value per hectare identified that selected crop categories, such as fruits, vegetables, legumes and oilcrops, experienced a significant increase in value per hectare, thus providing revenue opportunities which have yet to be explored by all BMCs.

>> Fruits, vegetables, legumes and oilcrops increased their production value per hectare and provide an important new revenue opportunity

While the farmers who produced high value crops could harness the existing market potential, not all BMCs shifted an increasing share of their agricultural area into more profitable production systems. The inability to change part of the national land use to more profitable forms over long periods of time indicates an insensitivity to prices, which is a further development constraint.

>> Production systems were not sufficiently reactive to follow new price incentives for certain crop and livestock products

Another aspect of key importance highlighted by this Chapter is the harnessing of synergies between productive but also environmentally and socially sustainable production systems. In the fisheries sector, the active targeting of synergies between the conservation of aquatic resources and sustainable tourism provides an important growth opportunity, which has not been utilized sufficiently.

>> The joint development of aquatic tourism and the conservation of aquatic resources offers an important fishery sector development opportunity

Unless opportunities to include the conservation and protection of natural resources into development measures become integrated into the way of doing business, natural resource degradation itself may soon become a major limiting factor for economically viable tourism and fishery sector activities.

>> Unless adequate conservation measures are taken, natural resource degradation of the aquatic ecosystem and coastal resources will become an increasing challenge to the tourism and fisheries sectors

Livestock production systems are divided between semi-commercial, small producers and commercial, medium- and large-sized producers. Competition with imported livestock products limits the opportunities for producers with low-productivity and undercapitalized production systems. Therefore, targeted support for small- and medium-sized producers can help them transition to higher productivity levels, achieve a sustainable business model, and become more competitive.

>> The market for livestock products provides lucrative revenue opportunities that are insufficiently utilized by small livestock producers

Given the high import volume of livestock products in BMCs, livestock production systems provide lucrative revenue opportunities for farmers.

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5 Agri-food trade and global value chains

Key messages

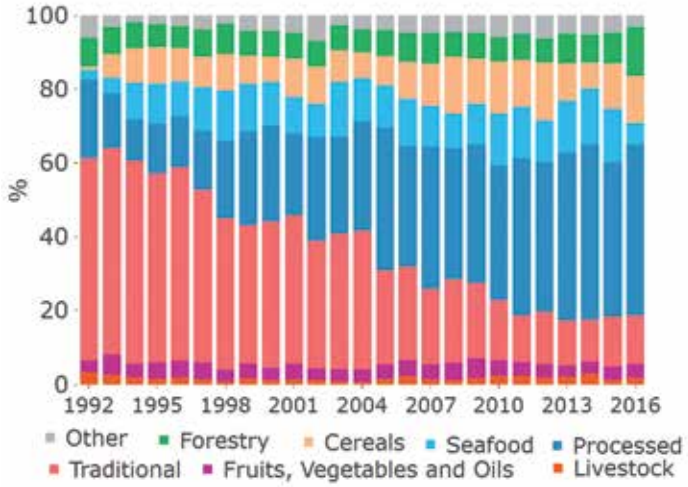
- Borrowing Member Countries are either islands or have direct access to the sea; they are relatively small and constrained by natural and geographic conditions, which is why trade and international value chains are so important for the region.
- Historically, agricultural supply chains and trade in BMCs were heavily targeted towards export to the European Union. Yet, reforms of European Union trade policies caused a dramatic decline in export demand for sugar and bananas from BMCs, resulting in a more diversified BMC trade structure.
- Globally, agri-food trade is transformed through the tightening of produce and process standards, which in turn affects related sectors in BMCs: tourism, foreign investments in BMC value chains, and trade.
- Farmers and local food chains are faced with the challenge of addressing new food industry standards with regard to quality, safety, volumes, and timeliness.
- Key investments are needed in infrastructure and institutions to help farmers comply with international agri-food standards, improve production efficiency, and access markets for high-value food in modern retail, processing and wholesale markets.
- Greater synergy between local agricultural production and the growing tourism sector can create opportunities for local farmers to access high-value food markets.
- Today, linkages between local agricultural production and tourism are limited.
- Constraints to local agricultural production include inefficient irrigation practices, a lack of cold storage facilities, low productivity, and information asymmetry regarding the standards required by hotel and restaurant chains, cruise ships, and the yachting sector.
- There has been significant foreign direct investment in agriculture and forestry in the Continental States.
- Data on the evolution of trade, although incomplete, suggest that exports from Continental States have increased significantly since 2000, whereas imports have increased more than exports for the Small and Large Island States.
- There has been a shift in BMC exports away from traditional export crops, such as banana and sugar crops, towards processed foods, such as beverages.
- Although BMCs are close to the markets of the United States of America and Canada, integration into these international trading systems is constrained by weak liner shipping connectivity and inefficiencies in port operations.

5.1 Introduction: The transformation of agri-food value chains and trade

Historically, agricultural supply chains and trade in BMCs were heavily targeted towards export to the European Union. Large plantations of sugar and bananas produced agricultural commodities for exports, and represented an important sector for the economy. As documented in Chapter 4, the post-independence era has been characterized by a shift in trade patterns. For example, European Union agricultural policy reforms caused a dramatic decline in export demand for sugar and bananas. This stimulated a restructuring of BMC farming systems, and led to a shift in exports from raw materials (agricultural products) to processed food products, thus creating a more diversified production and trade structure.

Changes in BMC production and trade structures are illustrated in Figure 56: traditional exports including sugar, bananas and basic agricultural commodities declined from 60 percent of BMC agri-food exports in the early 1990s to less than 20 percent in 2016. The main export growth area has been processed foods, which increased from about 15 percent to around 50 percent of BMC agri-food exports over the same time period. The economies of Small and Large Island States have undergone large-scale transformation, whereas the economies of Continental States have done so less (see section 6.4).

Figure 56. Composition of agri-food exports from BMCs

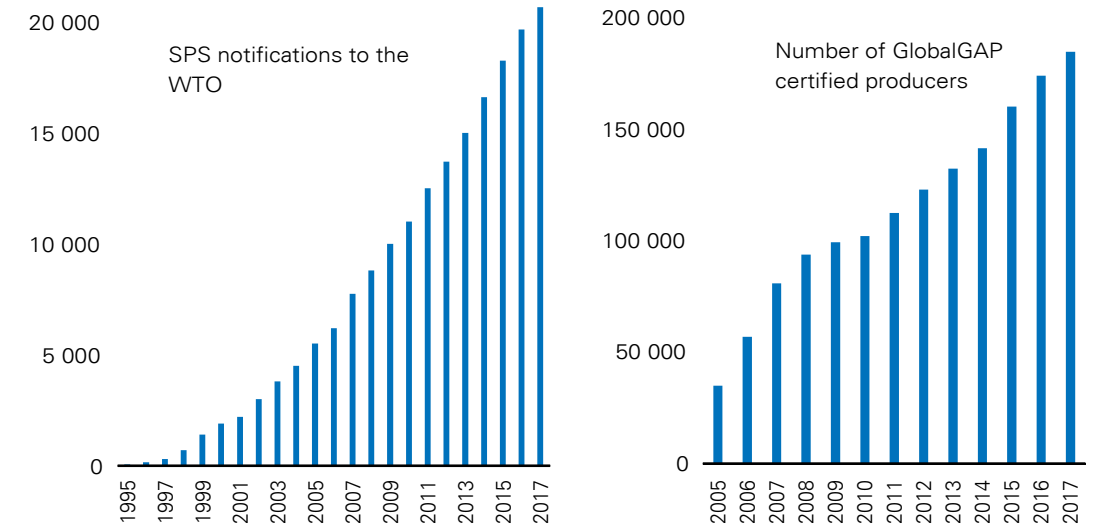


Source: Adapted from UN-COMTRADE data.

While BMC exports were undergoing a considerable tranformation, other major changes were occurring in local and global agri-food markets, such as changes in trade and food standards. Such standards have spread rapidly, with production and trade being increasingly regulated through stringent public and private requirements on quality, safety, and ethical and environmental aspects (Henson and Reardon, 2005; Jaffee and Henson, 2004). These tightening standards are correlated with the shift from low-value commodities, such as sugar, bananas and staple foods, towards higher-value food products.

Both public and private standards are increasing. Figure 57 illustrates the rapid increase in public standards, represented by the number of new agriculture and food trade related sanitary and phytosanitary (SPS) measures which have been notified and submitted to the World Trade Organization (WTO). These have increased exponentially in the last 20 years, from a few hundred in the mid-1990s to more than 20 000 in recent years. While such regulations were initially restricted to richer countries, they have now spread to many emerging and developing countries.

Figure 57. The rise of agri-food standards



Source: Adapted from the WTO "Note from the Committee on Sanitary and Phytosanitary Measures," October 2017; GlobalGAP.

In addition to the growth and spread of public food regulations, private agri-food standards, and standards implemented by third-party organizations – such as non-governmental organizations (NGOs) – are often more stringent than public ones (Fulponi, 2007; Vandemoortele and Deconinck, 2013). Figure 57 illustrates the spread of private standards: the number of GlobalGAP certified farmers has increased nine-fold over the past two decades, increasing from around 20 000 in the mid-1990s to around 185 000 in 2017.

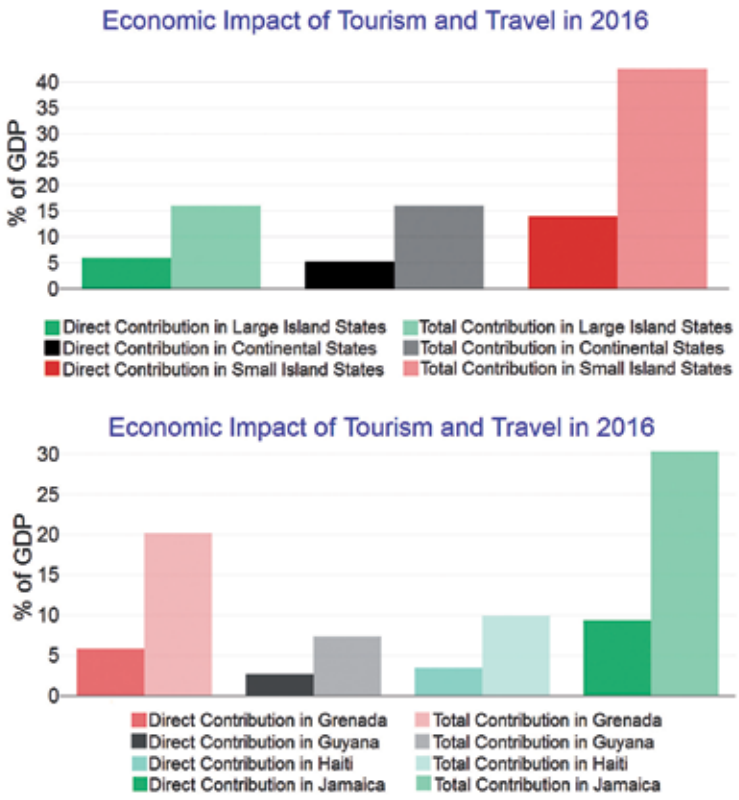
In BMCs, these standards influence the tourism sector, foreign investments in agri-food value chains, and trade. Increased demand for high-value products and high prices create opportunities to realize economic growth through the expansion and diversification of agricultural production and trade. In addition, high-value products and often labour-intensive production systems can help raise rural incomes, and consequently reduce poverty.

Several BMCs have recognized that promoting the development of these high-value agri-food chains and trade is an important strategy to foster pro-poor growth. In this Chapter, we review some key changes in the agri-food value chains and trade for BMCs. We focus on three aspects: (1) the growth of tourism and its implications for BMC agri-food systems; (2) investments in food processing and retail, and the spillover into agriculture; and (3) changes in the BMC agri-food trade structure.

5.2 Tourism and the BMC agri-food system

In BMCs, growth in tourism has represented an important structural change over the past decades. This creates major challenges and opportunities for local agri-food chains. Though the importance of tourism in BMCs varies, the average effects are large. For example, the direct contribution of tourism to GDP in BMCs is 8 percent on average, whereas indirect contributions to GDP amount to about 25 percent (see Figure 58). Small Island States are the most dependent on tourism, with total contributions to GDP as high as 40 percent. In larger countries such as Jamaica, tourism contributes up to 30 percent of GDP.

Figure 58. Direct and indirect economic impact of tourism and travel in BMCs

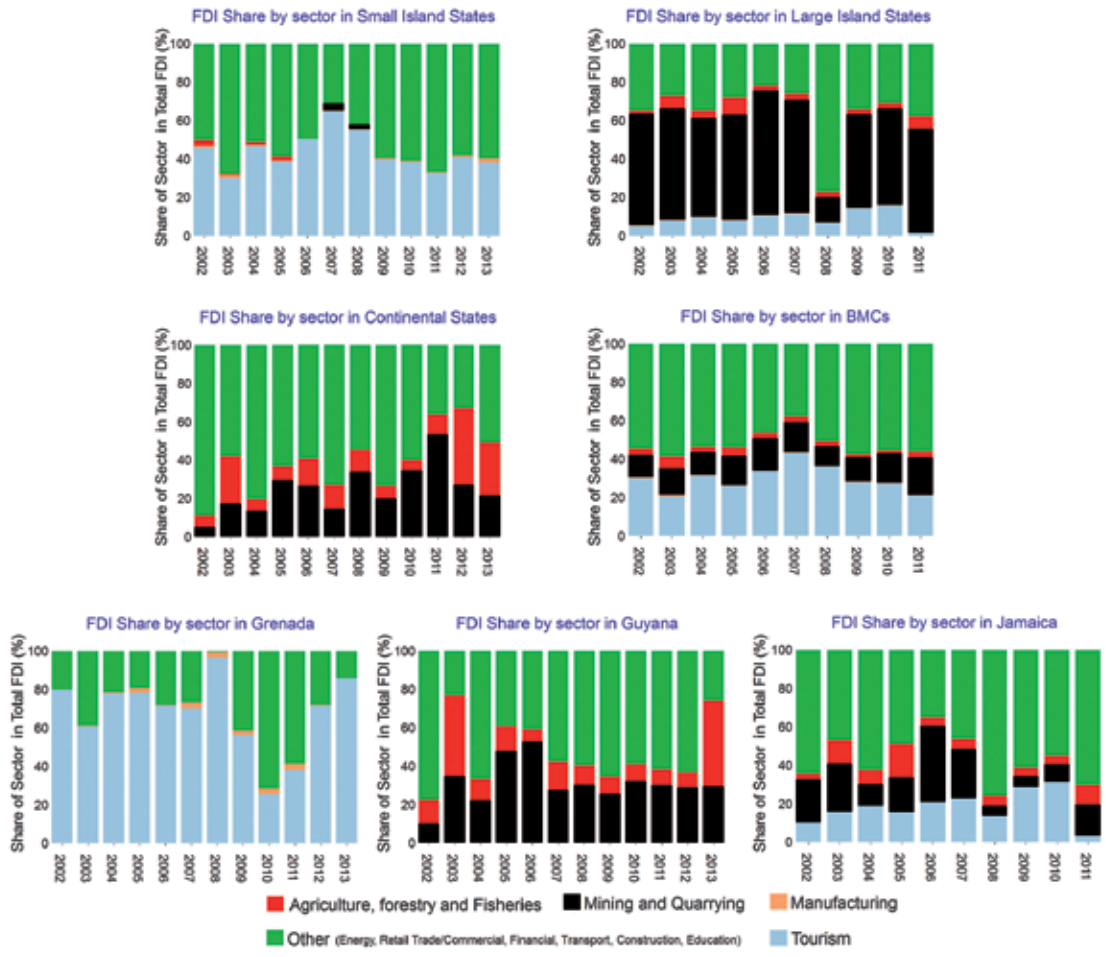


Source: Adapted from World Travel and Tourism Council (WTTC) data.

NOTE: For direct impact, the WTTC considers the amount of money the travellers pay directly to: airlines, coaches, rental cars, trains, cruise lines, travel agents, hotels, convention centres, restaurants, shopping centres, sports arenas, and so on. For indirect impact they refer to values generated by outside goods and services, such as marketing and PR, cleaning and maintenance, energy providers, catering and food production, design and print, etc. The total impact is the sum of the direct and indirect impacts, plus the induced value, generated by the jobs created as a consequence of tourism (in agriculture, infrastructure, healthcare).

Tourism also represents a major share of total foreign direct investment (FDI). Figure 59 shows that, for BMCs as a whole, the share of FDI in tourism has been around 30 percent on average over the past 15 years. Small and Large Island States have the largest share of FDI in tourism: In Small Island States, it accounts for 50 percent of FDI on average; in Grenada it accounts for almost 80 percent of FDI. For Continental States however, FDI in tourism is much less important.

Figure 59. FDI inflows by sector in BMCs



Source: Adapted from CARICOM data.

There are several relationships between the tourism industry and the agri-food system. Over the years, the influx of foreign tourists has increased the local demand for food, and for specific food products, affecting both trade and local production. According to the CARICOM (2010), food imports increased in several BMCs, especially in small BMCs, when tourism increased.

However, growth in the tourism sector coupled with increasing demand for high-value food products created an opportunity for local farmers to expand and diversify their production. Nevertheless, studies suggest that such linkages between local agricultural production and tourism have not yet materialized (Rhiney *et al.*, 2015).

Agricultural production in the Small Island States is constrained by many factors: small farm sizes; low investment; natural disaster risks; limited water supply and irrigation; low production capacity; limited trade competitiveness; the short supply of skilled human resources; phytosanitary issues; and larceny (Jansen *et al.*, 2015). In a study in the Negril area in Jamaica, Rhiney (2009) found that local producers were unable to consistently produce food as a result of lacking cold storage facilities and inefficient irrigation systems. These problems were exacerbated by weak organizational systems and poor communication between producers and hotel representatives.

With local production unable to meet the growing market demand for high-value food products, imports increased. The World Bank (2008) estimates that, for countries in the Organisation of Eastern

Caribbean States (OECS), the demand for imported food from the hotel tourism sector amounted to USD 93 million in 2008, representing about 25 percent of OECS agricultural imports. Only 32 percent of the food demand arising from the tourism industry was met locally.

Hotel representatives interviewed by the World Bank explained that the consistency of supply of locally grown produce is especially challenging during the dry season, which happens to coincide with the high tourist season, from mid-December to mid-April. This is exactly the period when local agricultural production drops in the absence of intensive irrigation. Jansen *et al.* (2015) find that the main strategy used by larger hotels to mitigate locally grown food supply shortages is through importing food; smaller hotels purchase foods from importers, such as traders, wholesalers, supermarkets and marketing boards.

5.3 The "supermarket revolution" and investments in the food industry

Over the past two decades, both foreign and domestic investments in various steps of the food value chain have increased significantly all over the developing world. Borrowing Member Countries receive some of the highest levels of FDI in the world, with many economies having reported FDI to GDP ratios above 10 percent in 2012 (De Groot and Ludeña, 2014). A detailed analysis of greenfield investments between 2003 and 2018 (see Appendix 5.6.2) shows that agri-business greenfield FDI is concentrated in BMCs with large populations (Haiti, Jamaica, Trinidad and Tobago), and in BMCs with a high agricultural share of GDP (Belize, Suriname). This extensive FDI in the tourism sector in BMCs has a significant impact on agriculture and food trade.[38]

In recent decades, there has been a sharp rise in FDI in the food retail sector in developing and emerging countries. The term "*supermarket revolution*" was coined following a flood of FDI in the retail sector. Many studies have shown that, downstream in the value chains, these investments can have very important implications for local agriculture and food consumers.

According to the limited data available for BMCs, a similar process may have taken place in the Caribbean. Based on discussions with some supermarket operators in Barbados, and Saint Vincent and the Grenadines, Iton (2009) highlights that supermarkets are becoming increasingly important in the Caribbean. For example, the number of stores belonging to a supermarket chain in Trinidad and Tobago is reported to have increased by 36 percent between 1990 and 2006. In addition, since 2006 a rapid increase has been recorded for the number of transactions realized in the different stores, as well as the sale of fruits and vegetables.

For food consumers in BMCs, the so-called supermarket revolution has changed their diets and consumption basket. The traditional diet of BMCs was mainly composed of roots and tubers, produced primarily on local farms with the surplus being sold on the market (Iton, 2009). Today, many other products are available – a large percentage of which are imported – such as fruits and vegetables, and processed foods.

As with supplies to the tourism industry, the potential market for local suppliers has not been met due to a variety of constraints, both at the farm level, and in the exchange between farmers and modern actors in the food chain. Therefore, improving links with modern food value chains – be it for the tourism sector or the food processing and retail sector – presents opportunities for future investment strategies. Many studies have shown that such value chain development strategies

38 There is a considerable body of large economics literature on the relationship between foreign direct investments (FDI) and economic growth, considering the determinants of growth, the determinants of FDI, the role of multinational companies in the recipient economies, and the direction of causality between FDI and growth (Chowdhury and Mavrotas, 2006).

can have important spillover effects at the farm-level through vertically coordinated value chains (Swinnen and Kuijpers, forthcoming; Dries and Swinnen, 2004).

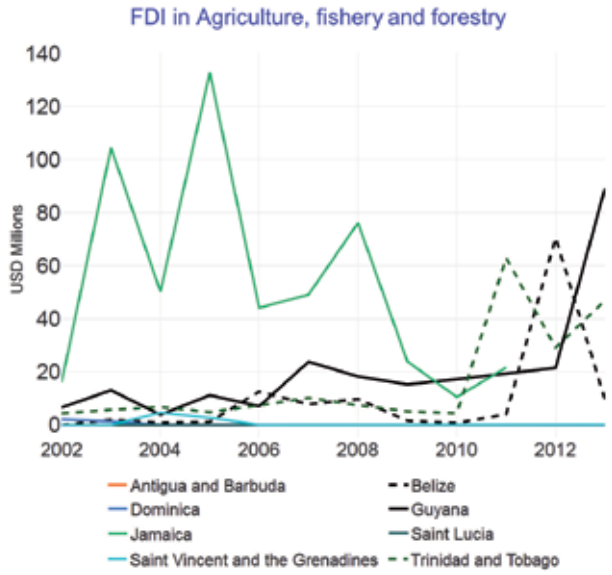
Strengthened connections between local food producers and leading players in the agri-food value chain can lead to:

- ► increased productivity;
- ► improved quality and safety of agricultural raw materials;
- ► better access to markets; and
- ► more transfers of technology and know-how to farmers.

Finally, foreign direct investment is significant for agriculture, fisheries and forestry in BMCs; however, it is mostly concentrated in the Continental States and some Large Island States (see Figure 59 and Figure 60). For example, in Continental States, FDI in agriculture, fisheries and forestry has accounted for more than 20 percent of total FDI, which is large by international standards. As shown in Figure 60, FDI in agriculture has also been substantial in Jamaica.

In Continental States, greenfield FDI is mainly directed to crop production, such as cereals and sugar cane, rather than to the transformation of the product to processed food. This conclusion is supported by an analysis of recent foreign land acquisitions in BMCs (see details in Appendix 5.6.2). The majority of land acquisitions are concentrated in Guyana, and are mostly made by buyers from Asia. This is largely due to Guyana's promising forestry economy. Ethnic and cultural reasons also play a role in these foreign investments, as many acquisitions are made by Indian enterprises, and many people in Guyana have Indian origins.

Figure 60. Agriculture, fishery and forestry FDI in BMCs (USD Millions, 2010 constant)



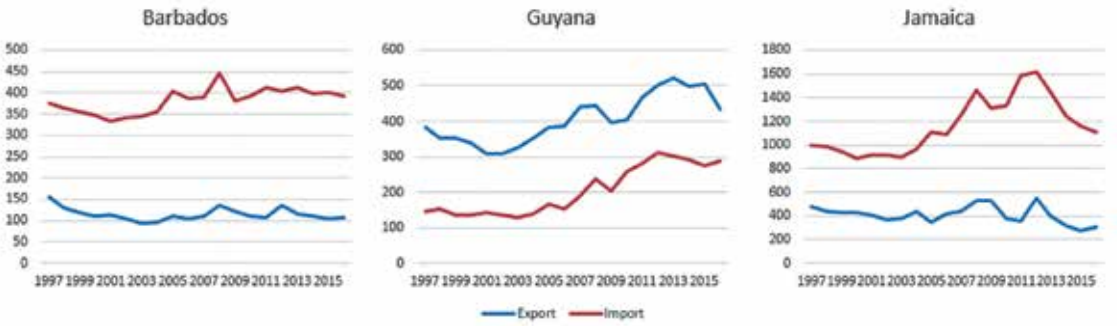
Source: Adapted from CARICOM data.

5.4 From low-value raw material exports to higher-value food product exports

All the BMCs are either islands or have direct access to the sea, which makes trade, and especially maritime trade, a vital component of their economies. Many BMCs are also relatively small countries, often constrained by geographic and climatic conditions; therefore, imports can complement domestic constraints on the production of specific foods, while exports of products for which there is a comparative advantage generate revenue. In 2016, the export of agricultural products from the BMCs amounted to a total of USD 1.7 billion, while imports added up to USD 4.47 billion (WTO).[39]

For a more accurate analysis of how the trade balance has evolved over the past decades, more reliable trade data is needed. As shown in Figure 61, only a few BMCs have consistent trade data series, including Barbados (Small Island State), Guyana (Continental State), and Jamaica (Large Island State). These data show a large and growing trade deficit for the Islands (Barbados and Jamaica), and a trade surplus in Guyana – both exports and imports have been growing fast since 2000.

Figure 61. Development of agri-food trade in Barbados (SIS), Guyana (CS), and Jamaica (LIS) (USD Millions, 2010 constant)



Source: Adapted from UN-COMTRADE data.

The importance of trade for the BMCs is also reflected in the fact that the traded value of agricultural products is higher than the agricultural GDP for most BMCs. The *Agricultural Trade Openness index* (measured as the sum of imports and exports as a percentage of the agricultural gross domestic product)[40] shows that BMC agricultural and food markets are highly integrated with the rest of the world (see Figure 62). The Island States are heavily dependent on the import of agricultural products, while the share of agricultural products compared to the total merchandise imports is stable or slightly increasing (as is the case for the Large Island States and Continental States).

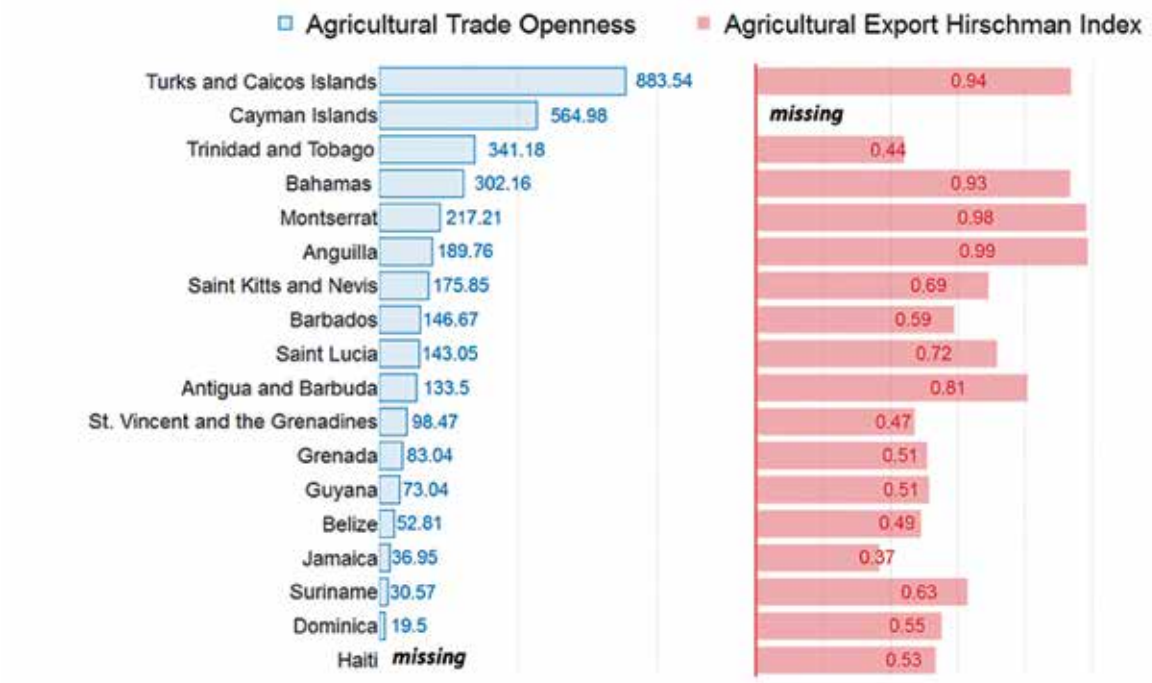
However, opportunities created through trade also create vulnerabilities. For example, a strong dependence on imports for specific food items makes the consumers vulnerable to external shocks on the international markets for these food items; and strong dependence on a few export products makes producers vulnerable to changes in demand and prices for these products.

39 2016 data refer to 15 out of 19 BMCs, with the exception of Anguilla, the Cayman Islands, Montserrat, and Turks and Caicos Islands.

40 The Agricultural Trade Openness Index covers the trade of agricultural commodities that do not require transformation: live animals; meat and edible meat offal; fish, crustaceans, molluscs, aquatic invertebrates; products of animal origin, not elsewhere specified; live trees, plants, bulbs, roots, cut flowers, etc.; edible vegetables and certain roots and tubers; edible fruit, nuts, peel of citrus fruit, melons; and cereals.

The degree of specialization (and thus concentration) in exports can be measured by the so-called **Herfindahl–Hirschman Index** (see Figure 62).[41] The index value ranges from 0 (no trade) to 1 (one commodity traded). The higher the index value, the more concentrated exports are. As expected, the Small Island States have a higher concentration of exports, as there is less product competition than Large Island States. The latter have a higher diversification of exports, due to better development of their respective agri-food industries, which allow for the export of processed products and beverages.

Figure 62. Agricultural trade openness and exports concentration index in BMCs (USD value for the last available year)



Source: Adapted from UN-COMTRADE data.

While trade has historically been very important for the development of agriculture and food systems in BMCs, the nature of agri-food trade has changed fundamentally over the past decades, both in terms of the nature of the products that are traded, and the conditions and requirements imposed on the products, as already mentioned above.

The decline of traditional exports (sugar and bananas) after European Union trade policy reforms

One of the major changes in trade over the past 20 years has been the decline of traditional exports, especially bananas and sugar.

41 $Hirschman_j = \sqrt{\sum \left(\frac{x_i}{X_t}\right)^2}$ **Where x_i is country j's exports of product I and X_t is country j's total exports.**

The Hirschman-Herfindahl Index is calculated using two-digit agricultural commodity exports: Agri-food comprises the commodities 01-24 in the trade harmonization system (HS96). These are live animals; meat and edible meat offal; fish, crustaceans, molluscs, aquatic invertebrates; dairy products, eggs, honey, edible animal products; products of animal origin; live trees, plants, bulbs, roots, cut flowers, etc.; edible vegetables and certain roots and tubers; edible fruit, nuts, peel of citrus fruit, melons; coffee, tea, mate and spices; cereals; milling products, malt, starches, inulin, wheat gluten; oil seed, oleagic fruits, grain, seed; lac, gums, resins, vegetable saps and extracts; vegetable plaiting materials, vegetable products; animal, vegetable fats and oils, cleavage products, etc.; meat, fish and seafood food preparations; sugars and sugar confectionery; cocoa and cocoa preparations; cereal, flour, starch, milk preparations and products; vegetable, fruit, nut, food preparations; miscellaneous edible preparations; beverages, spirits and vinegar; residues, wastes of food industry, animal fodder; and tobacco and manufactured tobacco substitutes.

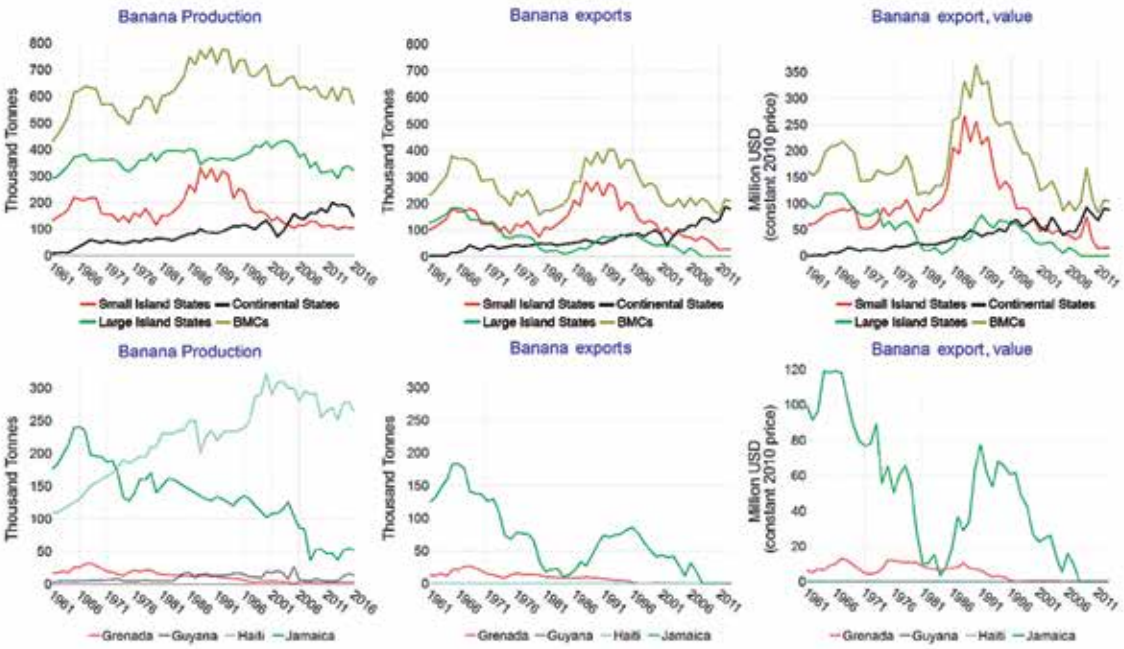
Until recently, the banana sector was vital for BMC economies, especially for Small Islands States. Described as "green gold" (Thomson, 1987), bananas created the conditions for independence from Britain, contributing largely to the economic growth from the 1950s to the beginning of the 1990s (Payne, 2006).[42] They represented a major source of rural income and produced large multiplier effects (Trotman *et al.*, 2009), affecting the economies of Belize, Jamaica and Suriname.

Towards the end of the 1970s, BMC economies started focusing on import substitution industrialization, and more recently on export-oriented agriculture, based on banana and sugar production (Williams and Smith, 2008).

Since the mid-1990s, the erosion of the European Union preferential access agreement has caused a rapid decline in both the volume of bananas traded, and the export earnings generated in the Small Island States. The sharp decline in banana production in the Small Island States was compounded by the rise of diseases affecting bananas and plantains, namely Black Sigatoga and Moko disease (FAO, 2015). At its peak in the early 1990s, banana industry earnings contributed about 20 percent to the GDP of some Small Island States. Since then, it has declined to less than 5 percent of GDP (Mlachila *et al.,* 2013). The number of registered banana farmers dropped from 23 100 in 1994 to 5 300 in 2003 (Ford *et al.*, 2007).

In January 2008, an Economic Partnership Agreement was established between the European Union and the Caribbean region, whereby all agricultural exports from Caribbean countries belonging to the African, Caribbean and Pacific Group of States (ACP), including bananas, are allowed duty-free and quota-free access to the European Union. The European Commission developed assistance plans to support the adjustment of ACP countries to its reformed (post-1993) banana regime.

Figure 63. The evolution of banana exports

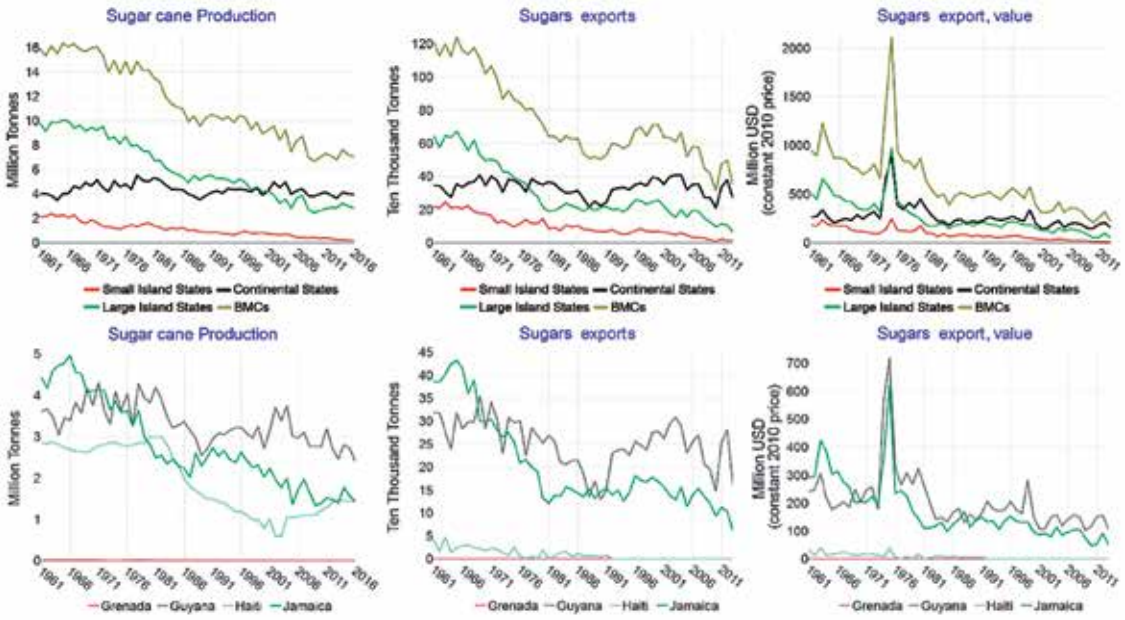


Source: Adapted from FAOSTAT data.

42 Caribbean agriculture has been focused on exports since the plantation institution in the seventeenth century, (Lowitt et al., 2015; Briguglio, 1993).

The story of the BMC sugar trade is similar. In October 2004, the WTO stated that the European Union subsidies for sugar, which were beneficial to sugar producers in the Caribbean and elsewhere, broke global trade rules. As a response, the European Union agreed to revise its regime in late 2005, which included a 36 percent reduction of the European Union's guaranteed sugar price (Clegg, 2015). In September 2007, the European Union announced that it would end its sugar protocol by 2009. However, Caribbean sugar exports were given duty-free access, without a guaranteed price. Similarly, sugar exports have dropped since 2008, as can be observed in Figure 64. With the exception of Belize, the land dedicated to the cultivation of sugar has declined in all the BMCs. This is reflected in the trade of exported production and exported value.

Figure 64. The evolution of sugar exports (USD 2010 constant values)



Source: Adapted from FAOSTAT data.

NOTE: For sugar export statistics, we consider the sum of the following products: beet sugar; confectionery sugar; raw sugar; refined sugar; maple sugar and syrups; sugar crops; centrifugal and non-centrifugal sugar.

>> The erosion of preferential trade agreements requires a reorganization of the agri-food system in BMCs to promote competitiveness in global markets

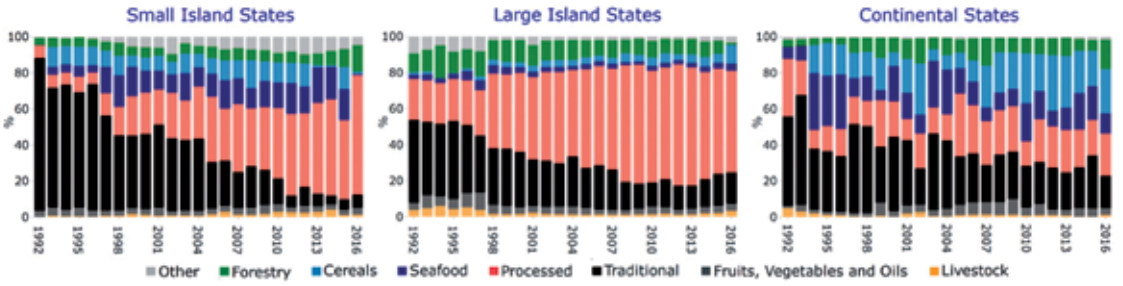
The dismantling of both the sugar and banana industries alongside the erosion of preferential access to the European Union market represents a shift from a centrally organized system based on export production to one that serves domestic markets (Lowitt *et al.*, 2015; Saint Ville *et al.* 2015; Weis 2004, 2007). The large-scale production of traditional crops (cash crops, sugar, banana, cocoa), and the institutions organizing that production and market have disappeared (Williams and Smith, 2008).

The increase in processed food and higher-value exports

As established in the introduction, there has been a dramatic shift from traditional exports to the export of processed food in BMCs since the 1990s. Figure 65 illustrates this significant transformation in the Island economies, and in particular, in Small Island States; however, Large Island States and,

to a lesser extent, Continental States have also undergone a transformation. Of all the BMCs, the Continental States have the most diversified composition of agri-food exports.

Figure 65. The composition of agri-food export trade in BMCs



Source: Adapted from UN-COMTRADE data.

Most BMCs specialize in the export of beverages and alcohol, including ethyl alcohol, beer, juice, and water. Beer exports in particular have increased considerably. In Jamaica for example, beer has been among the five main agri-food exports since 2004, with beer export values catching up with ethyl alcohol: in 2017, 10 percent of agri-food exports were from beer, whereas 14 percent were from ethyl alcohol. In Saint Vincent and the Grenadines, beer accounted for fifteen percent of its agri-food exports.[43]

Other important export product categories include seafood (mainly from the Bahamas, Belize, and Turks and Caicos Islands), cereals, and bakery products. Guyana and Suriname primarily export rice – in Guyana this represented 39 percent of total agri-food exports in 2016. Trinidad and Tobago is specialized in exports of bread and prepared food based on cereals: their exports flow into the CARICOM market, representing about 10 percent of total agri-food exports in BMCs. In general, traditional products such as bananas, sugar, coffee, and tobacco continue to play an important role in the region's agri-food export trade.

While exports from BMCs are concentrated on a few products, imports are much more diversified. For example, the agri-food import sector in BMCs has a high level of intra-trade: the main agri-food imports are not only concentrated on those commodities for which BMCs have no competitive advantage, but they also include alcohol, cereals, and bakery products, for which many BMCs are highly competitive. Further details on the most important traded agri-food products can be found in Appendix 5.6.1.

(Future) comparative advantages of BMCs

Measures of revealed comparative advantage (RCA) can be used to determine a country's potential to expand its exports.[44] Figure 66 presents the list of the agricultural commodities with comparative advantage for the BMCs.[45] The higher the index, the greater the competitive advantage.

Fish and seafood products are naturally advantageous in the BMCs. In particular, exports from the Turks and Caicos Islands and the Bahamas are highly concentrated on crustaceans and molluscs. Belize, Grenada, and Guyana also have the potential to succeed in the fish market, despite their specialization in other products – sugar and beverages for Belize, wheat and nutmeg for Grenada, rice and sugar for Guyana.

43 Data by UN-COMTRADE.

44 The RCA is measured as the ratio between the export share of the country and the share of world export in a determined sector/product. If the export share of the country is higher than the world export share, then the country has a comparative advantage.

45 The shift towards the decriminalization of cannabis in several BMCs has increased the product's future trade potential.

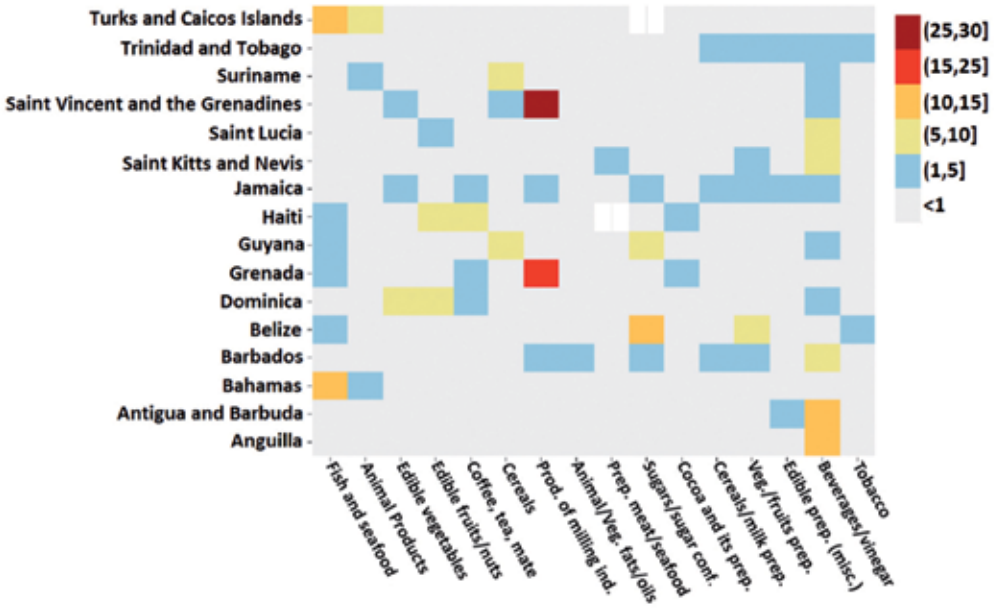
Suriname is the most competitive BMC in the animal products subsector. However, Guyana has the potential to emerge in this subsector: by increasing the quality standards of its abattoirs, it can become less dependent on imports. According to the Guyana Livestock Development Authority (GLDA), Guyana is self-sufficient in meat production, yet it continues to import meat products, as local meat quality standards do not satisfy the fast food industry and other internationally aligned sectors.[46]

In Jamaica, there has been a promising increase in poultry exports over the last five years – from USD 5.4 Million in 2012 to USD 29.6 Million in 2017, at constant 2010 prices. Increased investments in this sector will boost production and competitiveness.

Barbados, Jamaica, and Trinidad and Tobago have been focusing on increasing their exports of bread and bakery products in the region. By investing in, and raising quality standards, and strengthening cooperation among BMCs, exports of bread and bakery products can grow, and ultimately supply the entire regional market. This would in turn sustain wheat exports from Grenada as well as Saint Vincent and the Grenadines.

Finally, intra-sectoral trade is strong in the beverages sector, both at the regional level and internationally. Despite the significant competitiveness of the sector, both alcoholic (beer) and non-alcoholic (fruit juice) products are becoming increasingly important among BMC exports. The beverage industry can grow even further in the regional market with targeted investments aimed at raising quality standards, improving marketing and developing human capital. Moreover, the use of cassava in beer production will sustain its established local production, reducing malt imports from the United States of America and Europe.

Figure 66. Revealed comparative advantage in agricultural commodities in BMCs (USD value for the last available year)



Source: Adapted from UN-COMTRADE data.

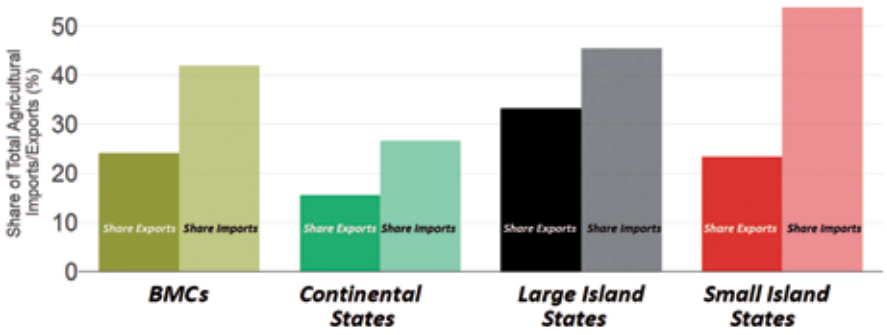
46 http://agriculture.gov.gy/2018/01/10/state-of-the-art-abattoir-for-region-five/.

Countries with a different comparative advantage in different commodities may benefit from starting a trade partnership. On the contrary, countries with similar agri-food export specializations may benefit from increased cooperation through intra-industry trade.

The geography of BMC trade: main trading partners

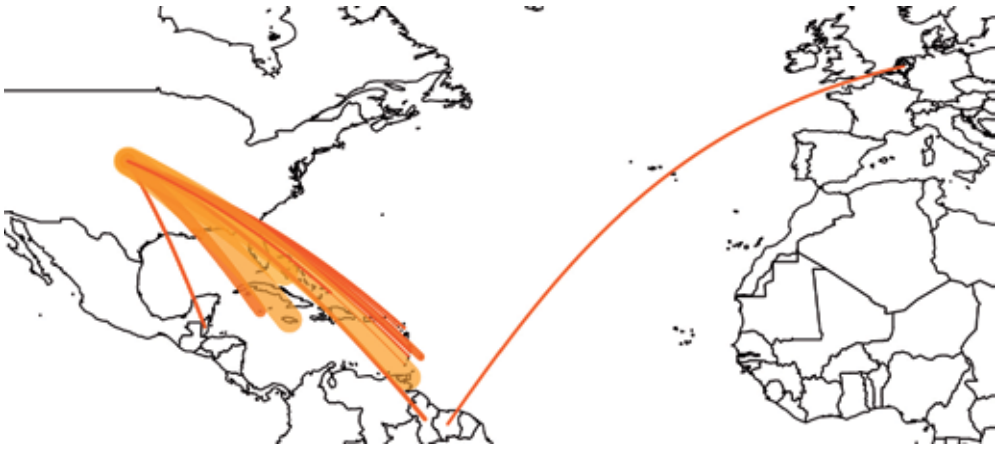
Unlike the past, BMCs now have diverse trading partners for their agri-food exports. The main agricultural commodities are exported to European partners, the United States of America, or within the Caribbean. The BMCs' main European trading partners continue to be the United Kingdom of Great Britain and Northern Ireland, and France. However, the United States of America has become the key trading partner for the region, importing the most agricultural products from the BMCs. Figure 67 shows that average trade with the United States of America represents around 40 percent of the BMCs' total agricultural imports, and 20 percent of their agricultural exports. Small Island States are the most dependent on this trade relationship.

Figure 67. Dependence on the United States of America (all agricultural products in the last available year)



Source: Adapted from UN-COMTRADE data.

Figure 68. Imports from the most important exporters to BMCs (all agricultural products in the last available year)



Source: Adapted from UN-COMTRADE data.

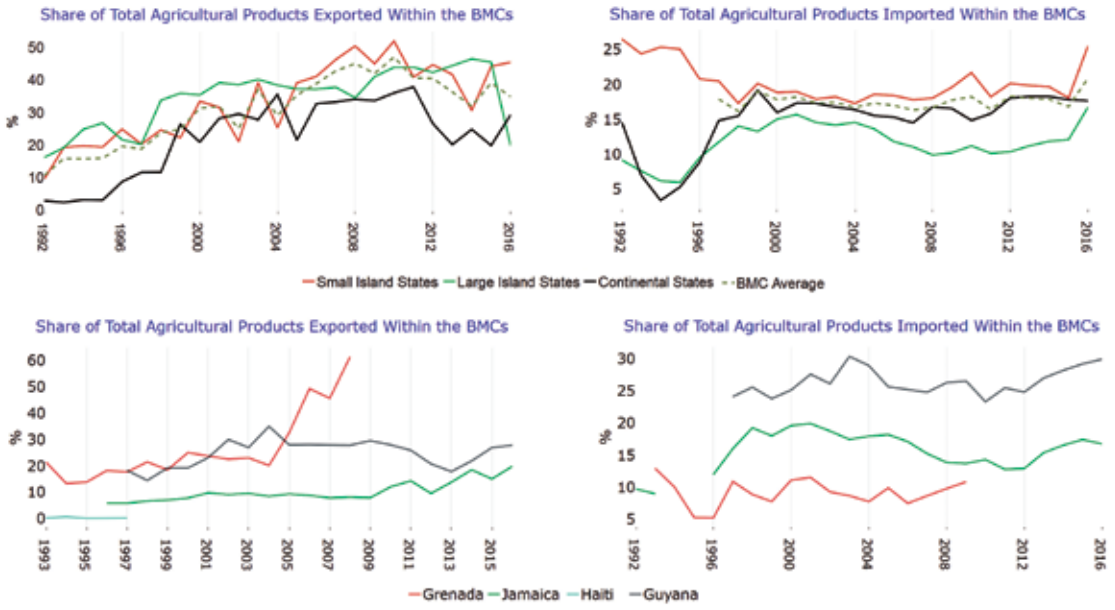
NOTE: The wider the line, the wider the percentage of the main imported agricultural commodity by the main partner.

Figure 69. Exports from the Caribbean to the most important importers (all agricultural products in the last available year)

Source: Adapted from UN-COMTRADE data.

NOTE: The lines are representative of the trade among countries. Each node within one state boundary represents that state.

Figure 70. Intra-BMC Trade in Agricultural Products



Source: Adapted from UN-COMTRADE data.

NOTE: Graphs have a different scale in line with the data.

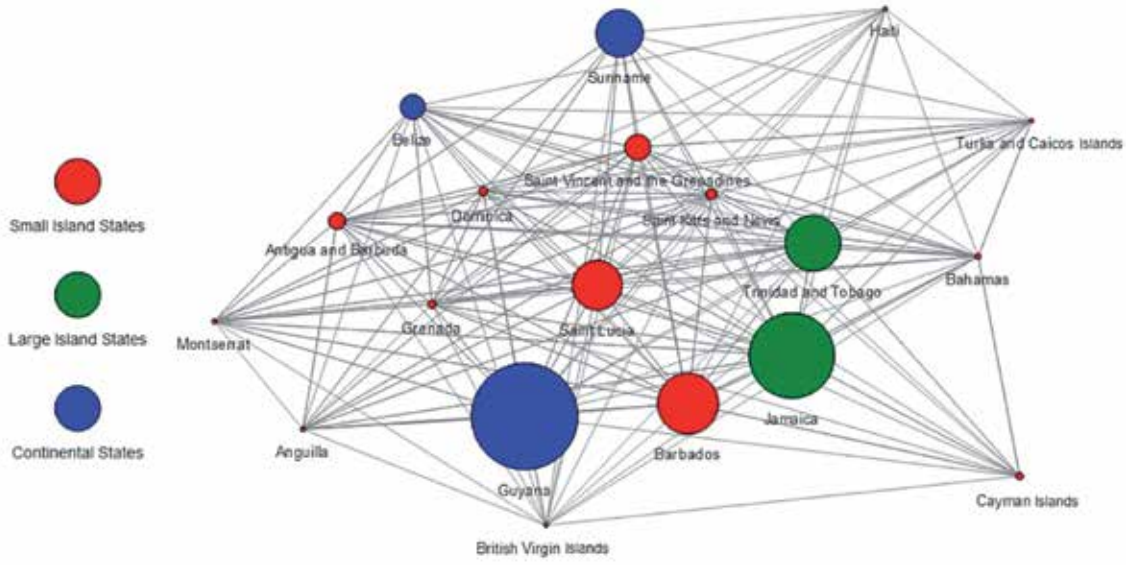
Intra-BMC agricultural trade is becoming increasingly important. The share of agricultural products exported within BMCs represents more than 30 percent on average. However, the intensity of trade among BMCs differs, with more vigorous export trading originating from the Small Island States compared to the other states. Figure 70 shows that, since the 1990s, intra-trade has increased,

resulting in flourishing market activities focused on neighbouring countries. The success of intra-BMC agricultural trade also bears testament to the effectiveness of CARICOM [47] policies (see Chapter 7).

Figure 71 shows the results of a network analysis, which describes the "trade centrality" of each BMC between 2008 and 2016. The size of each node represents the traded value (the sum of imports and exports). A link between two nodes denotes the existence of a trading relationship. Finally, nodes with more linkages are more centrally placed in the figure.

Specifically, Figure 71 shows that Guyana is the most important player in intra-regional, agri-food trade, followed by Jamaica, Trinidad and Tobago, and Barbados, both in terms of values traded (size of the nodes), and in terms of the number of trade partners (centrality of the nodes). A strong correlation has been found between the centrality of the nodes, and better liner shipping connectivity, which will be explored in the next section.

Figure 71. Agricultural BMC Intra-Trade Network (average 2008 – 2016)



Source: Adapted from UN-COMTRADE data.

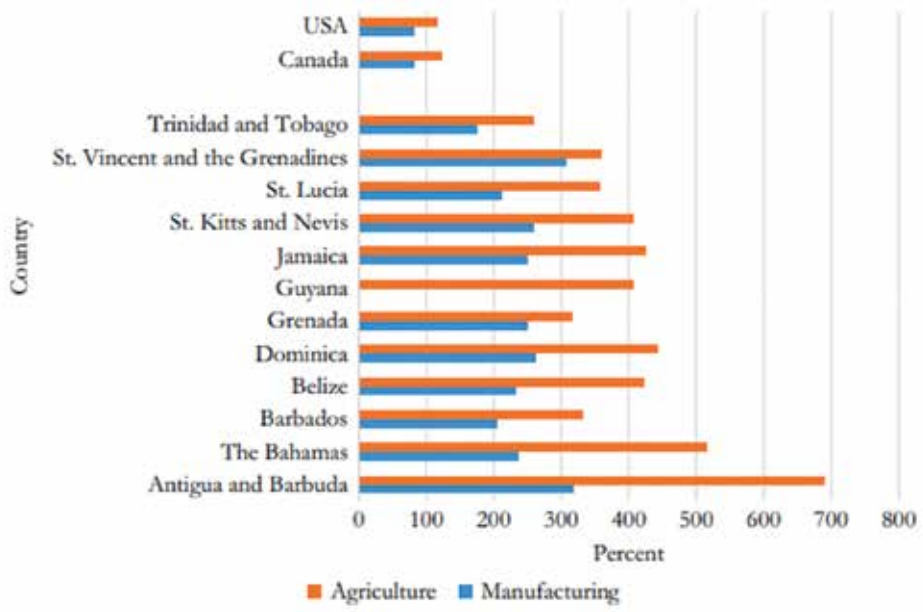
Barriers to trade

Despite being in close proximity to the markets of the United States of America and Canada, Caribbean markets are not well integrated in international trading systems, largely because of high trade costs. As noted in Arvis *et al.* (2013), the ESCAP-World Bank Trade Costs Database provides a description of the bilateral trade costs experienced by BMCs (see Figure 72). This dataset comprises all the aspects that can cause friction between gate prices in the exporting countries, and consumer prices in the importing countries. In particular, it includes trade frictions such as tariff and non-tariff barriers, regulatory measures, differences in cultural and legal institutions, standards, and geographical and historical factors. Arvis *et al.* (2013) find that average trade costs can be computed based on the bilateral data.

47 CARICOM was established in 1973 by Barbados, Jamaica, Guyana, and Trinidad and Tobago. Membership was later expanded to include Antigua and Barbuda, the Bahamas, Belize, Dominica, Grenada, Haiti, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Suriname. The move to an open regionalism began in 1989, with the launching of the CARICOM Single Market and Economy (CSME), which is aimed at the free movement of goods, services, capital, and labour.

In the agricultural sector, trade costs in the Caribbean are between two and six times higher than in the United States of America and Canada. It is important to note that trade costs in agriculture are higher than in manufacturing. This phenomenon is also found in other countries in the world. One explanation is that markets for primary goods and processed goods can be exposed to more tariff and non-tariff barriers, and more product standards than the manufacturing sector. Such barriers can have particularly negative consequences for small developing countries, such as those in the BMCs.

Figure 72. Trade costs in agriculture and manufacturing, percent ad valorem equivalent, selected countries, for 2012 (latest complete available year)



Source: Arvis et al. (2013).

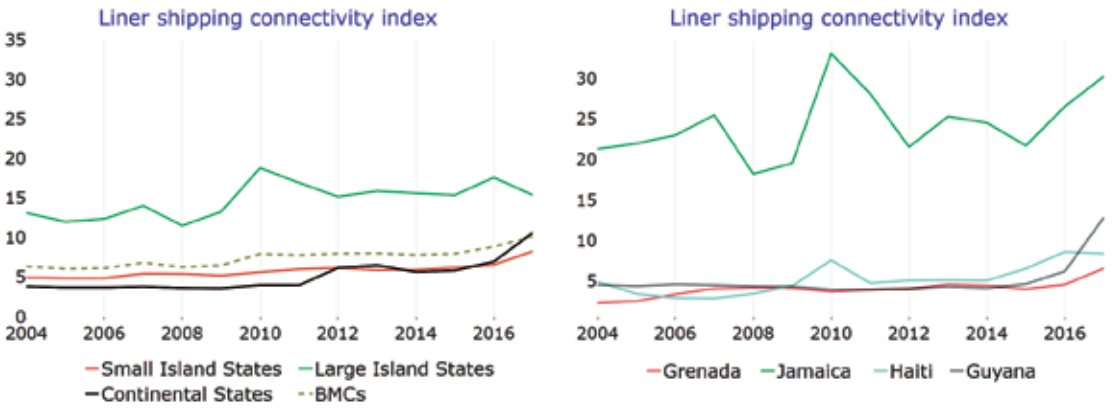
Conventionally, distance is considered one of the main determinants of transport costs (freight rates). However, for the Caribbean, the key factors influencing transport costs are (1) liner shipping connectivity, and (2) port efficiency (Sanchez *et al*. 2003; Wilmsmeier and Sanchez, 2009; Wilmsmeier and Hoffman, 2008). According to a recent ECLAC report (2017), one of the principal constraints to fostering export diversification and redressing supply-side capacity constraints – in Belize, Suriname, and Trinidad and Tobago in particular – is deficient economic infrastructure in terms of ports, freight logistics, maritime and air transport, and communications networks.

Figure 73 shows the Liner Shipping Connectivity (LSCI) for BMCs.[48] Despite a small but significant improvement, particularly in Continental and Small Island states, all BMCs have relatively low liner shipping connectivity. The exceptions are the following Large Island States: Jamaica, and Trinidad and Tobago. In fact, Jamaican ports are known to provide exemplary services for container ships. According to the International Association of Ports and Harbors (IAPH), and World Container Traffic Data from 2017, the Jamaican capital city, Kingston, ranks eighth among Central and South America's

48 The LSCI measures a country's level of integration into the existing liner shipping network. It is based on five components of the maritime transport sector: number of ships, their container-carrying capacity, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports. For each component, a country's value is divided by the maximum value of each component in 2004, the five components are averaged for each country, and the average is divided by the maximum average for 2004 and multiplied by 100. The index generates a value of 100 for the country with the highest average index in 2004. The indicator is developed by UNCTAD, Division on Technology and Logistics, Division on International Trade in Goods and Services, and Commodities and is based on data from Containerization International Online (www.ci-online.co.uk) and Lloyd's List Intelligence.

top ports, and first among the Caribbean ports, with a 101 percent growth rate of TEU (twenty-foot equivalent unit) between 2012 and 2016.

Figure 73. Liner shipping connectivity index in BMCs



Source: Adapted from UNSTAT data.

>> Investing in the quality improvement of transport infrastructure is key for the BMCs' agricultural sector development

5.5 Challenges and opportunities

Borrowing Member Countries have experienced significant structural changes: improved growth in the tourism sector; increased investments in downstream segments of the food supply chain, such as in retailing and processing; and a shift in the composition of exports towards processed foods, such as beverages, and away from traditional export crops.

These important structural changes create opportunities to realize economic growth through the expansion and diversification of agricultural production and trade. At the same time, they create challenges to meet the higher and more elaborate standards that are increasingly imposed on farmers and local food chains.

Challenges

The agricultural sector in BMCs is unable to adequately respond to growing local and regional demand for high-value produce from the tourism, processing, retailing, and livestock sector. Food imports to these and other sectors add up to about USD 4.47 billion: almost three times the amount exported by BMCs. These high-value sectors tend to import products from the United States of America. Conversely, local farmers in BMCs face considerable constraints, as they often contend with inefficient irrigation systems, inadequate cold storage facilities, low productivity, and information asymmetry regarding the standards required by buyers.

Although BMCs are close to the markets of the United States of America and Canada, their integration in the international trading systems is constrained due to low liner shipping connectivity, inefficiencies in port operations, and non-tariff barriers. Maritime transport costs to Caribbean countries are significantly higher than to other regions. For example, it is cheaper to ship a container from Miami to Shanghai than from Miami to one of the BMCs. The transport costs account for nearly half the cost of imported produce, and thus strongly influence the price

competitiveness of Caribbean farmers in the world. In addition, high standards regarding safety and quality prohibit farmers from entering these highly remunerative markets. Meat exporters in Guyana, for example, face high barriers due to stringent Sanitary and Phytosanitary standards.

Opportunities

Value chain development policies and programmes can enable local agriculture to fulfil local, regional, and international demand for high-value agri-food produce. Most importantly, this involves improving the environment in which farmers and agribusiness operate to enable them to meet this demand locally. This includes general policies, such as stimulating FDI, improving the investment climate, ensuring macroeconomic stability, and general infrastructural investments (such as in port facilities and national food safety systems). Value-chain-specific investments are also necessary to meet private standards, such as specific extension and certification services, capacity-building programmes for farmers' associations, and stimulating specific infrastructural investments (such as cold storage, transport, and irrigation for certain sectors).

"Integrated value chain development" programmes have the potential to directly assist farmers in specific high-potential value chains. Different modalities are possible, but all require close collaboration with major companies in the respective value chains: suppliers to the tourism sector, hotel and restaurant chains, exporters, processors, and so on. One modality is to finance these companies with concessional loans or subsidies – through public–private partnerships, for example – to develop the domestic value chain from which they can source their produce. This typically includes training and technology transfer to farmers to make them comply with public and private standards regarding quality, quantity, safety, and reliability.

A major advantage that local farmers have over food imports in the tourism sector is reduced transport time and costs. The World Bank (2008) estimates that, within the OECS countries, the demand for imported food from the hotel tourism sector amounted to USD 93 million in 2008, representing about 25 percent of OECS agricultural imports. Only 32 percent of the food demand arising from the tourism industry is met locally, even though locally grown food requires little transportation, is fresher and saves on high transportation costs. Proximity and flexibility is especially important for perishable products, such as fruits, vegetables, and animal products.

Increasing demand from the yachting sector presents further opportunities for growth. In recent years, full-service, modern marinas have been built in several BMCs, including the 170-berth Port Louis Marina in Grenada, which opened in 2010, and the 60-berth Marina at Christophe Harbour in Saint Kitts, which partially opened in February 2015. Both of these marinas can accommodate super-yachts of up to 300 feet.

The development of domestic cassava value chains for bread, poultry feed, and beer represents another potential investment opportunity. Cassava can be processed into different grades of flour, which can form the basis of numerous products. Cassava flour, for example, is used to produce sliced bread in Trinidad and Tobago, Barbados and Grenada. Additionally, cassava may substitute the corn in livestock feed (particularly poultry). When used in local beer production, Cassava can substitute malt imports from the United States of America and Europe. However, to increase local beer production, farmers would need support to both grow cassava, and to meet the product and processing requirements of breweries.

Investments in air and maritime transport infrastructure are also vital for growth. Shipment times and delays are inherently linked to a country's trade potential in global agri-food value chains. Djankov, Freund, and Pham (2010) find that each additional day that a shipment is delayed is equivalent to a country distancing itself from its trading partners by one percent (or about 70 km). They also show that in the case of perishable products, such as fruits and vegetables, the effects of

time delays are even more severe, making it impossible in some cases to export certain agricultural products from certain countries. Many BMCs have low shipping connectivity and inefficient port operations, and therefore forgo beneficial trade opportunities, especially for perishable products. In the case of Belize, Suriname, and Trinidad and Tobago, deficient economic infrastructure (ports, freight logistics, maritime and air transport, and communications networks) is among the primary drivers of high trade costs. Other countries can learn from Jamaica, which has the most efficient port operations in the region.

Finally, the production of meat for the domestic and regional retail and services sectors in land-abundant BMCs, such as Suriname and Guyana, presents investment opportunities. Guyana already produces cattle and pig meat, and there is sufficient knowledge available to further foster cattle breeding, meat production, and export. Despite being self-sufficient in meat production, Guyana still imports meat due to a misalignment between the quality standards of the local production and those required by the fast-food industry and other internationally aligned sectors. To face this limitation, the Government of Guyana recently launched the Sustainable Agricultural Development Programme (SADP) that supports the compliance of sanitary and phytosanitary standards (SPS). Under this programme, a state-of-the-art abattoir will be built in 2018 to ensure compliance with international standards. In addition, the Guyanese minister of agriculture and finance engaged with the Inter-American Development Bank in order to review the standards and codes related to products with potential export markets.

5.6 Appendix

5.6.1 Appendix – Identification of trade clusters

For the purposes of this study, clusters of BMCs with a similar profile in terms of exported and imported agri-food commodities are defined by analysing the five most traded agri-food products,[49] and identifying the five main trade partners for each of these products. Figure 74 illustrates this agri-food profiling in BMCs in general.

While all BMCs tend to produce a few, specialized agri-food export products, they import a larger number and concentration of diversified products. An important export-oriented cluster is represented by beverages and alcohol. In recent years, many BMC agri-food exports have relied not only on ethyl alcohol, but also on the exports of water, fruit juice and beer – especially for Jamaica, Saint Lucia, and Saint Kitts and Nevis.

Baked goods are increasingly important in Trinidad and Tobago agri-food exports. Despite the downturn in market prices since the mid-1990s, the banana industry has remained an integral part of the small economies of the Windward Islands, and is still one of the most important agri-food export products for Dominica and Saint Lucia. From 1993 to 2012, banana exports have declined from 85 percent of total agri-food exports in Dominica to 25 percent, and from 86 to 23 percent in Saint Lucia.

Export cluster 1: Beverages and alcohol

Most BMCs are specialized in the export of beverages and alcohol. These commodities are among the most exported by Anguilla, Antigua and Barbuda, Barbados, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago. Products within this commodity group are exported by the Bahamas, Dominica and Guyana. Until 2008, a high percentage of agri-food exports from the Bahamas was composed of ethyl alcohol. Within the

49 Data by UN-COMTRADE, with classification at 4-digit level.

beverages and alcohol export-oriented cluster, two subgroups are composed of countries specialized in the export of waters (with and without added sugars), beer, and ethyl alcohol.

Ethyl alcohol subgroup. Anguilla, Antigua and Barbuda, Barbados, Jamaica, Suriname, Trinidad and Tobago, and to a lesser extent Guyana, are specialized in ethyl alcohol. In terms of export destinations within this subgroup, the main destination is the United States of America, followed by European countries and BMCs.[50] Alcohol from Guyana, one of its main export products, is exported to Canada, followed by Mexico, the United States of America, and the United Kingdom of Great Britain and Northern Ireland.

Beer, waters and fruit juice subgroup. Dominica, Montserrat, and Trinidad and Tobago are focused on water exports. Trinidad and Tobago exports primarily to countries in the Caribbean (Barbados, Guyana, Jamaica, and Suriname), and marginally to the United States of America. Its exports of ethyl alcohol are also abundant and are directed outside BMCs (the United States of America, the United Kingdom of Great Britain and Northern Ireland, and the Netherlands).

Water products from Dominica and Montserrat are exported to France in particular, whereas Belize exports fruit Juice to Jamaica, the Netherlands, Trinidad and Tobago, and the United States of America.

Between 1993 and 2004, waters were one of the most important agri-food exports in Saint Kitts and Nevis, but have since been surpassed by beer. In fact, beer is becoming one of the most exported products among the agri-food commodities, oriented predominantly to the CARICOM market (especially to Antigua and Barbuda, Barbados, Belize, Dominica, and Saint Lucia), and only marginally to the United States of America.

Saint Lucia, Saint Kitts and Nevis, and Saint Vincent and the Grenadines are specialized in beer products. Saint Lucia exports its beer predominantly within the BMCs (especially to Barbados, Belize, Guyana, and Trinidad and Tobago. In 2015, beer accounted for 15 percent of the agri-food commodities destined for export from Saint Vincent and the Grenadines. The destinations are within the BMCs (Antigua and Barbuda, Belize, Barbados, Dominica, Grenada).

Jamaica has historically specialized in ethyl alcohol. However, since 2004 beer has become one of the five, main agri-food exported products, accounting for 10 percent of the agri-food exports in 2017, compared with 14 percent for ethyl alcohol. Jamaica mainly exports alcohol to Canada, Mexico, New Zealand, the United Kingdom of Great Britain and Northern Ireland, and the United States of America; among the European countries, to Germany. Jamaican beer is exported mainly to Canada, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

As noted by Toro-Gonzalez (2017), the brewing industry is rapidly growing in Latin America. In fact, between 2008 and 2013, the sector grew twice as fast as the world beer market: an average of 2.8 percent versus 1.4 percent (Euromonitor, 2015). In Latin American, small craft breweries are common, due to the consolidation of the large-scale breweries. The consumer tendency to prefer small craft breweries may be an opportunity for the development of export-oriented, small Caribbean brewery production. Specifically, supporting local producers and taking advantage of the knowledge spillover from large, export-oriented enterprises may give rise to an industrial brewery district.

50 Antigua and Barbuda has a privileged relationship with the Netherlands, Trinidad and Tobago, Canada and Saint Lucia; Guyanese alcohol is directed to Canada, Mexico, the Netherlands, the United Kingdom of Great Britain and Northern Ireland, and the United States of America; Anguilla exports alcohol to Guyana, the United States of America, the United Kingdom of Great Britain and Northern Ireland; Barbados exports mainly to the United States of America and Canada (in 2017 also to Jamaica).

Export cluster 2: Crustaceans and molluscs

Crustaceans and molluscs are among the main agri-food commodities exported by the Bahamas, Belize, and the Turks and Caicos Islands. Crustaceans make up about 10 percent of exported products from Belize, destined for Asian markets (Viet Nam and Thailand), the United States of America, and the United Kingdom of Great Britain and Northern Ireland. The Bahamas exports crustaceans and molluscs to Canada, the Far East (China, Japan, Viet Nam), France, and the United States of America. Finally, the Turks and Caicos Islands exports only to the United States of America.

Figure 74. Agri-food trade profiling

Source: Adapted from UN-COMTRADE data.

Export cluster 3: Cereals and bakery

Wheat or meslin flour are the most important agri-food exports from Grenada and Saint Vincent and the Grenadines; they are mostly destined for the BMC market, and in particular, for Dominica, Saint Kitts and Nevis, and Saint Lucia. Nutmeg was also one of Grenada's main exports; however, exports declined following major losses in the wake of Hurricane Ivan in 2004.

Guyana and Suriname are large exporters of rice. Guyana's rice exports represent the main exported agri-food products: 39 percent of total agri-food exports in 2016, in terms of value. Guyana primarily exports rice to Central and South America (Mexico, Panama, the Bolivarian Republic of Venezuela), within BMCs to Jamaica, and to European countries (Italy, Portugal, and Spain). Rice exports from

Suriname are largely destined for markets in Brazil, France, Jamaica, Panama, the United States of America, and the Bolivarian Republic of Venezuela.

Barbados primarily exports bread, pastry and cakes to Guyana, Jamaica, Saint Lucia, and Trinidad and Tobago, as well as to the United States of America. In Trinidad and Tobago, bread and prepared food obtained from cereals account for about 10 percent of the country's total agri-food exports, which are directed towards the CARICOM markets.

Export Cluster 4: Traditional products (bananas, sugar, coffee) and tobacco

Jamaica exports coffee beans predominantly to Japan, the United Kingdom of Great Britain and Northern Ireland, and the United States of America. Sugars exports from Guyana and Belize are directed towards the United States of America, the United Kingdom of Great Britain and Northern Ireland, and Trinidad and Tobago. Dominica and Saint Lucia mainly export bananas to the United Kingdom of Great Britain and Northern Ireland, but also to Antigua and Barbuda, Barbados, France, Saint Kitts and Nevis, Trinidad and Tobago, and the United States of America.

Since 2014, Belize has largely exported sugar cane to Canada, Italy, the Netherlands, Trinidad and Tobago, and the United Kingdom of Great Britain and Northern Ireland. The country also exports bananas, mainly to the United Kingdom of Great Britain and Northern Ireland, but also to European countries and to the United States of America.

Finally, cigar exports from Trinidad and Tobago are largely directed to Barbados, Belize, Guyana, Jamaica, and Suriname.

According to Beckford and Rhiney (2016), disused sugar estates and factories can be transformed by diversifying production. For example, Jamaica has begun moving towards the production of alcohol and spirits, and away from just sugar. This is also evident in trade: sugar cane was among the five main agri-food exported products until 2013. Since then, alcohol has become the most important exported product.

In Guyana, sugar is the second most important exported agri-food product, accounting for 16 percent of total agri-food exports. These sugar exports are mainly directed to the United Kingdom of Great Britain and Northern Ireland, which makes up 57 percent of total exports, while 11 percent (in value terms) is directed to the United States of America, and a large percentage is directed to the BMC market (12 percent to Trinidad and Tobago, 5 percent to Suriname, and 4 percent to Saint Lucia). Molasses for refining sugar is the fourth main exported product by Guyana, and its exports are directed to Barbados (35 percent), the United Kingdom of Great Britain and Northern Ireland (27 percent), and the United States of America (9 percent).

Meat and Milk Cluster

Meat and animal products (milk and cheese) are imported from the most competitive countries in the world (Brazil, the Netherlands, New Zealand, the United States of America, and marginally from Ireland and Denmark). These products represent the main agri-food imports for many BMCs.

Food preparations, cereals and bakery cluster

Food preparations are one of the main commodities imported by the BMCs, especially from the United States of America,[51] which is also the main exporter of wheat and soya beans towards the

51 This is the case for the Bahamas and Jamaica (importing also from Belgium), Barbados (importing also from Costa Rica), Belize (importing also from Costa Rica and Mexico), Antigua and Barbuda (importing also from the Dominican Republic), Suriname (importing also from the Netherlands, Costa Rica and Mexico), Saint Vincent and the Grenadines (importing also from the United Kingdom of Great Britain and Northern Ireland, and Trinidad and Tobago).

BMCs. In particular, Guyana imports mainly wheat and bakery products from the United States of America and Canada; Barbados imports soya beans mainly from the United States of America; Saint Vincent and the Grenadines imports wheat principally from the United States of America.

Cereals are imported by Saint Lucia and Dominica from exporters within the BMCs. In particular, Saint Lucia imports wheat or meslin flour from Barbados, Grenada, Saint Vincent and the Grenadines, and marginally from Mexico and the United States of America. Saint Lucia also imports bread produced in Barbados, as well as in Trinidad and Tobago. Dominica imports wheat from Grenada, Guyana, Saint Vincent and the Grenadines, Trinidad and Tobago, and the United States of America.

Finally, rice is one of the main imported food products in Jamaica and Saint Vincent and the Grenadines, imported primarily from Guyana and the United States of America. Jamaica also imports rice from China and Thailand.

Beverages and Alcohol

Waters

Waters imports in BMCs originate from Jamaica, Saint Lucia, Trinidad and Tobago, the United States of America, and European Countries.

Ethyl alcohol

Intra-trade of ethyl alcohol is common within the BMCs and internationally. In particular, the main extra-regional exporters for BMC imports are Canada, China, Brazil, France, the Netherlands, Panama, the United Kingdom of Great Britain and Northern Ireland, and the United States of America. The intra-regional exporters are mainly the Bahamas, Guyana, Jamaica, and Trinidad and Tobago.

Beer

Anguilla mainly imports beer from the Netherlands and the United States of America, whereas Antigua and Barbuda imports beer from Saint Vincent and the Grenadines, the Netherlands, and Trinidad and Tobago.

Sugar

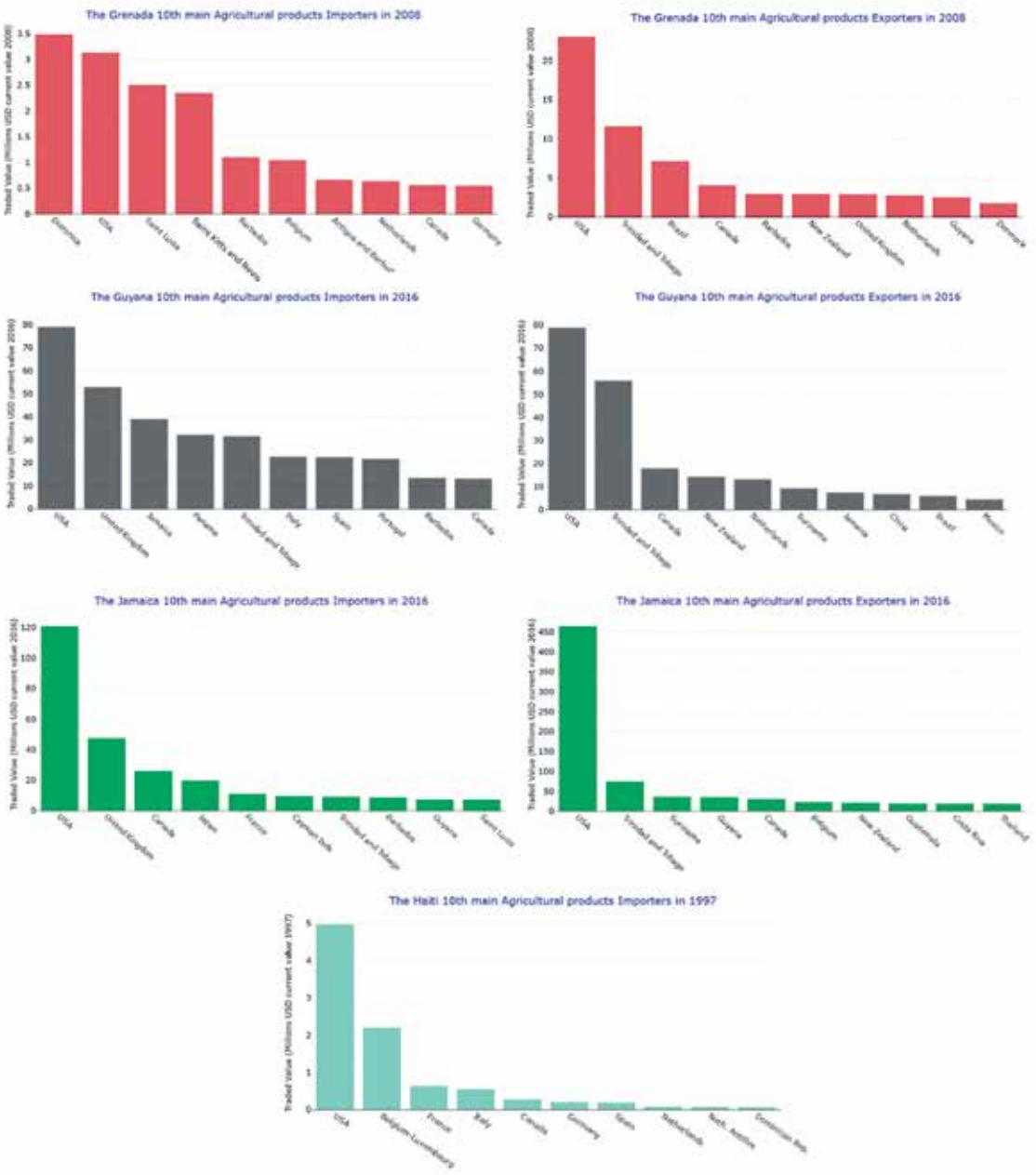
Jamaica and Trinidad and Tobago import sugar cane from outside CARICOM countries (Colombia, Guatemala, Honduras, the United States of America); Suriname also imports sugar cane from Colombia, Guatemala, and Guyana.

Tobacco cluster

Tobacco is the most common imported agri-food product in Belize, originating from China, India, the Republic of Korea, the United Arab Emirates, and Trinidad and Tobago. Cigars and Tobacco are among the most imported commodities by Suriname from Trinidad and Tobago and the Netherlands.

In terms of trade partners, Figure 75 identifies the ten most important importers and exporters for the focus countries. The Figure illustrates the extent of the BMCs' trade flows with the United States of America – its key trade partner – and the importance of trade with other countries, such as the United Kingdom of Great Britain and Northern Ireland. Trinidad and Tobago is also shown to be the second most important exporter to Grenada, Guyana and Jamaica.

Figure 75. Ten most important exporters and importers for the BMCs' agri-food trade

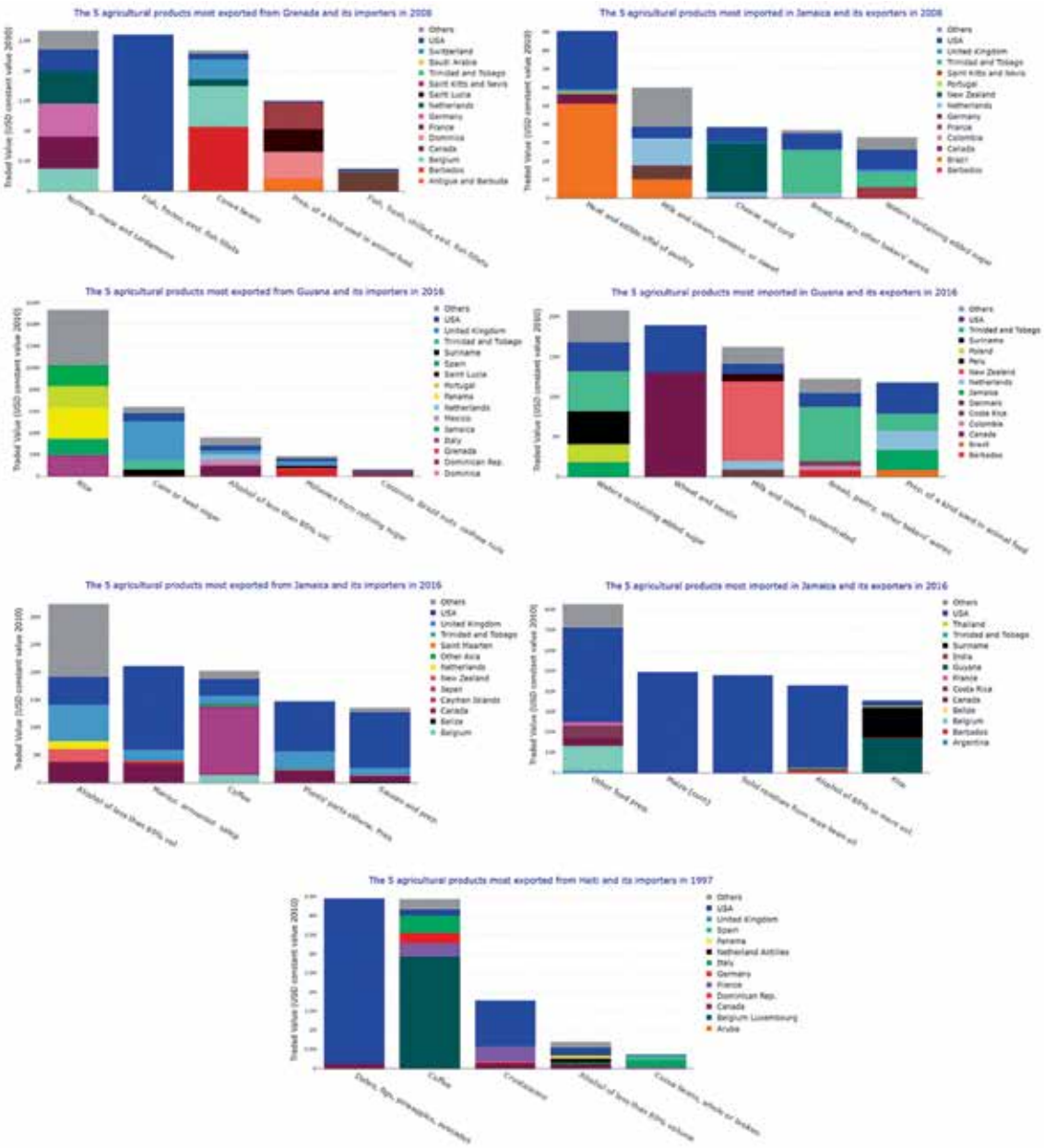


Source: Adapted from UN-COMTRADE data.

Figure 76 shows the five main exported (on the left) and imported (on the right) agri-food products, in terms of value, for the selected countries; it also indicates the five main destinations and origins of exports and imports, respectively,[52] by considering the last available year.

52 The calculations are made at 4-digit level, Harmonized System.

Figure 76. What (and to whom) focus countries export and what they import (and from whom)



Source: Adapted from UN-COMTRADE data.

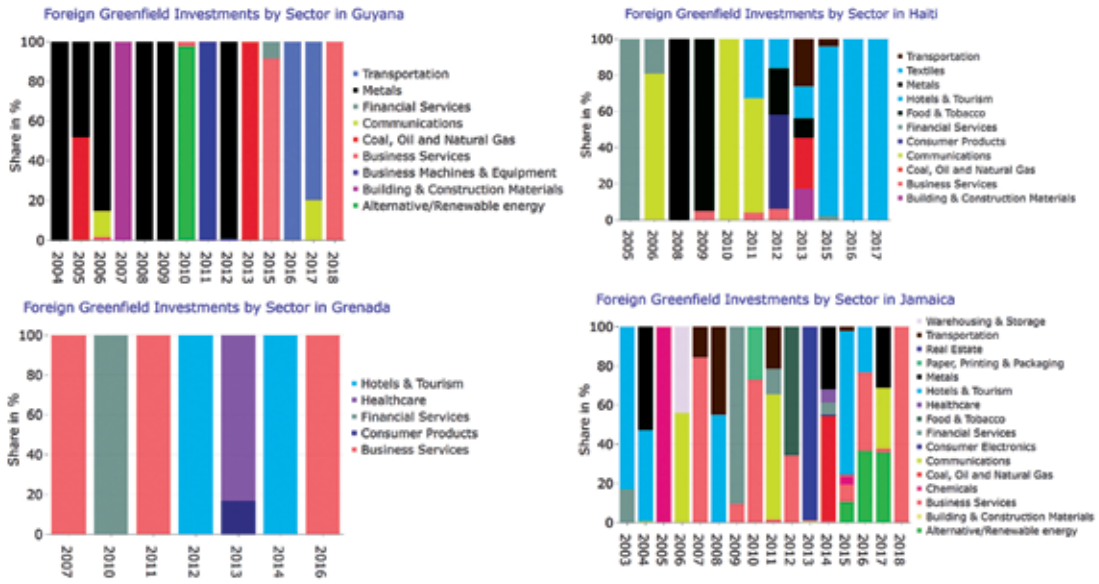
5.6.2 Appendix – Greenfield Investments

The analysis of greenfield investments between 2003 and March 2018 (Figure 77 and Table 6) reveals the presence of greenfield agri-food investments in some states: Belize, Haiti, Jamaica, Saint Lucia, Suriname, and Trinidad and Tobago. The agri-business greenfield investments are concentrated in the CDB states with large populations (Haiti, Jamaica, and Trinidad and Tobago), and in those with a high agricultural share of GDP (Belize and Suriname).

Saint Lucia is the only Small Island State with greenfield investments in the agri-food sector (FDI in agriculture are also directed to the Island). Unlike other greenfield foreign investments in the BMCs, the investments in Saint Lucia are from other Caribbean countries, namely from Trinidad and Tobago, and Martinique. These findings are supported by the central position of Saint Lucia in the BMCs agri-food trade network, illustrated in Figure 71.

Table 7 shows statistics on foreign land acquisition in the BMCs. The majority of acquisitions are concentrated in Guyana, and many investments are made by Indian enterprises. This is primarily due to the promising forestry economy, and the strong ethnic and cultural ties to the Asian community, as a large share of the population in Guyana has Indian origins.

Figure 77. Greenfield Investments in selected countries



Source: Adapted from fDi Markets data.

Table 6. Agriculture investment inflow for case study countries (2003 – March 2018)

Recipient Countries	Investment (in USD million)	Jobs Created	Investing Company	Source Country	Sector	Investment Date
Belize	46.7	218	TexBel Agricultural Investments	The United States of America	Fruits & vegetables & specialist foods	3/1/2013
Belize (Cayo District)	72.5	300	Green Tropics Limited	Spain	Sugar & confectionary products	5/1/2012
Haiti	46.7	218	BRF Brasil Foods	Brazil (Santa Catarina)	Animal production	8/1/2013
Haiti (Ouest)	11.53	48	East Caribbean Tobacco	Jamaica	Tobacco	6/1/2012
Haiti	46.7	218	Sirona Fuels	The United States of America (California)	Crop production	4/1/2009
Jamaica (Saint Catherine)	8	33	Nestle	Switzerland (Vevey)	Dairy products	9/1/2012
Jamaica	9.7	14	Fertilizantes Santo Domingo (Fersan)	Dominican Republic (Santo Domingo)	Pesticides, fertilisers & other agricultural chemicals	3/1/2005
Saint Lucia (Vieux-Fort)	0.10	0	Caribbean Grains	Martinique	Animal food	10/1/2013
Saint Lucia	68.6	297	Blue Waters	Trinidad & Tobago (Trinidad)	Soft drinks & ice	3/1/2013
Suriname	46.7	218	State Trading Corporation of India (STC)	India (Delhi)	Crop production	7/1/2008
Trinidad & Tobago	68.6	297	Central American Bottling Corporation	Guatemala (Guatemala City)	Other (Beverages)	12/1/2011
Trinidad & Tobago	46.7	218	Central American Bottling Corporation	Guatemala (Guatemala City)	Sugar & confectionary products	12/1/2011

Source: Adapted from fDi Markets data.

Table 7. Foreign land acquisition for case study countries

Recipient Countries	Primary Investor	Secondary Investor	Secondary Investor Country	Intention of Investment	Contract Size (ha)	Negotiation Status	Implementation Status	Crop
Guyana (Upper Takutu-Upper Essequibo)	Vaitarna Holdings Private Inc. (VHPI)	Café Coffee Day (CCD)	India	For wood and fibre	391853	[2010] Concluded (Contract signed)	[2015] Start-up phase (no production)	
Guyana	Clenergen Guyana Inc. in India	Clenergen Corporation	United States of America	Biofuels, Renewable Energy	2023	[2009] Concluded (Contract signed)	[2010] Start-up phase (no production)	Bamboo
Guyana (Bartica)	Vaitarna Holdings Private Inc. (VHICafe Coffee Day (CCD)	India	For wood and fibre	345961	[2010] Concluded (Contract signed)	[2011] In operation (production)		
Guyana (Berbice)		Ajeenkya D Y Patil Group	India	Food crops, Livestock		[2014] Failed (Negotiations failed)	[2014] Project not started	Fruit, Vegetables
Guyana	Bai Shan Lin Inc.	Bai Shan Lin International Forest Development Inc.	China	For wood and fibre	627072	[2011] Concluded (Contract signed)	[2011] In operation (production)	
Guyana (Upper Takutu-Upper Essequibo)	Santa Fe Inc	Kyffin Simpson	Barbados	Food crops, Livestock	4046	[2013] Concluded (Contract signed)	[2013] In operation (production)	Corn (Maize), Rice, Soya Beans

Recipient Countries	Primary Investor	Secondary Investor	Secondary Investor Country	Intention of Investment	Contract Size (ha)	Negotiation Status	Implementation Status	Crop
Guyana (East Berbice-Corentyne)	Bornion Guyana Inc.	Wee Boon Ping Group	Malaysia	Biofuels, Food crops, Non-food agricultural commodities	4046	[2012] Concluded (Contract signed)	[2012] Start-up phase (no production)	Acacia, Bean, Cassava (Maniok), Citrus Fruits, Corn (Maize), Fruit, Oil Palm, Rice, Rubber, Sugar Cane, Tomatoes
Suriname (Commewijne)	Forest Returns in Brazil	Forest Returns	Netherlands	Food crops, Forest-unspecified, Livestock, Tourism	823	[2008] Concluded (Contract signed)	[2008] In operation (production)	Bamboo, Trees
Jamaica (Saint Catherine Parish, Clarendon Parish)	Pan Caribbean Sugar Company Ltd.	China National Complete Plant Import & Export Corporation	China	Food crops	18000	[2011] Concluded (Contract signed)	[2011] In operation (production)	Sugar Cane
Belize (San Jose Nuevo Palmar)	ASR Group	Florida Crystals Corporation, Sugar Cane Growers Cooperative of Florida	United States of America	Biofuels, Food crops	1618	[2012] Concluded (Contract signed)	[2012] In operation (production)	Sugar Cane
Belize (Dangriga)	TexBel Agricultural Investments Ltd.	TexBel Agricultural Investments Ltd., Moringa SCA SICAR	Belize, France	Food crops	1214	[2013] Concluded (Contract signed)	[2013] In operation (production)	Citrus Fruits, Coconut

Source: Adapted from Land Matrix data.

Table 8. Foreign land acquisition made by BMCs

Secondary Investor Country	Secondary Investor	Primary Investor	Target country	Intention of Investment	Contract size (ha)	Negotiation status	Implementation status	crop
Barbados	Kyffin Simpson	Santa Fe Inc	Guyana	Food crops, Livestock	4046	[2013] Concluded (Contract signed)	[2013] In operation (production)	Corn (Maize), Rice, Soya Beans
Belize, Romania	Mediterranean Design INC, Lord Energy SRL	SC Intercereal SA	Romania	Food crops	10847	[2010] Concluded (Contract signed)	In operation (production)	Sun Flower, Corn (Maize), Wheat
Belize, France	TexBel Agricultural Investments Ltd., Moringa SCA SICAR	TexBel Agricultural Investments Ltd.	Belize	Food crops	1214	[2013] Concluded (Contract signed)	[2013] In operation (production)	Citrus Fruits, Coconut
Malaysia, British Virgin Islands	Wah Seong, Silvermark Resources Inc, Giant Dragon Group	Atama Plantation SARL	Congo	Agri-unspecified, Biofuels, For wood and fibre, Renewable Energy	470000	[2010] Concluded (Contract signed)	[2013] In operation (production)	crop
Malaysia, British Virgin Islands	IOI Group, Wellpoint Pacific Holdings Ltd	Bumitama Agri Ltd	Indonesia	Agri-unspecified	199000	Concluded (Contract signed)	In operation (production)	Oil Palm
British Virgin Islands	La Esperanza Timberland Holding Limited	Unknown	Colombia	Agri-unspecified	1292	[2012] Concluded (Contract signed)	[2012] Project not started	Oil Palm
British Virgin Islands	La Diana Timberland Holdings Limited	Unknown	Colombia	Agri-unspecified	1283	[2012] Concluded (Contract signed)	[2012] Project not started	
British Virgin Islands	Las Ventas Timberland Holdings Limited	Unknown	Colombia	Agri-unspecified	1273	[2012] Concluded (Contract signed)	[2012] Project not started	
British Virgin Islands	Potosí Timberland Holdings Limited	Unknown	Colombia	Agri-unspecified	1269	[2012] Concluded (Contract signed)	[2012] Project not started	
British Virgin Islands	La Libertad Wood Holdings Limited	Unknown	Colombia	Agri-unspecified	1294	[2012] Concluded (Contract signed)	[2012] Project not started	
British Virgin Islands	La Paz Wood Holding Limited	Unknown	Colombia	Agri-unspecified	1290	[2012] Concluded (Contract signed)	[2012] Project not started	

Secondary Investor Country	Secondary Investor	Primary Investor	Target country	Intention of Investment	Contract size (ha)	Negotiation status	Implementation status	crop
British Virgin Islands	La Esperanza Wood Holding Limited	Unknown	Colombia	Agri-unspecified	1294	[2012] Concluded (Contract signed)	[2012] Project not started	
British Virgin Islands	Canaguay Wood Holding Limited	Unknown	Colombia	Agri-unspecified	1293	[2012] Concluded (Contract signed)	[2012] Project not started	
British Virgin Islands	El Morichal Wood Holding Limited	Unknown	Colombia	Agri-unspecified	880	[2012] Concluded (Contract signed)	[2012] Project not started	
British Virgin Islands	Paraíso Wood Holding Limited	Unknown	Colombia	Agri-unspecified	326	[2012] Concluded (Contract signed)	[2012] Project not started	
British Virgin Islands, Lebanon	African Company for Oil Derivatives, Yousef Freiha and Sons, Ralph Freiha, Freiha Feed Company	Congo Oils and Derivatives SARL	Democratic Republic of the Congo	Agri-unspecified	10000	[2009] Concluded (Contract signed)	[2014] Project not started	
India, British Virgin Islands	Agro Commodities Limited, Unknown investor (British Virgin Islands)	Unknown	Zambia	Agri-unspecified, Biofuels, Food crops	5000	[2014] Concluded (Oral Agreement)	[2015] Start-up phase (no production)	Oil Palm, Soya Beans
British Virgin Islands	Pacific Land Company Vietnam Ltd.	Unknown	Viet Nam	Industry	201	[2015] Concluded (Contract signed)	[2015] Start-up phase (no production)	Corn (Maize), Oil Palm, Rice, Soya Beans, Sugar Cane, Wheat
Cayman Islands	Leopard Capital		Cambodia	Food crops				Rice
Cayman Islands	Fresh Del Monte Produce	Unknown	Brazil	Non-food agricultural commodities	1223	[2004] Concluded (Contract signed)	[2004] In operation (production)	Coconut, Banana
Cayman Islands, Singapore, China, Hong Kong SAR	CDC Corporation , Middle Utilities Company Pte. Ltd , Infra Asia Investment Limited		Viet Nam	Industry, Other (please specify)	1192	[2016] Intended (Under negotiation)		[2016] Project not started
Cayman Islands	Fresh Del Monte Produce	BanaPiña de Nicaragua SA.	Nicaragua	Food crops	1000	[2008] Concluded (Contract signed)	[2016] Start-up phase (no production)	Pineapple

Source: Adapted from Land Matrix data.

Of the total land acquisition, the Land Matrix project covers 52 percent in Guyana; 46 percent in Jamaica; 32 percent in Belize, and 46 percent in Suriname.

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6 Climate change and natural hazards

Key messages

- Climate change and natural hazards pose key threats to agricultural development in the Caribbean.
- Agriculture will be affected by increasing temperature, changing rainfall patterns, rising sea level, increased saltwater intrusion, more frequent and intense storms and cyclones as well as shifting agricultural seasonality.
- Climate change adaptation strategies are vital to the medium- and long-term development of the agriculture sector in BMCs.
- Key adaptation actions include developing water-efficient irrigation systems, strengthening agricultural extension and agro-meteorological information systems, scaling improved land management practices, and exploring the use of precision agriculture technologies for smallholder farmers.
- Climate change is likely to adversely affect key socio-economic activities and sectors that determine quality of life in the region, including water availability, agriculture and food production, natural resources and biodiversity, health, and tourism.

This chapter discusses the role of climate change and natural hazards for agricultural development throughout the Caribbean. Recent trends in climate events and natural hazards are presented, along with their economic impacts; subsequently, future trends as well as priorities for climate change adaptation and natural hazard preparedness are discussed.

6.1 Introduction

Climate change and natural hazards affect agricultural development and overall economic growth in the Caribbean in various ways. Actively considering both climate change and natural hazards becomes thus an imperative for economic growth and development policies in BMCs. Several key characteristics set BMCs apart from other countries in Latin America and the Caribbean, both in terms of their exposure and vulnerability to climate change and natural hazards:

- Countries located in Hurricane Alley[53] are more likely to be affected by frequent and intense cyclones.
- Characterized by low-lying coastal areas and long coastlines, BMCs have a high *exposure* to a particular set of climate change impacts, such as sea level rise and rising water temperatures.
- Countries in the Caribbean are mostly small islands, with largely coastal-based economies, which makes them particularly *vulnerable* to the impacts of climate change.
- Seven of the world's top 36 most water-stressed countries are found in the Caribbean,[54] which puts particular pressure on rain-fed agriculture.

Each single BMC is affected to a different degree by the above issues, yet certain countries have additional particularities regarding their exposure and vulnerability to climate change and natural hazards.

6.2 Recent trends in climate variability and natural hazards

Current trends in weather patterns can inform short- and medium-term policy and investment planning, while projections of future climate change complement this process.[55] However, it is important to note that climate trends are associated with uncertainty.

The prioritization of policy and investment decisions should thus focus on "low-regret" options, which provide favourable outcomes under different future climate scenarios – as opposed to policy options that lead to (highly) unfavourable outcomes under a set of possible future climate scenarios.

6.2.1 Recent trends in climate variability

Recent trends in precipitation and temperature

Recent trends in precipitation and temperature in the Caribbean are investigated in this section by reviewing the evidence from both (1) daily observational surface temperature and precipitation data from weather stations (Stephenson *et al.,* 2014), and (2) observational-based gridded temperature and precipitation data (CRU TS 3.21 and GPCCv5, 2013; Jones *et al.*, 2016). While global gridded data products provide the advantage of consistent spatial coverage and resolution, they are often based

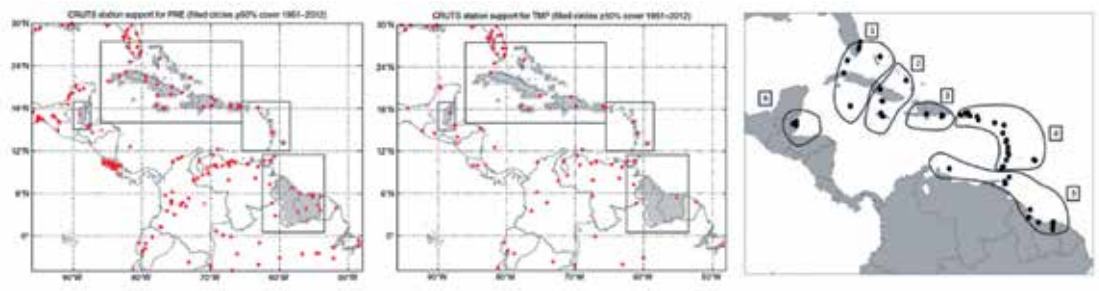
53 Also referred to as the *hurricane belt*, Hurricane Alley refers to a section of warm water in the Atlantic Ocean, that spans from the west coast of northern Africa, to the east coast of Central America, and the Gulf Coast of the United States of America.

54 Antigua and Barbuda, Barbados, Dominica, Jamaica, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago (Reig, Maddocks and Gassert, 2013).

55 While trends in recent climate events and natural hazards are identified and presented in this section, the extent to which recent trends are due to natural variability, or to the consequences of ongoing anthropogenic climate change are uncertain.

on a limited set of weather stations, as shown in Figure 78. The non-gridded data set on the right in Figure 78 shows the distribution of 51 weather stations throughout the Caribbean; this provides an important complementary information source, and offers a higher level of detail for Small Island States.

Figure 78. Location of weather stations considered by different data set: CRU precipitation (left), CRU temperature (middle), Stephenson *et al*. 2014 (right)



Source: Jones et al. (2016), Stephenson et al. (2014).

When focusing on the trends in annual mean temperature and precipitation, both data sources find significant warming of surface air temperature for most of the Caribbean, whereas no significant, less consistent or generally weaker trends are found in precipitation. Annual mean temperature and precipitation are useful indicators to detect trends that occur consistently throughout all months and agricultural seasons.

In terms of intra-annual distribution and variability, a **consistent trend towards warmer temperatures** prevails throughout the eastern, western, northern and southern regions[56] in the Caribbean, as shown in Figure 79.

>> Significant warming of surface air temperature and more frequent temperature extremes have been recorded for most of the Caribbean

The gridded data products displayed in Figure 78 – CRU TS 3.21 – are based on a small number of weather stations for selected regions in the Caribbean. However, Stephenson *et al.* (2014) consider a larger set of 51 weather stations, and confirm the same trend: From 1961 to 2010, Caribbean-wide regional averages of annual mean temperatures indicate a significant warming of 0.19 °C and 0.28 °C per decade of daily maximum and daily minimum temperatures. The fact that night-time temperature trends generally exceed daytime temperature trends may lead to particular stressors for plant physiology and development. Specifically, night-time plant respiration may increase, utilizing limited plant energy reserves, and thus reducing biomass accumulation and crop yield, while selected grains may react with an overall shortening of grain filling duration.

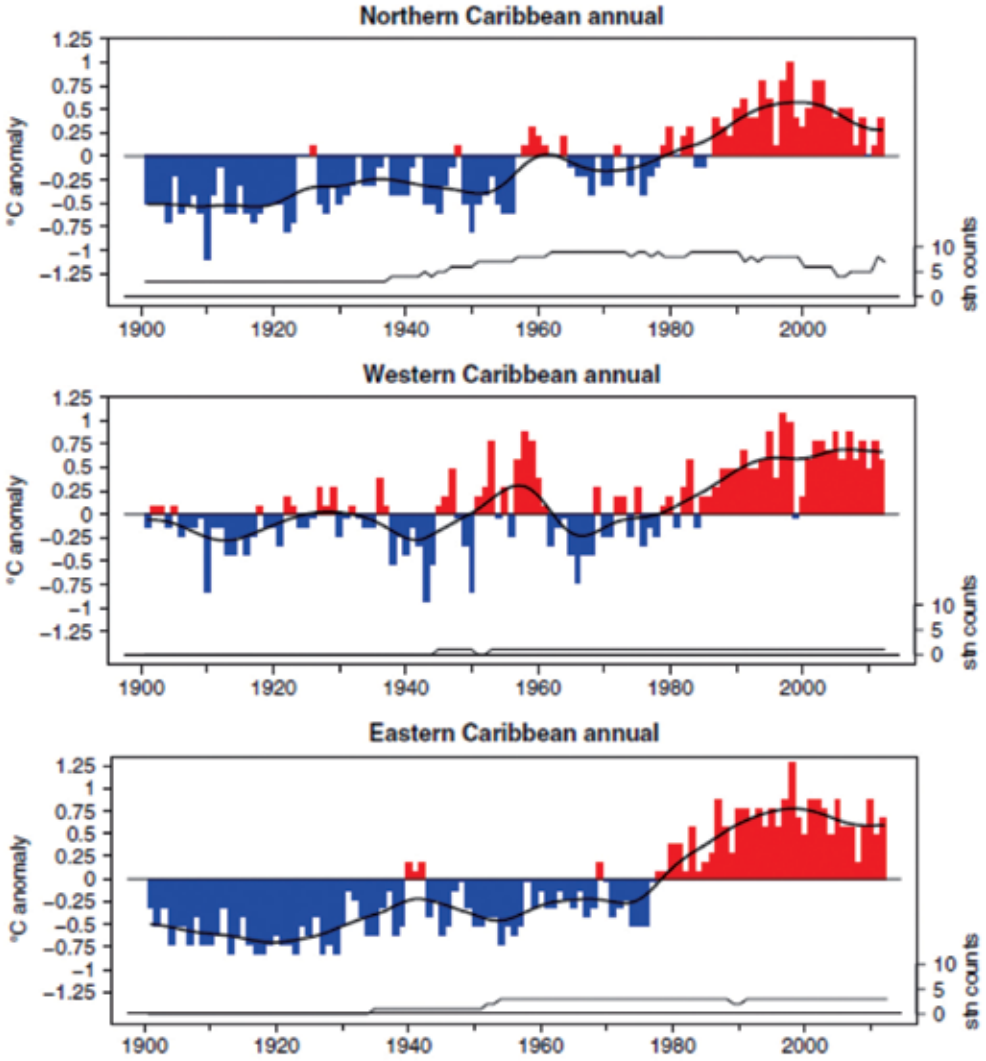
In addition to increasing temperature means, Stephenson *et al.* (2014) also found a **higher frequency in temperature extremes** across most of the Caribbean.

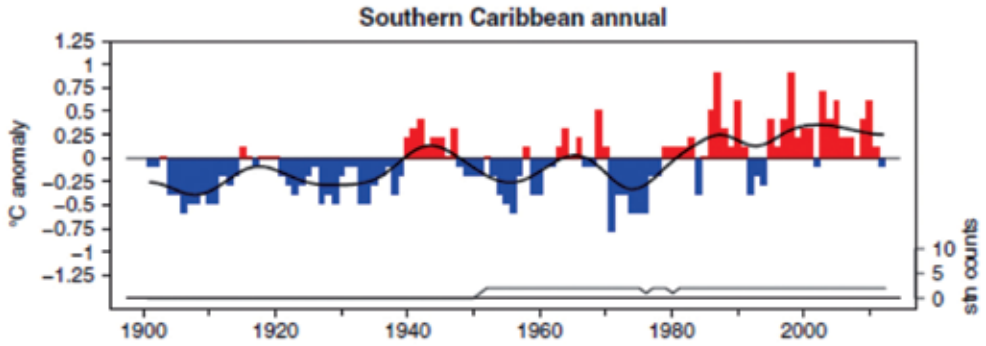
56 The geographic division is defined as: **Northern Caribbean** – The Bahamas, Cayman Islands, Cuba, Dominican Republic, Haiti, Jamaica, Puerto Rico, Turks and Caicos Islands; **Western Caribbean** – Belize; **Eastern Caribbean** – Anguilla, Antigua and Barbuda, Barbados, British Virgin Islands, Dominica, Grenada, Guadeloupe, Martinique, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines; **Southern Caribbean** – Guyana, Suriname, Trinidad and Tobago.

Trends in rainfall, however, show a less clear picture when considered at this aggregate, national and annual level. Specifically, neither of the gridded data sets – CRU TS 3.21, GPCCv5 – shows any statistically significant century-scale trends across the different Caribbean regions.

As illustrated in Figure 79 and Figure 80, both the northern and eastern Caribbean regions have shown higher precipitation totals since 2000 (Jones *et al.*, 2016). Although this does not constitute a time trend in itself, it is part of a weather pattern with periods of decades which are characterized by wetter or drier conditions than the 1961–1990 average (Jones *et al.,* 2016).

Figure 79. Annual temperature anomalies compared to 1961–1990 averages for four Caribbean regions using CRU TS 3.21

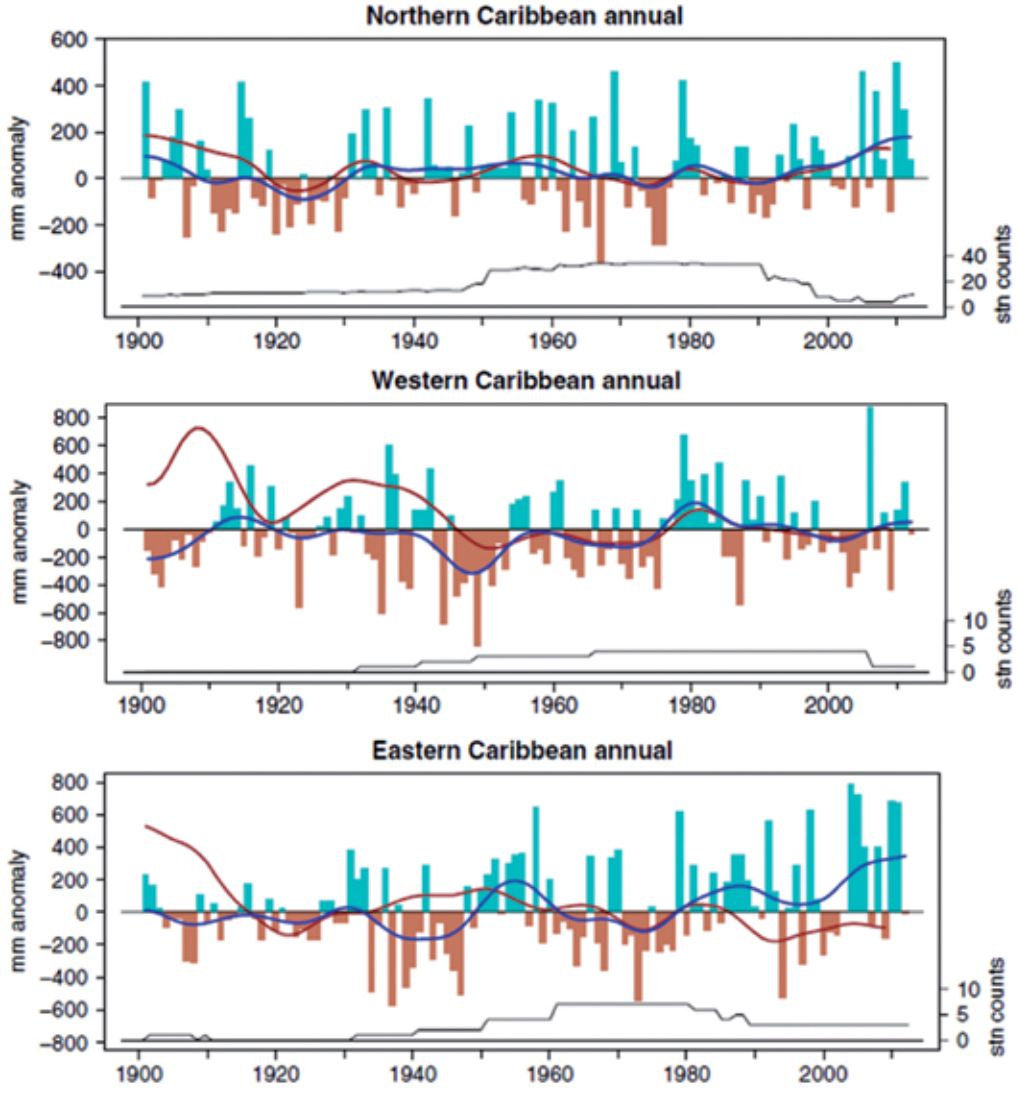


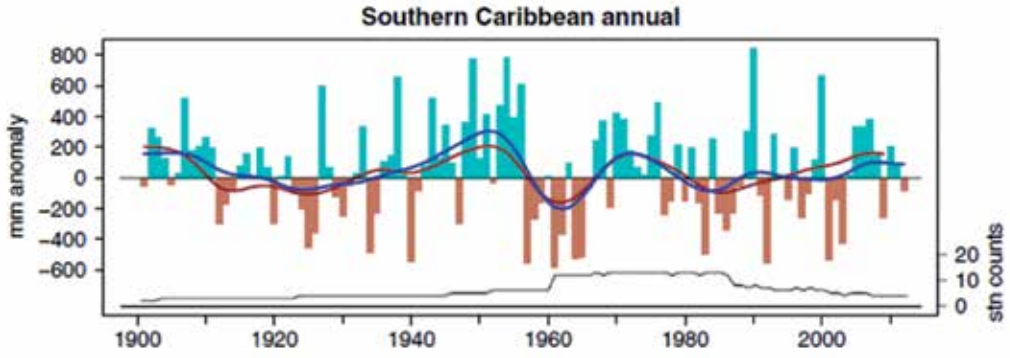


Source: Jones et al. (2016).

NOTE: Smooth lines indicate 10-year Gaussian smoothed series. Beneath each plot, the number of stations used per year is given.

Figure 80. Annual precipitation anomalies compared to 1961–1990 average for four Caribbean regions using CRU TS 3.21 and GPCCv5



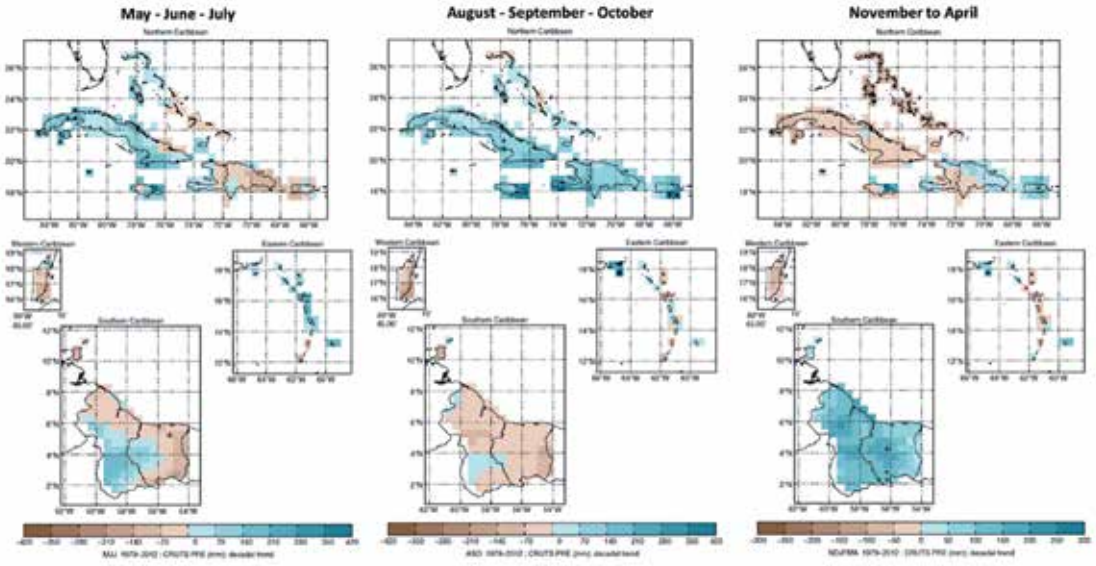


Source: Jones et al. (2016).

NOTE: Smooth lines indicate 10-year Gaussian smoothed series for CRU TS 3.21 and GPCCv5. Beneath each plot, the number of stations used per year is given.

Figure 81 depicts changes in **intra-annual rainfall patterns**. The northern Caribbean tends to be wetter during the wet season and drier during the dry season, whereas the southern Caribbean has experienced a wetter, minor rainy season. The eastern Caribbean (Belize) is drier all year round, though it has a less homogenous pattern. On the whole, most of these trends are not statistically significant – only a few regions are marked by a plus sign (+) in Figure 81.

Figure 81. Seasonal precipitation trends from 1979–2012 across four Caribbean regions and three seasons using CRU TS 3.21



Source: Jones et al. (2016).

NOTE: Statistically significant trends at the 95 percent level are marked with a + sign.

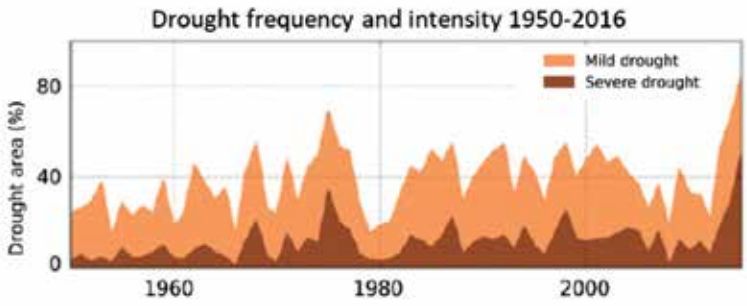
Drought frequency and intensity in the Caribbean

The increased frequency and intensity of droughts in the Caribbean can have serious consequences for agricultural production and economic growth in the region. Therefore, the spatial extent and frequency of drought is considered an important policy issue for agriculture in BMCs.

The recent decade has been particularly dry, with an increasing number of agricultural producers experiencing income shocks. Mild droughts frequently affect more than 40 percent of the Caribbean territory; in most years, at least 10 percent of the land area has been affected by severe drought conditions.

>> Drought frequently affects more than 40 percent of the Caribbean territory

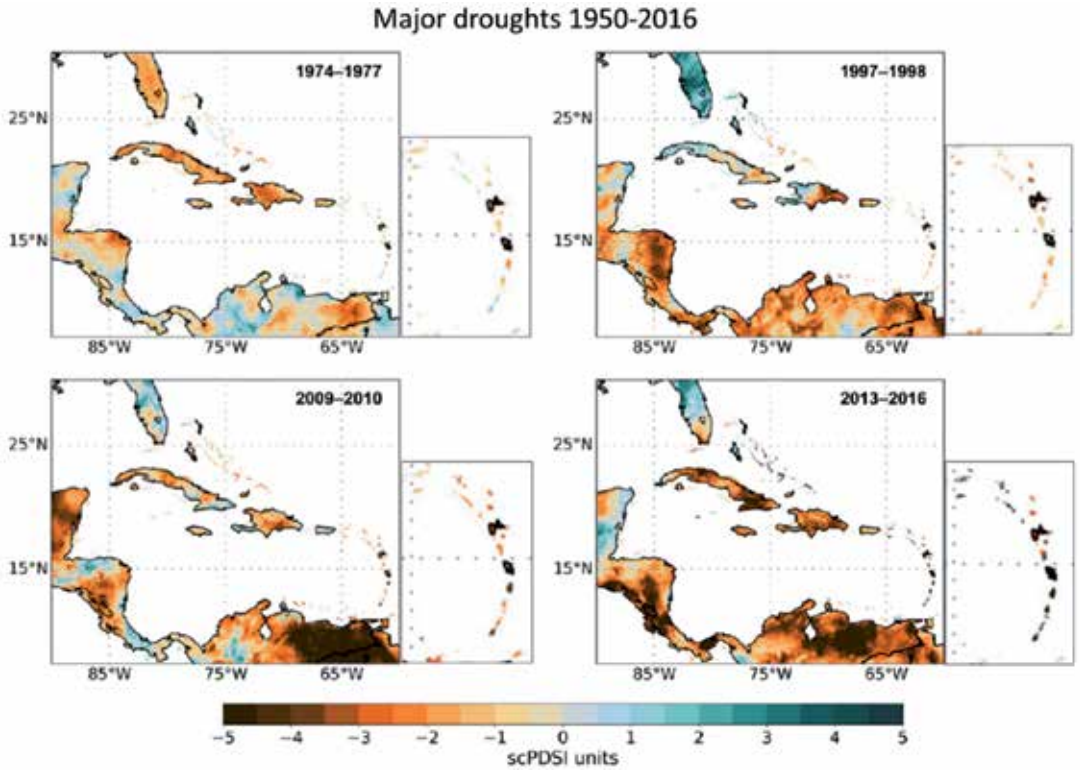
Figure 82. Drought frequency and intensity in the Caribbean



Source: Herrera and Ault (2017).

While drought occurrence is spatially heterogeneous, it is one of the few climate stressors that largely concerns all BMCs. Figure 83 shows the severity and location of major droughts on record in the Caribbean between 1950 and 2016.

Figure 83. Severity and spatial location of major droughts registered in the Caribbean between 1950 and 2016



Source: Herrera and Ault (2017).

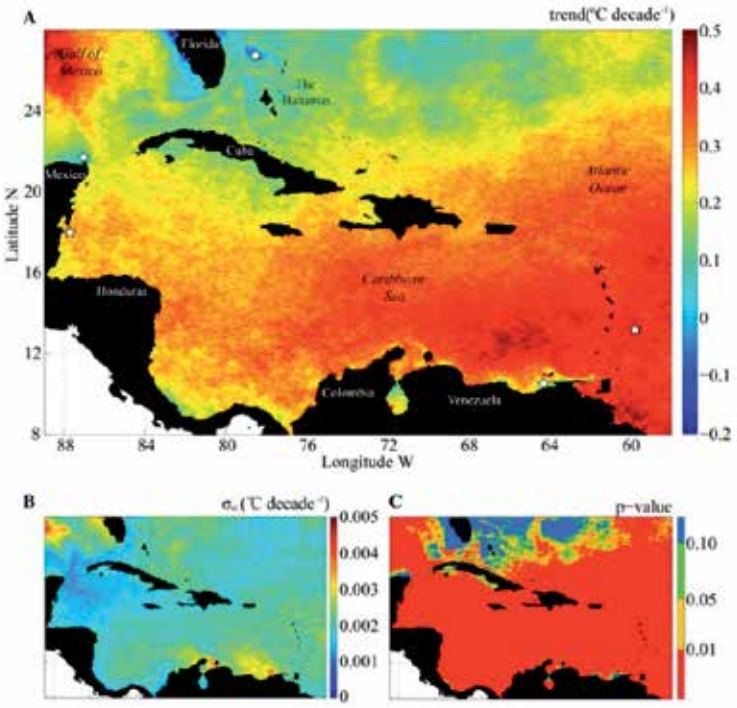
NOTE: scPDSI: self-calibrating Palmer Drought Severity Index (PSDI) for droughts of at least one year in duration.

Recent trends in sea surface temperature and sea level rise

Globally, **sea surface temperatures have increased** at an average of 0.04 °C per decade over the past 150 years, and at an average of 0.13 °C per decade since 1979 (Trenberth *et al.*, 2007). However, trends in sea surface temperatures are subject to strong regional variations. Chollett *et al.* (2012) report an average temperature increase of 0.27 °C per decade between 1985 and 2009 for the wider Caribbean, which suggests that sea surface temperature warming in the Caribbean region is above the global average.

Figure 84 identifies the spatial diversity in warming trends: Small Island States in the eastern Caribbean in particular are shown to have experienced sizable warming of sea surface temperatures.

Figure 84. A) Decadal trends in average sea surface temperatures in the Caribbean; B) associated standard deviation; C) significance of the trend



Source: Chollett et al. (2012).

>> Small Island States in the eastern Caribbean have experienced sizable warming of sea surface temperatures – an important variable for the marine ecosystem

Sea surface temperatures are an important aspect of the marine ecosystem and changes directly impact marine organisms. Generally, increased sea surface temperatures may have either positive or negative impacts on marine physiology, based on whether initial temperatures are close to the thermal optimum of the respective aquatic species.

Seasonal changes in water temperatures are likely to have an impact on the migration of marine species, affecting their feeding and reproductive patterns, such as spawning and nesting. Water

temperatures also directly affect the physiological functions of marine organisms, thereby influencing development and growth rates, reproductive output, the prevalence of disease, and mortality rates.

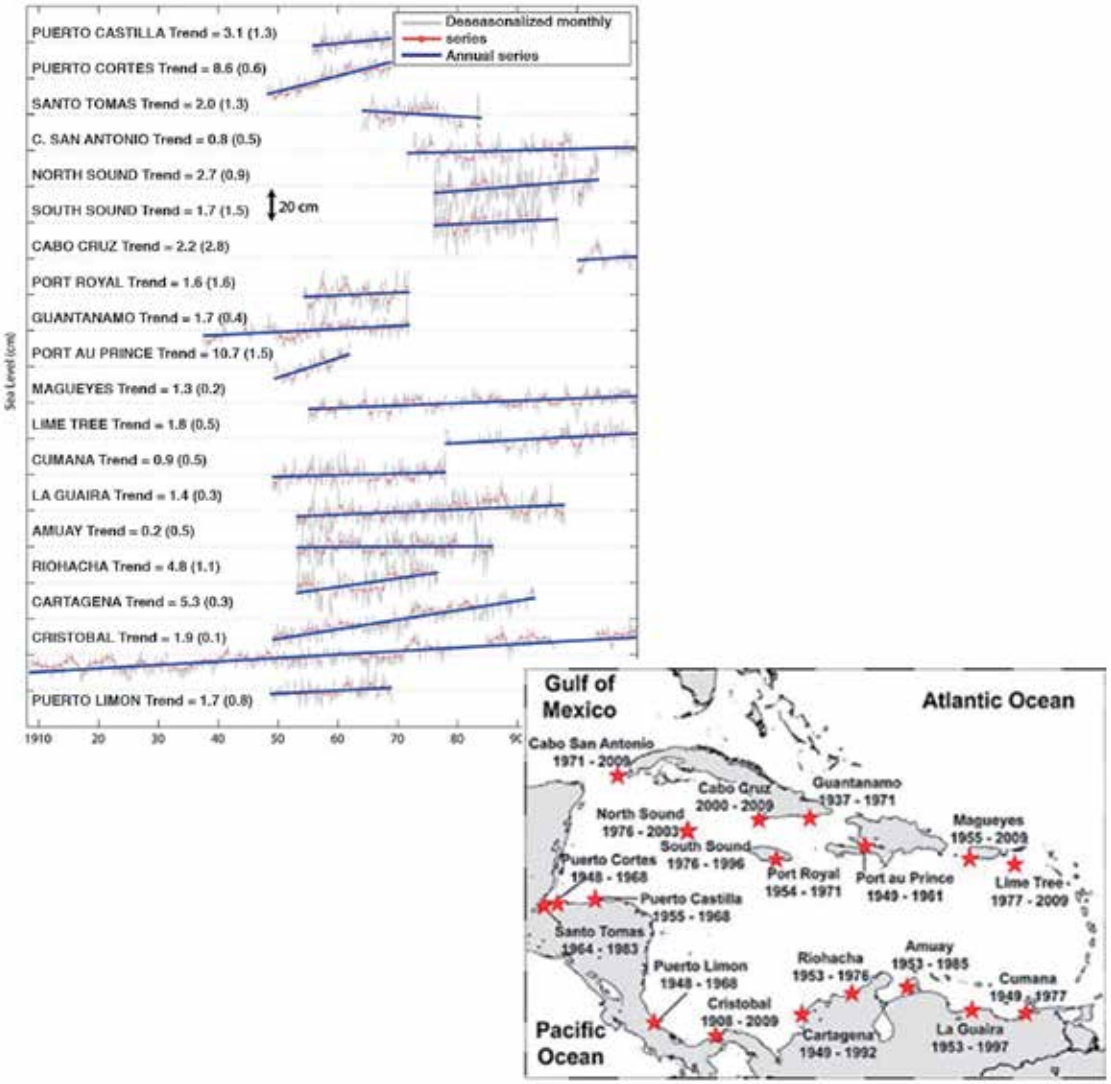
Recent trends in sea level rise

sea level rise is a global phenomenon with significant spatial variability, partly due to streamflow and wind impacts. Analyses of tide-gauge date, shown in Figure 85, indicate that the twentieth-century rate of global sea level rise averaged 1.7 +/- 0.5 mm per year (Bindoff *et al.*, 2007). During the more recent period, from 1993 to 2009, global mean sea level rise has been estimated at 3.2 +/- 0.4 mm per year (Church *et al.*, 2011).

For the Caribbean Sea, Torres and Tsimplis (2013) estimate sea level rise over the period 1993–2010 at a basin average of 1.7 +/- 1.3 mm per year. After correcting for glacial isostatic adjustment, the basin average trend is estimated at 2.5 +/- 1.3 mm per year, and is thus not statistically different from the global average. Overall, large spatial variability can be found within the Caribbean basin.

Figure 85 also identifies trends in sea level rise for the 19 stations studied by Torres and Tsimplis (2013).

Figure 85. Tide gauge observed and computed trends in sea level across 19 stations in the Caribbean



Source: Torres and Tsimplis (2013).

6.2.2 Recent trends and economic impacts of natural hazards

Borrowing Member Countries are exposed to a great variety of natural hazards[57] and disaster risks. The most frequently occurring natural hazards and catastrophic events in BMCs are considered in this report: hurricanes and tropical storms, drought, storm surges and riverine floods, landslides, and tsunamis.

While their spatial and temporal occurrence is commonly difficult to predict, **natural hazards and disasters can cause severe environmental, infrastructural and economic losses in BMCs**. These Losses are exacerbated by inadequate coping, adaptation, and insurance mechanisms. Moreover, disinvestment and maladaptation may lead to a significant number of long-lasting, indirect economic costs.

Frequency and intensity of hurricane and tropical storm landfalls

The Caribbean is subject to higher hurricane and tropical storm frequency when compared to other global regions. Since 1970, the frequency and intensity of storms in the North Atlantic have increased, though the causes of these increases are still a matter of debate.[58] Among the BMCs, the Bahamas experiences the highest frequency and intensity of hurricanes and tropical storms; however, since 1946, many other BMCs have been significantly affected by hurricanes and tropical storms, including Antigua, Barbuda, Belize, Haiti, and Jamaica. Table 9 shows how the frequency and intensity of hurricanes and tropical storms vary across BMCs.

Table 9. Frequency and intensity of hurricane and tropical storm landfalls

Atlantic Hurricane Landfalls (1946-1960, 1969, and 1983-2016)								Atlantic Tropical Storm Landfalls (1946-1960, 1983-2016)	
Hurricane intensity (Saffir-Simpson hurricane wind scale)									
Landfall Country	1	2	3	4	5	Number of hurricanes	Avg. max. winds (kt)	Number of tropical storms	Avg. max. winds (kt)
Antigua	**2**	**1**	**1**	**0**	**0**	**4**	**82.5**	**1**	**55.0**
Azores	1	0	0	0	0	1	65.0	3	48.3
Bahamas	**7**	**7**	**11**	**4**	**1**	**30**	**97.8**	**12**	**48.3**
Barbuda	1	0	2	0	0	3	96.7	1	55.0
Belize	**4**	**1**	**0**	**1**	**0**	**6**	**82.5**	**7**	**48.6**
Bermuda	2	2	0	0	0	4	82.5	1	55.0
British Virgin Islands	**2**	**0**	**0**	**0**	**0**	**2**	**70.0**	**1**	**60.0**
Canada	9	1	0	0	0	10	71.5	10	49.0
Cuba	11	4	5	9	0	29	97.4	20	48.8
Dominica	**1**	**0**	**0**	**0**	**0**	**1**	**70.0**	**1**	**60.0**
Dominican Republic	1	1	1	0	0	3	90.0	6	47.5
Grenada	**2**	**0**	**0**	**0**	**0**	**2**	**70.0**	**2**	**45.0**
Guadeloupe	0	0	0	1	0	1	120.0	1	50.0
Haiti	**1**	**2**	**1**	**1**	**0**	**5**	**97.0**	**3**	**46.7**
Honduras	2	0	0	0	0	2	70.0	3	36.7
Jamaica	**1**	**0**	**1**	**1**	**0**	**3**	**100.0**	**3**	**51.7**
Mexico	11	8	8	5	3	35	95.9	34	47.8
Nicaragua	2	1	1	1	1	6	100.0	4	40.0
Puerto Rico	1	0	3	0	0	4	97.5	3	53.3
St. Vincent	**0**	**1**	**0**	**0**	**0**	**1**	**85.0**	**1**	**45.0**
Turks and Caicos	**2**	**0**	**0**	**0**	**0**	**2**	**77.5**	**1**	**40.0**
US Virgin Islands	0	0	0	2	0	2	127.5	1	60.0

Source: Adapted from the Atlantic hurricane database (HURDAT2), National Hurricane Center (NHC); NOAA.

57 The manifestation of a hazard is in a particular place during a particular period of time. Severe hazardous events can lead to a disaster as a result of the combination of hazard occurrence and other risk factors (https://www.unisdr.org/we/inform/terminology).

58 For more details on the Synthesis Report of the Intergovernmental Panel on Climate Change, see https://www.ipcc.ch/report/ar5/syr/.

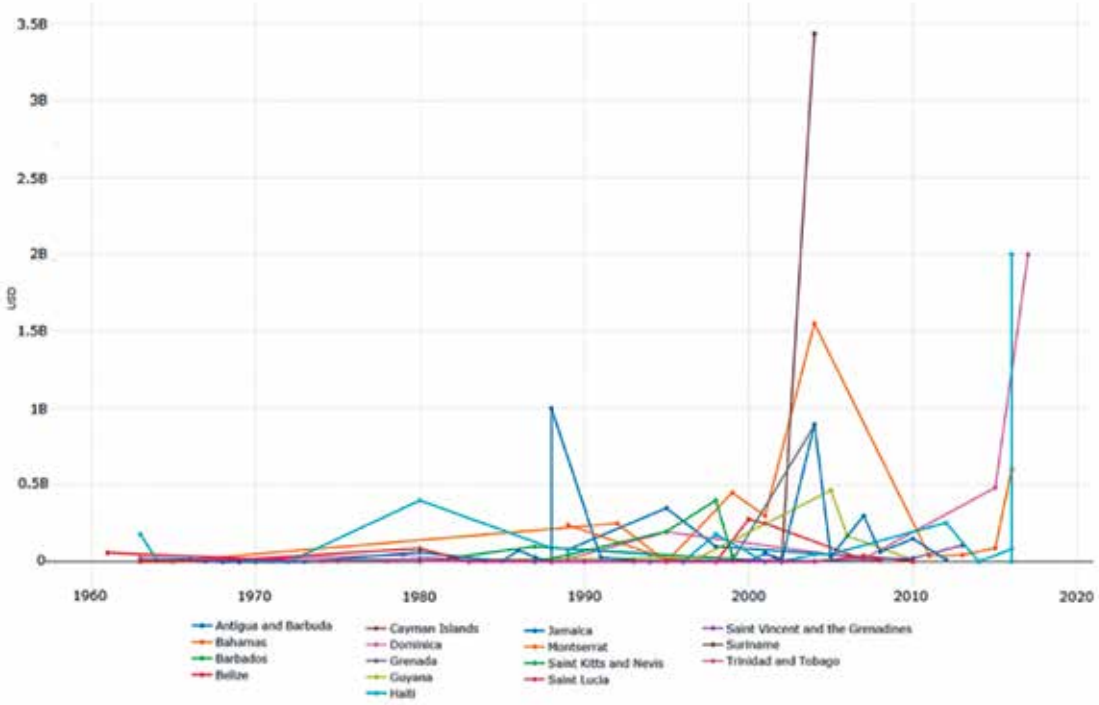
Records of total economic damages from natural disasters

The Caribbean is affected by a diverse set of natural disasters. Figure 86 illustrates that a large range of BMCs are recurrently affected by natural disasters at a significant scale.

>> Natural disasters can cause severe environmental, infrastructural and economic losses in BMCs, with countries such as the Bahamas, the Cayman Islands, Dominica, Haiti, and Jamaica particularly at risk

Economic accounting of damages from natural disasters is limited by low data availability and data quality limitations. Adequate estimates of actual economic damages occurring at the national level, may thus deviate significantly from estimates at the international level.

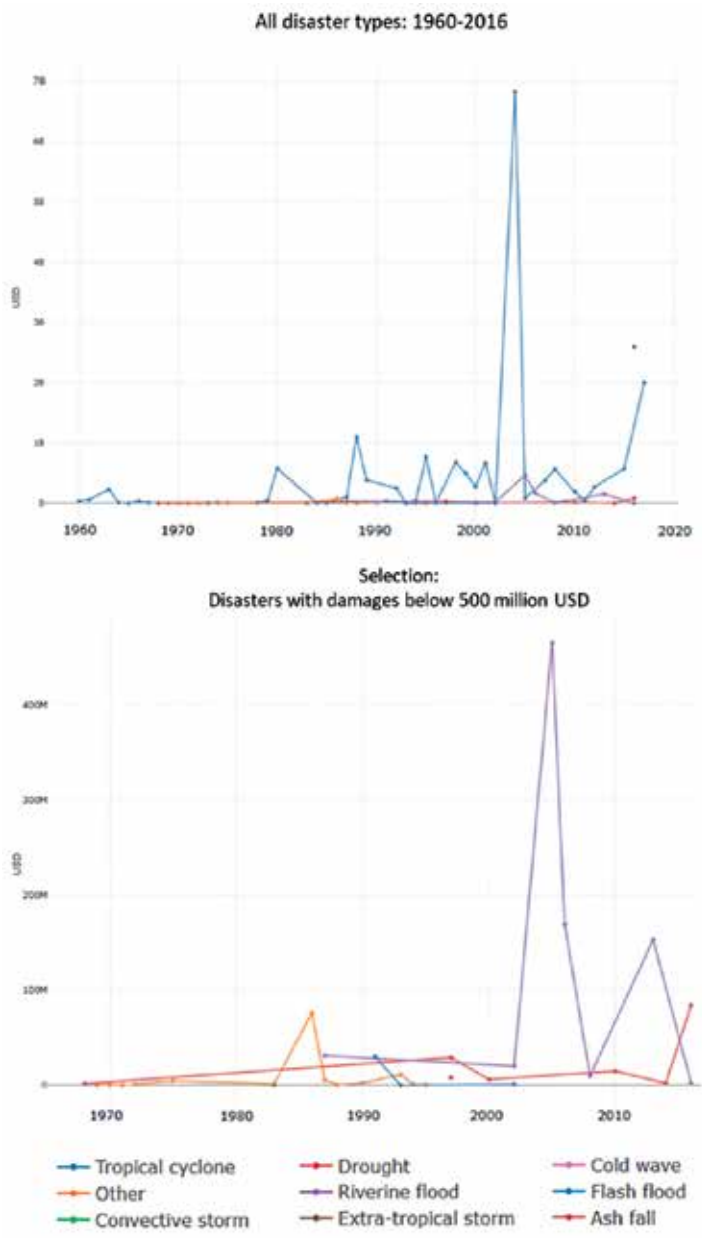
Figure 86. Records of total economic damages from natural disasters by country



Source: Adapted from EMDAT data.

When differentiating by disaster type, cyclones and tropical storms are the most relevant causes of economic damages for which records are available. Riverine floods and droughts are other relevant disaster types.

Figure 87. Records of total economic damages from natural disasters by disaster type



Source: Adapted from EMDAT data.

Average annual economic impacts of multiple natural hazards and disasters

Based on historical data, the United Nations Office for Disaster Risk Reduction (UNISDR, 2015) estimated the average annual damages that occurred to exposed national assets from irregularly occurring natural hazards and disasters. Figure 88 shows damages from tsunamis, cyclonic winds, storm surges, and riverine floods.

>> The average annual damages from natural disasters and hazards can reach significant scales – up to 5 percent of exposed national assets for selected BMCs

According to these estimations, many BMCs lose more than 2 percent of their exposed national assets due to natural hazards and disasters; these losses have considerable negative economic impacts, affecting Anguilla, Antigua and Barbuda, the Bahamas, the British Virgin Islands, the Cayman Islands, Dominica, Saint Kitts and Nevis, and Turks and Caicos Islands.

In terms of net losses of national value, Haiti, Jamaica, and Trinidad and Tobago also report high impacts.

Figure 88. Estimated average annual economic loss of multiple natural hazards and disasters (percentage of exposed national value)

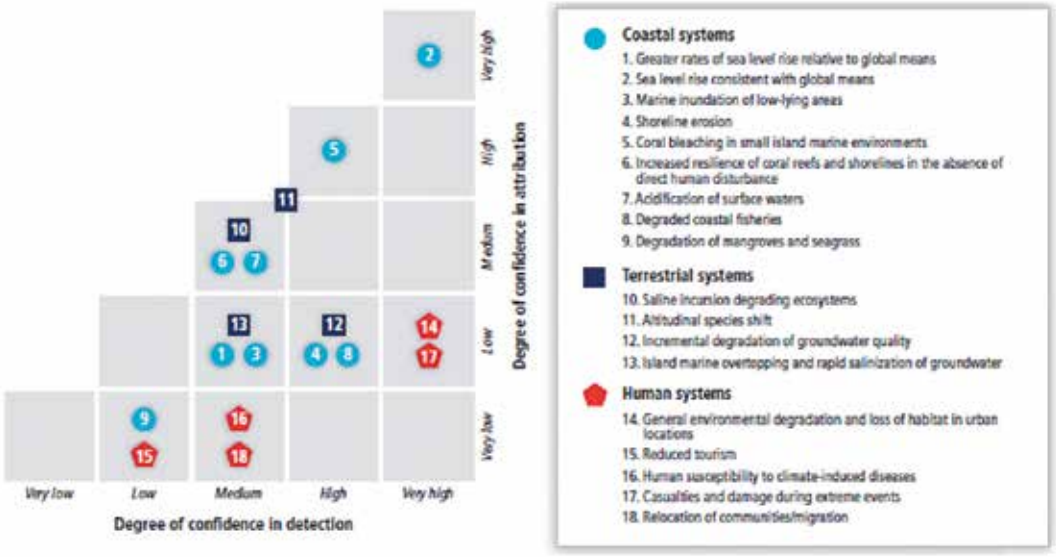
Source: Adapted from UNISDR (2015): GAR.

6.3 Future trends of climate and natural hazards

Climate change adds pressure on agriculture and may further reduce the low productivity level in the sector. In the Caribbean, climate change is expected to increase the frequency and intensity of extreme events, and to lead to a shift in average weather patterns. The Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPPC) projects a reduction in mean precipitation, and an increase in extreme precipitation. For example, an increase in the occurrence of tropical cyclones making landfall along the eastern and western coasts would result in heavier rainfall.

Another major concern is sea level rise, particularly for countries with low-lying territories, such as Barbados and Haiti. Figure 89 summarizes major expected climate change impacts on Small Island States.

Figure 89. Overview of expected climate change impacts on Small Island States and their confidence level



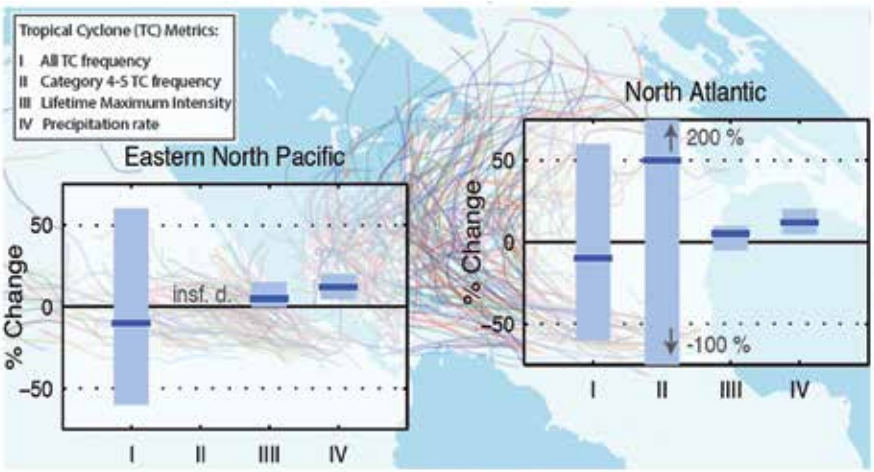
Source: IPCC, 2014.

NOTE: The Figure highlights the comparison of the degree of confidence in the detection of observed impacts of climate change on Small Island States with the degree of confidence in attribution to climate change drivers. For example, the blue symbol, No. 2 (Coastal Systems), indicates there is very high confidence in both the detection of "sea level rise consistent with global means" and its attribution to climate change drivers. The red symbol, No. 17 (Human Systems), indicates that although confidence in detection of "casualties and damage during extreme events" is very high, there is at present low confidence in the attribution to climate change. It is important to note that low confidence in attribution frequently arises owing to the limited research available on small island environments.

Projections of future cyclone frequency and intensity

With increasing sea surface temperatures, it is likely that tropical cyclones will become more intense, with higher maximum surface wind speeds, and more frequent heavy precipitation, as shown in Figure 90. While there is general agreement on the likelihood of increased tropical cyclone intensity, less scientific consensus prevails regarding cyclone frequency (IPCC, 2014).

Figure 90. Projected changes in tropical cyclone statistics in 2081–2100 compared to 2000–2019



Source: IPCC (2014).

NOTE: Projected changes in tropical cyclone statistics. All values represent expected percent change in the average over the period 2081–2100 relative to 2000–2019, under an A1B-like scenario, based on expert judgement after subjective normalization of the model projections. Four metrics were considered: the percent change in 1) the total annual frequency of tropical storms; 2) the annual frequency of Category 4 and 5 storms; 3) the mean Lifetime Maximum Intensity (LMI), or the maximum intensity achieved during a storm's lifetime; and 4) the precipitation rate within 200 km of a storm's centre at the time of LMI. For each metric plotted, the solid blue line is the best guess of the expected percent change, and the coloured bar provides the 67 percent (likely) confidence interval for this value (note that this interval ranges across –100% to +200% for the annual frequency of Category 4 and 5 storms in the North Atlantic). Where a metric is not plotted, there are insufficient data (denoted X) available to complete an assessment. A randomly drawn (and coloured) selection of historical storm tracks are underlaid to identify regions of tropical cyclone activity.

Regarding the uncertainties of predicting future cyclone frequency, the Fifth Assessment Report of the IPCC states:

Globally, there is low confidence in attribution of changes in tropical cyclone activity to human influence. This is due to insufficient observational evidence, lack of physical understanding of the links between anthropogenic drivers of climate and tropical cyclone activity, and the low level of agreement between studies as to the relative importance of internal variability, and anthropogenic and natural forcings. In the North Atlantic region, there is medium confidence that a reduction in aerosol forcing over the North Atlantic has contributed, at least in part, to the observed increase in tropical cyclone activity there since the 1970s (IPCC, 2014).

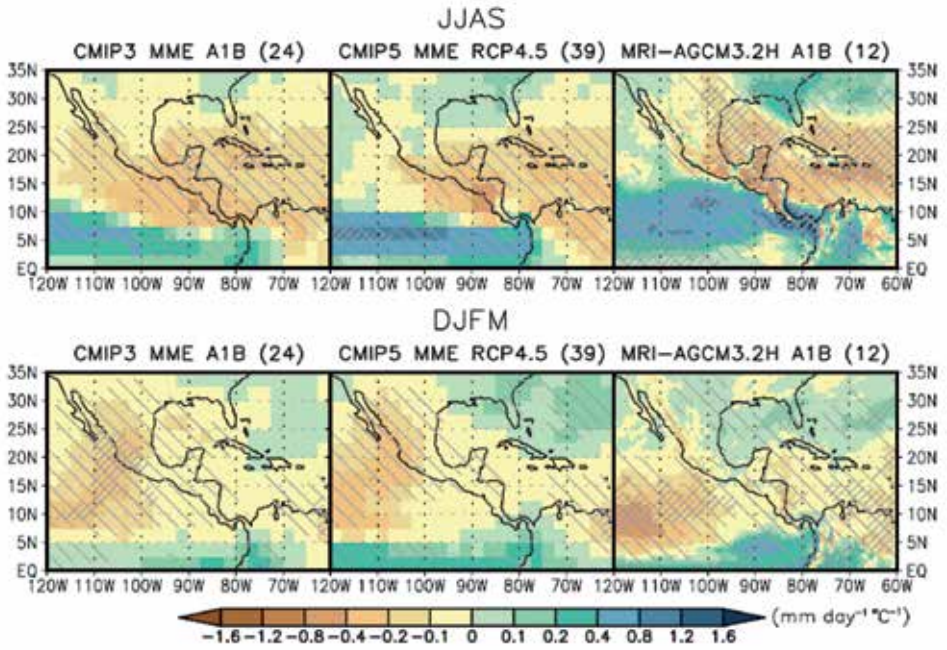
>> The increasing occurrence of tropical cyclones may lead to higher maximum wind speeds and more frequent heavy precipitation

Even more uncertainty prevails regarding the estimation of frequency and intensity of near-term tropical cyclone activity, while confidence in region-specific projections is low.

Projections of future changes in temperature and precipitation

From October to March, precipitation is projected to decrease in the southern Caribbean, and increase in the northern areas of the region. From April to September, a reduction in precipitation is expected all across the Caribbean and Central America. Figure 91 identifies future projections of precipitation under climate change using different climate models for moderate increases in greenhouse gas (GHG) emissions.

Figure 91. Precipitation changes under climate change for Central America and the Caribbean in 2080–2099 with respect to 1986–2005



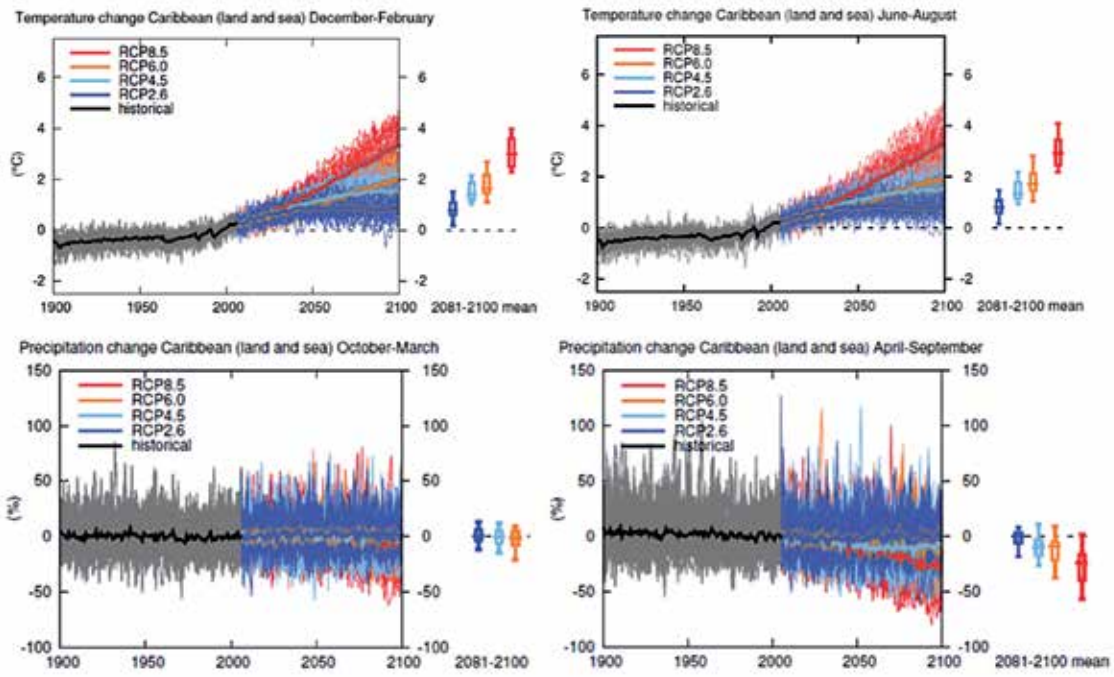
Source: IPCC (2014).

NOTE: Maps of precipitation changes for Central America and the Caribbean in 2080–2099 with respect to 1986–2005, in June to September (above), and December to March (below), in the SRES A1B scenario with 24 CMIP3 models (left), and in the RCP4.5 scenario with 39 CMIP5 models (middle). Figures on the right are the precipitation changes in 2075–2099 with respect to 1979–2003 in the SRES A1B scenario with the 12 member 60 km mesh Meteorological Research Institute (MRI)-Atmospheric General Circulation Model 3.2 (AGCM3.2) multi-physics, multi-SST ensembles (Endo *et al.*, 2012). Precipitation changes are normalized by the global annual mean surface air temperature changes in each scenario. Light hatching denotes where more than 66 percent of models (or members) have the same sign with the ensemble mean changes, while dense hatching denotes where more than 90 percent of models (or members) have the same sign with the ensemble mean changes.

>> Future precipitation levels are likely to decrease, particularly during the main cropping season

When only considering future temperature and precipitation estimates developed under the World Climate Research Programme's (WCRP) Coupled Model Intercomparison Model (CMIP5), Figure 92 shows future projections for different representative concentration pathways (RCP). Generally, higher Representative Concentration Pathways are projected to lead to warmer and drier outcomes, while the variability of precipitation projections around the mean is higher than for temperature projections.

Figure 92. Time series of comparative change relative to 1986–2005 in precipitation and temperature averaged over land grid points in the Caribbean



Source: IPCC (2014).

NOTE: Thin lines denote one ensemble member per model, thick lines the CMIP5 multi-model mean. On the right-hand side, the 5th, 25th, 50th (median), 75th and 95th percentiles of the distribution of 20-year mean changes are given for 2081–2100 in the four RCP scenarios.

While the above projections have been developed using global models, regional modelling studies (Taylor *et al.* 2012), as part of the PRECIS-Caribbean Initiative, found similar results. The Providing Regional Climates for Impacts Studies (PRECIS) regional climate model thus predicts annual surface temperature increases between 1 °C and 5 °C by the end of the century when compared to the 1961–1990 average.

Regarding trends in rainfall, PRECIS show a drying tendency for the main Caribbean basin of between 25 and 30 percent (A2 scenario) by the end of the century, in relation to present day values. Between June and October, which is the mean Caribbean wet season, the drying signal is robust and exceeds historical variability (Taylor *et al.* 2012).

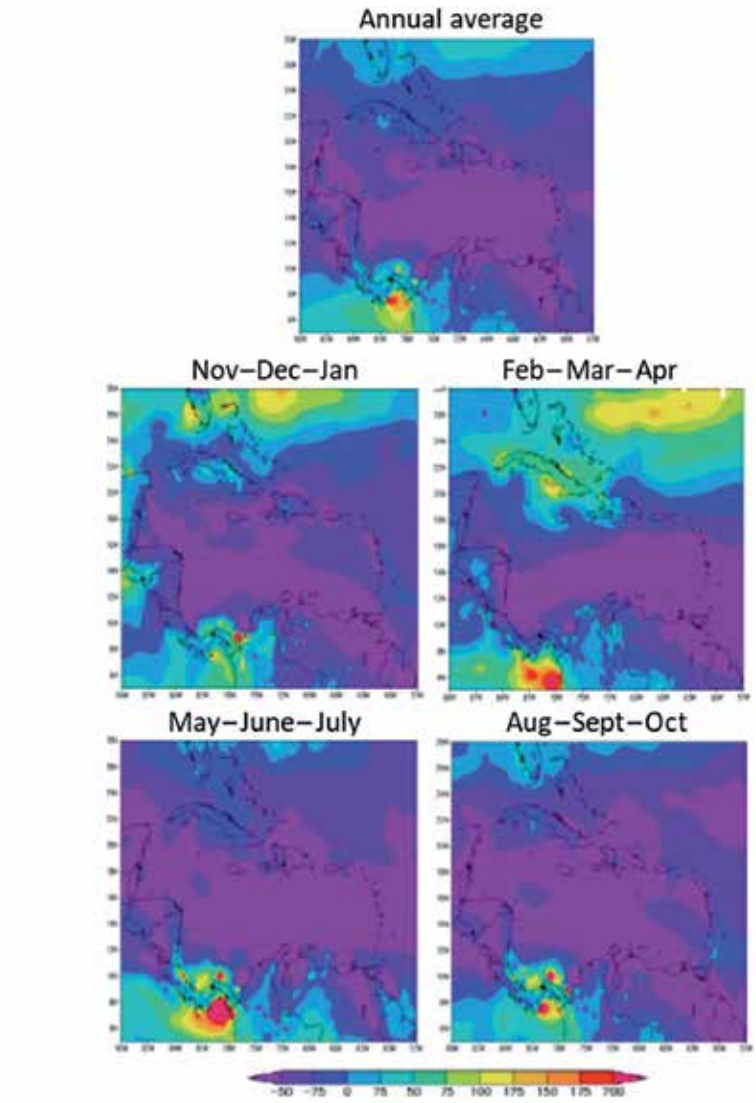
Table 10. Projected average temperature change in 2071–2099 using the PRECIS (Hadley) model across A2 and B2 SRES emission scenarios

Country	Absolute temperature change (°C)
Cayman Islands	2.1 – 2.7
Anguilla	2.3 – 3.2
Barbados	2.0 – 2.6
St. Vincent and the Grenadines	2.1 – 2.7
Guadeloupe	2.1 – 2.8
Antigua and Barbuda	1.9 – 2.4
Turks and Caicos	2.1 – 2.7
St. Kitt and Nevis	1.7 – 2.2

Source: Taylor et al. (2012).

Using the PRECIS-Hadley model, Campbell *et al.* (2011) report a varying rainfall response with seasons. More robust changes are expected from November to January, with the northern Caribbean (north of 22 °N) getting wetter, and the southern Caribbean getting drier. This trend is relatively strong, with the projections indicating an increase of up to 75 percent in precipitation over the northern Caribbean, and a 50 percent decrease over the southern Caribbean. The pattern of the north being wetter than the south is largely absent in the projections for the period spanning from May to October.

Figure 93. Rainfall projections for the period 2071–2100 relative to the period 1961–1990 baseline under the A2 scenario



Source: Taylor et al. (2012).

Future climate change impacts on fishery resources

Fishery resources will be affected by a wide array of future climate change impacts, which can be difficult to quantify at present. According to FAO (2011), one of the most direct impacts of climate change is likely to be a latitudinal shift in catch. Tropical countries may therefore experience a reduction of up to 40 percent in catch potential (FAO, 2011).

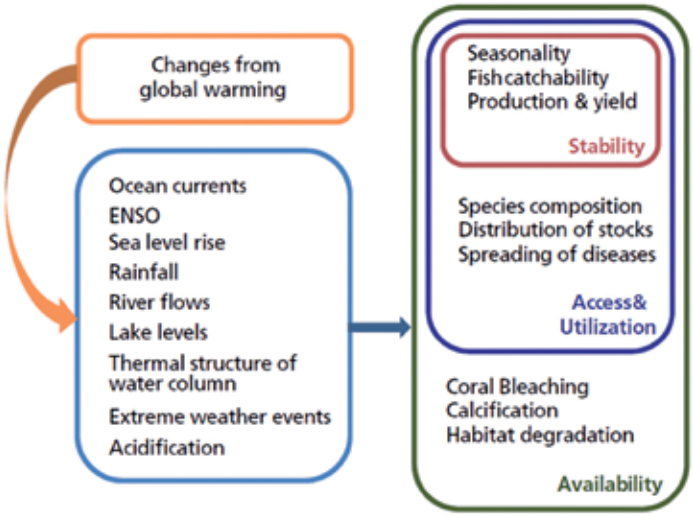
Climate change is also expected to impact the seasonality of biological processes of aquatic systems, alter marine food webs, increase risks of species invasion, and accelerate the spread of vector-borne diseases. In addition, riverine fish habitats will be impacted, for example through changes in groundwater and river flow, which in turn affect marine fisheries. Figure 94 identifies how climate change is expected to impact food security derived from aquatic foods.

Coral bleaching and overall habitat degradation is expected to reduce the overall availability of fishery resources. In the geographic regions most likely to be affected by climate change, the stability

of access to fishery resources will likely be restricted as a result of changes, not only in species composition, but also in the distribution of stocks, and the spread of diseases among marine species.

Fisherfolk will need the financial and institutional resources to adopt alternative technology that may allow them to adapt to the changed situation.

Figure 94. Climate change effects on food security derived from aquatic foods



Source: FAO (2011), adapted from Badjeck et al. (2010).

Projections of future changes and impacts in sea level rise and coastal environments

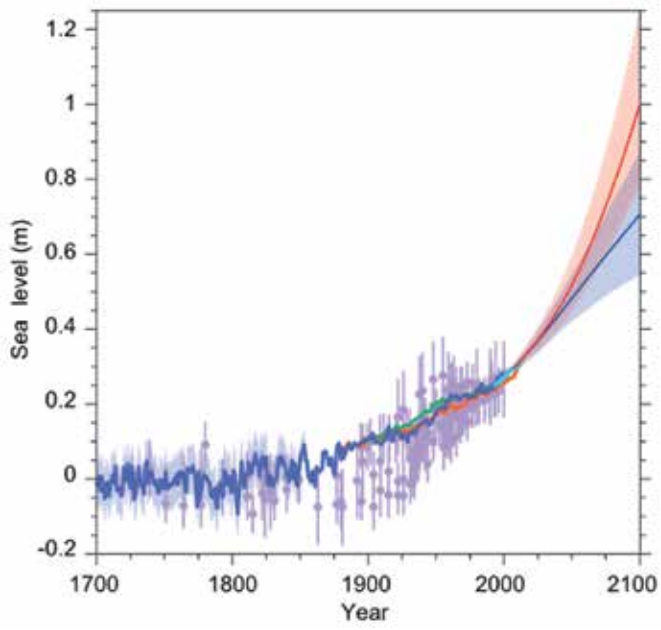
In the twenty-first century, global mean sea level rise is very likely to exceed the average rate of sea level rise during the twentieth century, even if future levels of greenhouse gas emissions are limited (RCP2.6).[59] In the Fifth Assessment Report, the IPCC estimates that sea level rise will continue for centuries, even if GHG concentrations stabilize; though, the extent of sea level rise depends on future GHG emissions.

>> Even if greenhouse gas concentrations stabilize, further sea level rise is expected to occur in the near future

If higher emission scenarios and warm temperature scenarios are realized, the Greenland ice sheet may eventually disappear and average rates in sea level rise may approach levels of the last deglaciation of the Earth, after the Last Glacial Maximum.

59 Anthropogenic GHG emissions are mainly driven by population size, economic activity, lifestyle, energy use, land-use patterns, technology and climate policy. The Representative Concentration Pathways, (RCPs) which are used for making projections based on these factors, describe four different twenty-first century pathways of GHG emissions and atmospheric concentrations, air pollutant emissions and land-use. The RCPs include a stringent mitigation scenario (RCP2.6), two intermediate scenarios (RCP4.5 and RCP6.0) and one scenario with very high GHG emissions (RCP8.5). RCP2.6 is representative of a scenario that aims to keep global warming *likely* below 2°C above pre-industrial temperatures (IPCC, 2014).

Figure 95. Central estimates and likely ranges for projections of global mean sea level rise for RCP2.6 (blue) and RCP8.5 (red)



Source: IPCC (2014).

Sea level rise and changes in coastal environments will negatively affect agriculture and economic growth in BMCs. The main impacts both for economic growth in general, and agriculture in particular, concern:

- ► inundation from sea level rise;
- ► salt water intrusion into ground water and agricultural plains;
- ► coastal land erosion (including mangroves), and beach erosion; and
- ► loss of beach territory and localized landslides.

Table 11 summarizes the main climate change vulnerabilities facing countries in the Caribbean. For the analysis, the Caribbean Community (CARICOM) and the United Nations Development Programme (UNDP) (2010) first categorize CARICOM members by considering the presence of (1) coastal plains less than 10 metres above sea level, (2) low-lying islands, (3) volcanic island coasts, and (4) various geophysical characteristics; then, they characterize the key climate change vulnerabilities, respectively.

Table 11. Summary of central climate change vulnerabilities related to sea level rise (SLR) and coastal environments in CARICOM countries

Geophysical Setting	Key Climate Change Vulnerabilities	CARICOM Members
Coastal plains below 10m	1. Flooding from storms 2. Inundation from SLR 3. Salt water intrusion of ground water 4. Erosion with loss of mangroves	Guyana, Suriname, Belize,
Low lying islands	1. Inundation from SLR 2. Flooding from storms 3. Salt water intrusion of ground water 4. Erosion from SLR and storms	The Bahamas, Barbuda, The Grenadines
Volcanic island coasts	1. Beach erosion from SLR and storms 2. Landslides (locally) 3. Localized flooding from storms	Dominica, Grenada, St Kitts and Nevis, St Lucia, St Vincent, Montserrat
Varied geophysical characteristics	1. Localized erosion by SLR and storms 2. Localized inundation from SLR 3. Localized flooding from storms 3. Localized salt water intrusion of ground water	Antigua, The Bahamas, Haiti, Jamaica and Trinidad and Tobago

Source: CARICOM and UNDP (2010).

The tourism industry in BMCs is particularly vulnerable to the effects of climate change, as most holiday destinations are located in coastal areas, where sea level rise is expected. Decreases in the tourism sector can directly affect a country's agricultural strategy, as tourism generates both indirect and direct demand for agricultural goods. According to CARICOM and UNDP (2010), a significant number of tourist resorts in CARICOM countries could be affected by a one-metre or two-metre sea level rise, respectively (see Table 12).

Table 12. Economic indicators and resort count from inundation and erosion under 1 metre sea level rise (SLR)

Country	Tourism % of GDP	No. of Resorts	Resorts Affected 1m SLR	Resorts Affected 2m SLR	Resorts Affected by 1m SLR and 50m erosion	Resorts Affected by 1m SLR and 100m erosion
Antigua & Barbuda	72%	99	10	18	34	44
Barbados	37%	75	6	24	42	50
Belize	23%	44	32	38	42	44
Dominica	22%	17	0	1	5	6
Grenada	23%	45	5	8	14	19
Guyana	23%	10	0	0	0	0
Haiti	1%	28	13	17	14	17
Jamaica	27%	105	8	19	34	52
Montserrat	1%	1	0	0	0	0
St. Kitts & Nevis	25%	22	14	17	15	18
St. Lucia	51%	30	2	3	5	9
St. Vincent & the Grenadines	29%	21	2	5	8	16
Suriname	23%	19	1	2	2	2
The Bahamas	46%	133	48	66	77	93
Trinidad & Tobago	2%	24	8	15	15	16

Source: CARICOM and UNDP (2010).

In addition to affecting coastal areas, sea level rise will negatively affect national infrastructure and agricultural lands. Table 13 shows CARICOM and UNDP (2010) estimates for the impacts of one-metre sea level rise in CARICOM countries on agricultural land, infrastructure and more.

Table 13. Estimated impacts of one-metre sea level rise in CARICOM countries

	Land Area	Population	Urban Area	Wetland Area	Agricultural Land	Crop and Plantation	Major Tourism Resorts	Airports	Road Network	Protected Areas	Sea Turtle Nests	Power Plants	Ports
Antigua & Barbuda	2%	3%	2%	*	2%	1%	10%	0%	2%	5%	12%	0%	100%
Barbados	1%	1%	<1%	*	<1%	<1%	8%	0%	0%	*	3%	0%	100%
Belize	1%	1%	1%	2%	1%	1%	73%	50%	4%	0%	44%	33%	40%
Dominica	<1%	1%	<1%	*	5%	<1%	0%	0%	14%	0%	7%	0%	67%
Grenada	1%	1%	<1%	*	3%	1%	11%	100%	1%	*	8%	0%	100%
Guyana	<1%	1%	<1%	1%	<1%	*	0%	0%	12%	*	50%	100%	0%
Haiti	<1%	1%	1%	2%	3%	1%	46%	50%	1%	*	44%	0%	100%
Jamaica	<1%	0%	<1%	<1%	1%	<1%	8%	20%	2%	1%	25%	0%	100%
Montserrat	1%	1%	*	*	2%	1%	0%	0%	4%	*	4%	0%	100%
St. Kitts & Nevis	1%	2%	1%	*	5%	1%	64%	50%	0%	*	35%	0%	50%
St. Lucia	1%	1%	<1%	*	1%	1%	7%	50%	0%	0%	6%	0%	100%
St. Vincent & the Grenadines	1%	1%	1%	*	2%	1%	10%	50%	1%	*	11%	0%	67%
Suriname	<1%	1%	1%	<1%	<1%	<1%	5%	0%	7%	0%	0%	0%	100%
The Bahamas	5%	5%	3%	5%	6%	3%	36%	38%	14%	1%	35%	38%	90%
Trinidad & Tobago	1%	1%	1%	<1%	3%	*	33%	50%	1%	0.%	15%	0%	100%

Source: CARICOM and UNDP (2010).

6.4 Challenges and opportunities: Priorities for climate change adaptation

The previous sections identified that climate change and natural hazards are likely to significantly affect agriculture and overall socio-economic development in BMCs, both in the short and the long term.

However, decisive national and regional policy initiatives as well as targeted investments can facilitate both effective climate change adaptation and natural hazard preparedness. While policy measures and investment initiatives are discussed as part of the overall institutional environment later in this report, this section highlights: (1) selected priority areas for climate change adaptation and natural hazard preparedness at the activity level; and (2) priority areas for investment and policymaking concerning climate change adaptation and natural hazard preparedness in agriculture, with low-regret options.[60]

Improving management of water resources

Improving the management of water resources in agriculture is a high priority for BMCs. Better infrastructure is needed to increase the efficiency of irrigation systems for agriculture, while improved water resource management for supplementary irrigation is needed during the rainy seasons as opposed to dryland farming.

Investments in drip irrigation systems are key to achieving increased water efficiency in agriculture; however, such investments involve knowledge intensive tasks, requiring the considerable

60 Low-regret or no-regret options are those options that are valid, regardless of whether expected climate change impacts occur or not.

involvement of farmers. Thus, natural resource conservation strategies, such as sustainable soil management practices, are important complementary measures which can contribute to increased soil water retention. In addition, fresh water harvesting – where technologically possible – can lead to increased water availability.

>> Irrigation infrastructure – one of the main measures to mitigate drought impacts – is scarce throughout the Caribbean

Overall irrigation area is unevenly distributed in BMCs, as shown in Table 14, especially in comparison with countries in close geographical proximity: Cuba, the Dominican Republic, southern parts of the United States of America, and the Bolivarian Republic of Venezuela (see Figure 96).

However, increasing access to irrigation infrastructure can lead to improved agricultural productivity as well as reduced production volatility and associated incomes. Complementary institutional measures are key to ensuring the avoidance of over-exploitation beyond sustainable water extraction rates, as water scarcity is a recurrent issue throughout all BMCs.

Among the BMCs, Barbados, Haiti, and Jamaica have the largest percentage of area with irrigation infrastructure (3 percent, 2 percent, and 2 percent, respectively), while Guyana, Haiti, Jamaica, and Suriname have the largest net area equipped with irrigation facilities. Among the countries with irrigation infrastructure, Haiti, and Trinidad and Tobago report the highest rates of underutilization: 28 percent and 15 percent respectively. Water consumption rates per hectare are highest in Guyana, Haiti, Jamaica, and Trinidad and Tobago.

Table 14. Summary of main irrigation information for countries in the Caribbean

COUNTRY	Area equipped for Irrigation - AEI (ha)	Percentage of total area equipped for irrigation (%)	Area actually irrigated - AAI (ha)	Percentage of AEI actually irrigated (%)	Percentage of AEI equipped for groundwater irrgation	Percentage of AEI equipped for surface irrgation	Water consumption per AAI (m^3/ha)
Anguilla	0	0%	0	0%	na	na	0
Antigua and Barbuda	130	0.2%	130	100%	15%	85%	667
Bahamas	0	0%	0	0%	na	na	0
Barbados	1000	2%	1000	100%	90%	10%	1692
Belize	3548	0.2%	3548.3	100%	23%	77%	1684
British Virgin Islands	0	0%	0	0%	na	na	0
Cayman Islands	0	0%	0	0%	na	na	0
Dominica	0	0%	0	0%	na	na	0
Grenada	219	1%	219	100%	0%	100%	1767
Guyana	150134	1%	150134	100%	0%	100%	2189
Haiti	91502	3%	65424	72%	15%	85%	3493
Jamaica	26444	2%	26444	100%	90%	10%	2207
Montserrat	0	0%	0	0%	na	na	0
Saint Kitts and Nevis	18	0.1%	18	100%	50%	50%	592
Saint Lucia	297	0.5%	297	100%	0%	100%	1795
Saint Vincent and the Grenadines	0	0%	0	0%	na	na	0
Suriname	51180	0.3%	51180	100%	0%	100%	1837
Trinidad and Tobago	3600	1%	3060	85%	10%	90%	2720
Turks and Caicos Islands	0	0%	0	0%	na	na	0

Source: FAO AQUASTAT.

Given that the Caribbean is a water-scarce region, improved water resource management is essential to ensure sustainable water withdrawal rates from surface and groundwater sources. Table 15 shows that, when considering water withdrawal across all sectors (including agriculture), only Barbados exceeds total renewable water resources; although, Saint Kitts and Nevis withdraws an estimated 65 percent of its total available renewable water resources.

When considering the percentage of renewable water resources already currently utilized for agriculture, no country – except for Barbados – uses more than ten percent of renewable water resources for agriculture. Overall, most countries have the capacity to moderately increase irrigation infrastructure and water use, without overexploiting their water resources.

Caution should be taken, however, when interpreting the data in Table 15, as the general availability of renewable water resources at national level do not indicate that water availability is equally spatially distributed throughout a country. Thus, there may be subnational regions where renewable water extraction levels are already heavily exceeded.

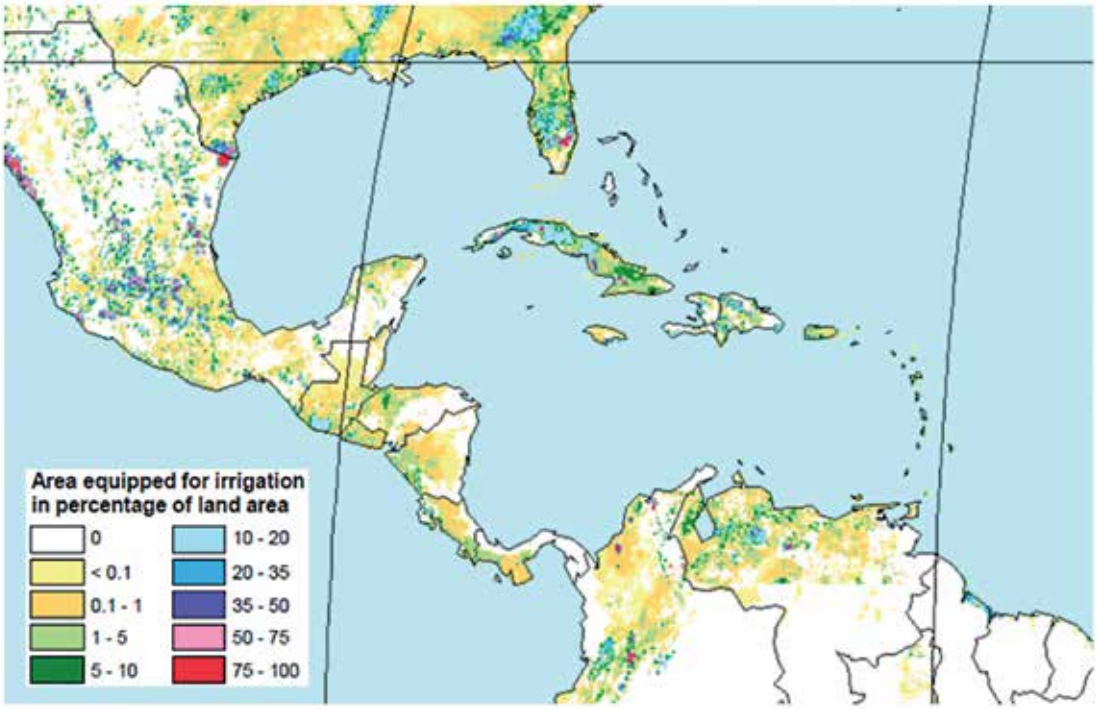
Table 15. Availability of renewable water resources and water usage

COUNTRY	Total renewable water resources	Total water withdrawal	Cultivated area	Total water withdrawal as % of total renewable water resources	Agricultural water withdrawal as % of total renewable water resources	Renewable water resources per cultivated area
	(million m3/year)	(million m3/year)	(ha)	(%)	(%)	(thousand m3/year)
ATG|Antigua and Barbuda	52	11.5	5000	22%	3%	10
BLZ|Belize	21730	101	110000	0.5%	0.3%	198
BRB|Barbados	80	81	12000	101%	69%	7
GRD|Grenada	200	14.1	7000	7%	1%	29
GUY|Guyana	271000	1445	450000	1%	1%	602
HTI|Haiti	14030	1450	1350000	10%	9%	10
JAM|Jamaica	10820	812	215000	8%	4%	50
KNA|Saint Kitts and Nevis	24	15.6	5100	65%	1%	5
LCA|Saint Lucia	300	42.9	10000	14%	10%	30
SUR|Suriname	99000	615.9	71000	1%	0.4%	1394
TTO|Trinidad and Tobago	3840	383.2	47000	10%	0.4%	82
VCT|Saint Vincent and the Grenadines	100	8.5	8000	9%	0.0%	13

Source: FAO AQUASTAT.

A wide range of technology options can be employed to improve and expand irrigation infrastructure throughout BMCs. However, not all technological options are suitable in each location, and they are often subject to adoption barriers and associated with risks – such as property damage or larceny. Water harvesting structures – for rainwater and surface runoff – can increase water availability at crucial moments during the growing season, while drip irrigation technology can increase water application efficiency and reduce labour costs when compared to manual water application. In general, low-cost solutions that are scalable to smaller farm and plot sizes are vital to increase the access to, and adoption of, efficient irrigation technology.

Figure 96. Location and percentage of irrigated area in the Caribbean



Source: FAO AQUASTAT.

Investments in the natural and physical infrastructure of coastal zones

The coastal ecosystems in the Caribbean provide essential ecosystem services (shoreline protection, carbon storage, biodiversity, and habitat provision), and they are subject to a diverse mixture of economic uses, such as tourism and fisheries. However, coastal zones are exposed to a range of hazards, including inundation as a result of storm surges, and sea level rise, while coastal ecosystems are vulnerable to changes in seawater temperatures.

There are many types of investments that can reduce both the pressures on coastal ecosystems, and coastal degradation:

- ▶ marine spatial planning;
- ▶ marine protected areas;
- ▶ fishing regulations;
- ▶ coastal land-use planning;
- ▶ sewage treatment requirements; and
- ▶ integrated watershed management.

Moreover, climate change adaptation and preparedness requires investments in (1) the conservation and restauration of coastal ecosystems, such as mangroves and coral reefs; and (2) breakwaters and further artificial measures of erosion control.

There are strong synergies between coral reef conservation, tourism and urban planning. For example, in Jamaica it is estimated that beach erosion in major beach resort towns could more than double if further significant coral biomass is lost. The precise estimates foresee increased beach erosion rates of 50 percent in Montego Bay, 70 percent in Ocho Rios, and 100 percent in Negril

over a 10-year period if significant coral reef loss occurs (WRI, 2011). Coral reef erosion also leads to increases in coastal flooding, which is a problem for urbanization.

In terms of economic impacts, WRI (2011) estimates that increased beach erosion could drive between 9 000 and 18 000 foreign tourists away from Jamaica each year, costing the country up to USD 19 million in lost tourism revenue per year, and up to USD 23 million in lost revenues to the wider Jamaican economy.

Strengthening agricultural extension systems as well as research and development efforts

Climate change has an impact on agroecological growing conditions. Small farmers will need timely access to climate, pest, and market information services. Therefore, agricultural extension systems are a central pillar of knowledge-intensive agriculture.

However, providers of extension services often face challenges when engaging with small farmers. Diverse and small farms are commonly characterized by a high level of specificity; they require targeted advice as opposed to standardized extension messages. At the same time, the low agricultural income and absence of economies of scale limit the ability of small producers to pay for extension services.

In terms of quality, extension information must be timely, and provide actionable information for management decisions at farm level – as supposed to generic information without direct consequences for current management. Extension systems can also strengthen feedback mechanisms, through which farmers can voice structural information deficits, and shape actual information needs.

Targeted and efficient agricultural extension systems are particularly effective when they are carried out in close collaboration with research and development (R&D) institutions. Accessible, low-cost technologies can help countries to adapt their agricultural systems to a changing climate. Examples include the development of drought-resistant and pest-resistant crop varieties; adequate irrigation technology; water-saving technologies; soil conservation practices; and on-farm risk management practices.

Scaling improved land management practices

Improved land management practices are a key priority for climate change adaptation and preparedness, as they limit soil carbon losses and soil degradation, conserve soil water, and reduce water stress on plant growth and productivity.

Many improved land management practices are readily available and can be adopted at larger scales if short-term adoption barriers are addressed by targeted policy measures. National institutions should be fully supported to thoroughly assess and identify the most suitable land management practices for the country. Examples of agricultural land management practices include permanent crop cover, intercropping with legumes, and reduced forms of tillage and land preparation – such as ripping or planting ditches.

Exploring options for precision agriculture

Precision agriculture is not scale independent; it is largely available to commercial farmers, with larger farms. For example, field- and season-specific assessments of nitrogen and water needs – using drones or other sensor-based technologies – are commonly not available to small farmers. While not all forms of precision agriculture are necessarily suitable for the production context of small farmers, targeted research and development should exploit existing, precision-agriculture opportunities that are suited to smallholder farmers.

In summary, climate change and natural hazards pose key threats to agricultural development in the Caribbean. This chapter identified the vulnerabilities of Caribbean countries to climate change, and the wide range of challenges BMCs will likely face considering average trends in climate, changes in the frequency and intensity of climate events, and natural hazards.

>> Caribbean countries face serious challenges in the context of a changing climate: More severe droughts, temperature increases, lower precipitation levels, sea level rise and saltwater intrusion, increased intensity of cyclones, as well as shifting agricultural seasonality

The main challenges highlighted in this Chapter include increased frequency of droughts, trends towards higher average temperature and lower precipitation during the main agricultural growing season, sea level rise and saltwater intrusion, increased intensity of cyclones as well as shifting agricultural seasonality.

While some positive impacts are associated with climate change, particularly in temperate regions, there are few evident opportunities that arise in the Caribbean as a consequence of climate change. Although rainfall may increase in selected Caribbean regions, it would likely increase during the agricultural off-season; therefore, benefits to agriculture are doubtful. Similarly, increased seawater temperatures may increase fish biomass growth for certain species. However, increased water temperatures and other climate change impacts may also reduce reproduction levels and biomass growth.

>> The availability of additional international financing sources for public sector investments provide one of the few opportunities arising from climate change

While climate change offers few direct opportunities, it may present more indirect, short-term opportunities in the form of additional financing sources for climate-related public sector investments in the Caribbean. For example, in 2018 the Green Climate Fund financed three major projects in the region to develop the climate-resilient water sector, climate-resilient infrastructure, and community resilience.

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7 Institutions and governance

Key messages

- The post-independence period was marked by the establishment and deepening of regional integration, with a shift from the Caribbean Free Trade Association (CARIFTA) to the Caribbean Community (CARICOM), and the establishment of the Organisation of Eastern Caribbean States (OECS).
- The Uruguay Round[61] and the establishment of the World Trade Organization (WTO) ended preferential market access for products exported from African, Caribbean and Pacific Group of States (ACP) countries destined for the European Union. As a result, the gap between agricultural exports and imports has continued to widen in several BMCs.
- Borrowing Member Countries rank very low with regard to the "ease of doing business" indicator, developed by the World Bank. The main business development constraints are related to getting credit, registering properties, and obtaining construction permits.
- Most agricultural assistance programmes have placed emphasis on transferring modern agricultural technologies and providing tangible products, such as irrigation systems and chemical fertilizers. However, the achievements brought about by these efforts will be severely limited without strengthened agricultural policies and good governance.
- Food security and nutrition policies are implemented at the regional level, in particular through the CARICOM Regional Food and Nutrition Security Policy and Action Plan, and at the country level.
- Increases in reported incidents of food-borne diseases (FBDs) have led to the creation of food safety policies and institutions in the region, such as the Caribbean Agricultural Health and Food Safety Agency.
- Integrating climate change adaptation strategies into regional and national policy initiatives can increase resilience and improve preparedness for the expected impacts of climate change on agricultural and economic development in BMCs.
- The CARICOM Youth Development Action Plan (CYDAP) facilitates the integration of youth policies and programmes in BMCs, focusing on youth development through job creation, enhanced social protection, education and training, active participation in the labour market, and more.

61 The Uruguay Round is the eighth round of multilateral trade negotiations conducted within the framework of the General Agreement on Tariffs and Trade (GATT): https://stats.oecd.org/glossary/detail.asp?ID=2822.

7.1 Introduction

This chapter briefly reviews the key institutions and policies that govern economic and agricultural development in BMCs. It presents an overview of the region's investment climate, regional and national agricultural strategies, food security and nutrition directives, trade policies, food safety standards and management, and climate change policies.

For a better understanding of current institutional and policy frameworks in BMCs, it is important to consider the region's historical context. In the years following independence, Caribbean economies continued to be driven by trade arrangements from the pre-independence era, remaining dependent on the export of primary goods. The 1970s saw important state investments in mineral industries: by Guyana and Jamaica in the bauxite industry; and by Trinidad and Tobago in the oil and gas industry. Taxation regimes also changed to collect more income from the mineral export sector.

The establishment and deepening of regional integration was another important feature of the period, with the shift from the Caribbean Free Trade Association (CARIFTA) to the Caribbean Community (CARICOM), and the establishment of Organisation of Eastern Caribbean States (OECS). International economic cooperation was consolidated in 1975 with the signing of the Lomé Convention[62] – a partnership characterised by its non-reciprocal trade benefits for African, Caribbean and Pacific Groups of States (ACP), including unlimited entry to the European Union single market for commodities such as bananas and sugar.

Since the 1980s, Caribbean economies have been characterized by structural adjustment programmes, price stabilization, and trade liberalization. Over the years, the World Bank and the International Monetary Fund have played critical roles in addressing balance of payments difficulties, and reducing vulnerabilities to fiscal crises. Caribbean countries participated in the Uruguay Round negotiations, and joined the World Trade Organization (WTO) at its establishment in 1994, resulting in the region's commitment to the multilateral trading system.

The Uruguay Round and the establishment of the WTO also implied an end to European Union trade preferences for exports from the African, Caribbean and Pacific Group of States (ACP) countries. These trade preferences represented an important inflow of resources through trade for Caribbean countries. While the end of these trade preferences resulted in easier access to Caribbean markets for imports, it also led to a loss of market shares for major export commodities from BMCs. As a result, the gap between agricultural exports and imports grew in the Caribbean.

The widening gap between agricultural exports and imports had a negative effect on a significant proportion of the population living in rural areas in BMCs, particularly affecting those dependent on agricultural activities for their livelihoods. The underlying policy assumption was that, through the effective functioning of factor and product markets, there would be adjustments into alternative areas of production and trade that were more competitive and economically sustainable. However, these adjustments have not yet happened, largely because of market imperfections, weak incentives, and institutional constraints. Policies are key to enabling markets to work better and to building the supply-side capacity.

One indicator of these institutional and policy constraints is the "ease of doing business" score and ranking, developed by the World Bank for 190 economies. The ease of doing business ranking compares economies with one another, while the ease of doing business score benchmarks economies with respect to regulatory best practice, showing the absolute distance to the best

62 See http://www.acp.int/content/lome-convention.

regulatory performance on each Doing Business indicator.[63] The ease of doing business indicator is composed of macroeconomic indicators and factors (bureaucratic, legal and institutional) that shape economic activity.

Caribbean economies rank 124 on average in terms of the ease of doing business, which is very low. As shown in Table 16, the highest ranked economy in the region is Jamaica, at 70 in the global ranking, followed by Trinidad and Tobago, at 102. The economies with the region's lowest rankings are Haiti (181), Grenada (142), and Saint Kitts and Nevis (134).

Table 16. Ranking by ease of doing business in BMCs

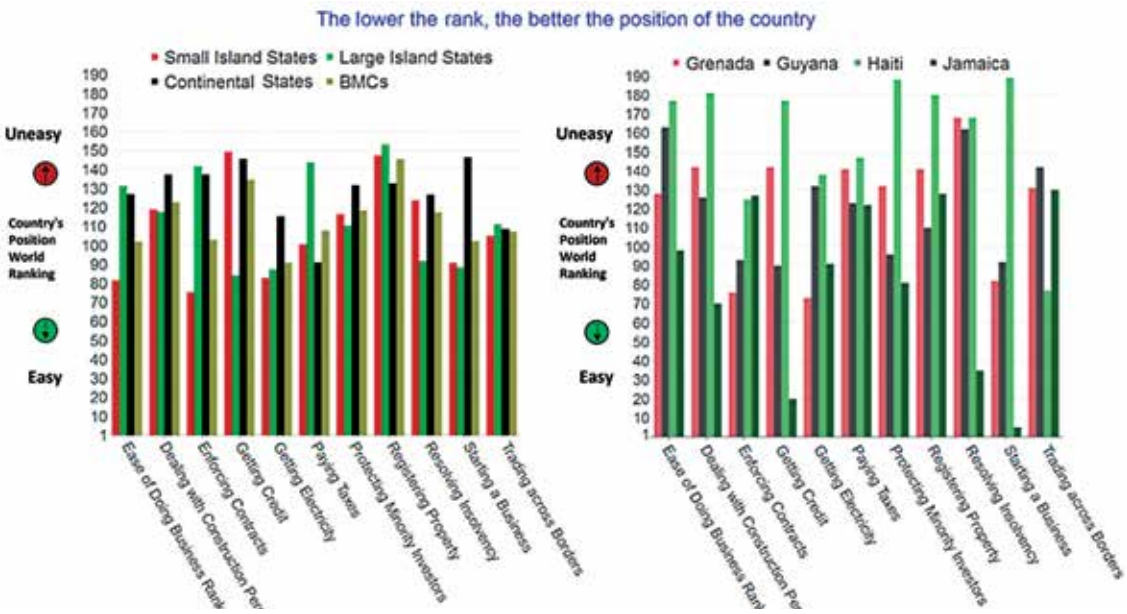
	Rank 2018
Jamaica	70
Trinidad and Tobago	102
Antigua and Barbuda	107
Belize	121
Guyana	126
Barbados	132
Saint Kitts and Nevis	134
Grenada	142
Haiti	181

Source: Adapted from World Bank data.

Figure 97 highlights the many ease of doing business indicators. It shows that, on average, the BMCs' main business development constraints are related to getting credit, registering properties, and obtaining construction permits. However, Jamaica is ranked among the top 10 economies worldwide in terms of access to credit and starting a business: It takes three days to start a business in Jamaica.

63 The ease of doing business ranking ranges from 1 to 190. The ranking of economies is determined by sorting the aggregate ease of doing business scores, rounded to two decimals: http://www.doingbusiness.org/content/dam/doingBusiness/media/Annual-Reports/English/DB19-Chapters/DB19-Score-and-DBRankings.pdf.

Figure 97. Ease of doing business in country clusters and focus countries



Source: Adapted from World Bank data.

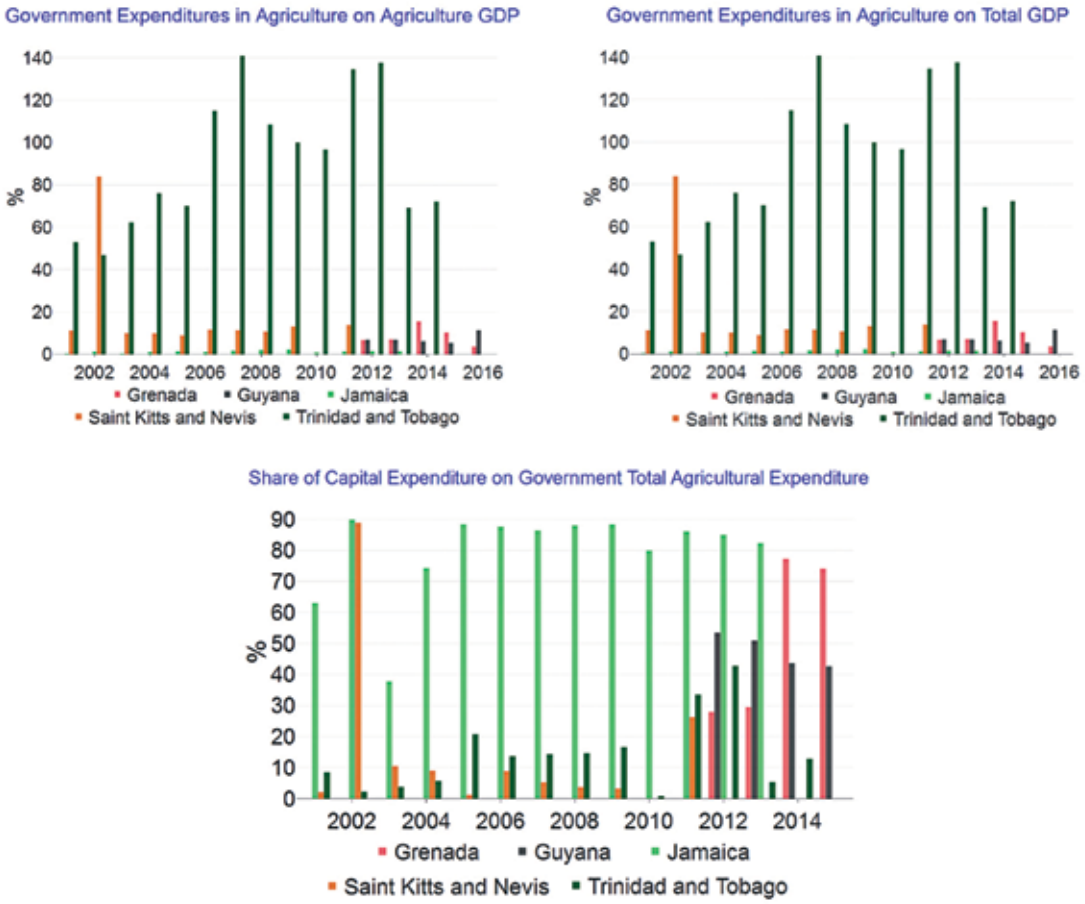
7.2 Agricultural policy and institutional framework

Agriculture is a major driver of economic development in many BMCs, and good governance is key to improving agricultural productivity. Specifically, government expenditure policies are of vital importance for the growth of the agricultural sector.

To date, many regional and international efforts have been launched to improve agricultural productivity in BMCs; however, poor agricultural performance persists owing to the limited physical capital, human capital and technology which drive agricultural modernization. Most assistance programmes have placed emphasis on providing tangible products, such as irrigation systems, chemical fertilizers, and transferring modern agricultural technologies. In recent years, however, policymakers have begun to realize that without good governance, the achievements brought about by these efforts will be severely limited.

Figure 98 shows the large differences among BMCs in terms of budget support to agriculture. Lower agricultural expenditure is evident in several countries. An exception is Trinidad and Tobago: Its share of budget dedicated to agriculture exceeds the sectoral GDP. For Jamaica and Saint Kitts and Nevis, public expenditure on agriculture is mainly dedicated to capital investment.

Figure 98. Government Expenditure in Agriculture



Source: Adapted from FAOSTAT data.

7.2.1 The Caribbean Community Agricultural Policy

The Caribbean Community Agricultural Policy (CAP), which was adopted in October 2011, is the most relevant policy related to the agricultural sector at regional level. The Common Agricultural Policy aims to achieve overall economic growth, reduce poverty and ensure fiscal stability and sustainability by:

- sustaining a broad-based and balanced development of the agricultural sector to ensure food security and economic growth;
- ensuring the sustainable use of natural resources;
- improving rural livelihoods; and
- building an internationally competitive agricultural sector through the promotion of economically viable enterprises.

Moreover, policies supporting the sustainable use and conservation of natural resources will contribute to the increased preparedness of BMCs as they face expected climate challenges.

This common policy builds on previous initiatives and commitments: (1) The revised Treaty of Chaguaramas, 2001; (2) The Jagdeo Initiative, 2004; (3) The CARICOM Single Market and Economy (CSME) Single Development Vision, 2009; and (4) The Liliendaal Declaration on Agriculture and

Food Security, and on Climate Change and Development, 2009.[64] These initiatives present key policy priorities and areas of policy intervention, including concrete proposals for action areas. Strengthened regional agricultural policy is particularly important considering the role of agriculture in the Caribbean Single Market and Economy.

Moreover, regional agricultural policies can address the changing international trade context for agricultural exports, such as for sugar and bananas. Dynamic international trade policies can favour the repositioning and restructuring of Caribbean commodity sectors in national, regional and international markets.

While effective public policies can reshape commodity sectors, policies supporting the private sector are essential, especially for small-scale Caribbean producers, human capital investments and improved innovation and competitiveness in the global framework. In this context, the Caribbean CAP recognizes that "trade policy within CARICOM must be an essential and complementary aspect of the CAP." Though it does not cover policy issues related to traditional agricultural exports, the Caribbean CAP is considered a driving force for the establishment of a structured management system for non-traditional exports.

Developing agricultural production and food value chains at regional level can also reduce countries' exposure to risk and uncertainties. The Caribbean CAP highlights that public goods and services – such as market intelligence and information, quality assurance and standards systems – are more effective when they are provided at the regional level.

The Caribbean Community Agricultural Policy reiterates the five pillars for policy intervention set out in the Treaty of Chaguaramas:

- food and nutrition security;
- production-trade (value) chains;
- sustainable development and natural resources;
- rural modernization and youth programmes; and
- modern knowledge and information systems.

Specific objectives are described within each pillar, together with action plans to provide a basis for rapid implementation; multiple thematic strategies and action plans with regional objectives are presented in each of the policy areas.[65]

Many lessons can be learned from the implementation of the Caribbean Community Agricultural Policy:

- Countries heavily dependent on non-agricultural exports should de-emphasize agriculture and focus on a food security strategy based on the development of food reserves.
- Countries with strong agricultural sectors should continue moving away from traditional agricultural exports (such as sugar and bananas), and instead pursue a strategy of export diversification based on non-traditional commodities, such as a variety of fruits and vegetables.

64 See the Caribbean Community Agricultural Policy for more details: https://issuu.com/caricomorg/docs/caribbean_community_agricultural_po.

65 Cooperation between the private and the public sector can be seen in the various regional programmes carried out to develop value chains for root and tuber crops (cassava and sweet potatoes), herbs and spices (hot peppers), and small ruminants (sheep and goats). These projects aim to boost the region's competitiveness, and their success depends on the improved integration of different components of the value chains – production, processing, marketing, communication strategies, and other downstream activities.

- Countries pursuing an export diversification strategy can meet food security concerns by reducing food imports and expanding production for the domestic market. Import replacement would differ from import substitution to the extent that domestic production would need to be competitive in terms of price, taste, freshness, food quality and food safety.

7.2.2 Agricultural policy and institutional framework in Jamaica[66]

While Jamaica provides a very high level of support to agriculture (by international standards), the support is heavily concentrated on a very small number of favoured subsectors. Not all of the supported subsectors appear to have sustainable growth prospects, while a number of subsectors that appear to be competitive are either unsupported or taxed. Public policy support is lacking for both general services in agriculture, and for climate change adaptation. In its 2017 report, the Inter-American Development Bank (IDB) makes a set of recommendations to improve the framework for developing a competitive agricultural economy, and for reducing poverty at any given level.

Strategic objectives, actors and main documents

Two main strategic documents shape policy directives for agricultural development in Jamaica, from a long-run perspective and a mid-run perspective, respectively: (1) the *Vision 2030 Jamaica*[67] – *National Development Plan,* and (2) the *Medium-Term Socio-Economic Policy Framework* (MTF)[68] to implement the Plan, over the periods 2012–2015, 2015–2018, and 2018–2021. The Plan is focused on achieving inclusive growth and sustainable development; the medium-term themes under the MTF for 2015–2018 include:

- development and protection of human capital;
- national security and justice;
- environmental sustainability and climate change response; and
- economic stability, growth and employment.

In addition, the 2009 National Export Strategy identifies export development as a priority, and focuses on the agri-food processing industry, aquaculture, and coffee.

Overall, the Vision 2030 Jamaica – National Development Plan, the Medium Term Socio-Economic Policy Framework, and the 2009 National Export Strategy can guide agricultural policy shifts in the context of a changing agricultural sector and fiscal austerity. They focus on creating an enabling framework for agriculture which will result in a more competitive sector, with prospects for growth and poverty alleviation in the future.

The Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF) is directly responsible for the administration of programmes and projects related to agriculture, forestry and fishery sectors in Jamaica. The Rural Agricultural Development Authority (RADA) – under the authority of MICAF – is a key institution for the implementation of agricultural policies in Jamaica. In particular, it provides extension services to farmers, delivers agricultural marketing information, and collects data on demand and supply in some local markets. It also allocates budget transfers for rural area development. Those that benefit from such projects can receive inputs, such as fertilizers and seeds.

66 See Shik, Boyce and de Salvo (2017) for more details.

67 For more information on Vision 2030 Jamaica, see http://www.vision2030.gov.jm/Portals/0/NDP/Introduction%20(web).pdf.

68 For more information on the Medium-Term Socio-Economic Policy Framework, see http://www.vision2030.gov.jm/Portals/0/MTF/MTF%202015%20-%202018%20(final).pdf.

Policy instruments

Agricultural support in Jamaica is heavily focused on a small number of products (Shik, Boyce and de Salvo, 2017). Poultry has been the most heavily supported commodity, followed by corn and sugar, whereas coffee, oranges and sweet potatoes have been heavily taxed in recent years.

A number of key instruments support most commodities:

- Tax concessions and waivers of taxes and duties (which greatly reduced after 2013).
- (High) import taxes for selected agri-food commodities.
- Subsidized loans through the Development Bank of Jamaica (DBJ).
- Budget transfers (grants) to selected farmers and processors through various programmes implemented by the Ministry of Agriculture and Fisheries (MOAF) and its subsidiaries.

The agricultural sector contributes less than one percent to national tax revenues, and is allocated just over one percent of the national budget.

The bulk of support is in the form of transfers from consumers, who pay higher prices than they otherwise would, as a result of government policies. This support, in the form of transfers from consumers, has an impact on poverty, as food expenditure represents a large portion of household budget for the poor. Although the government provides some offsetting subsidies to consumers, the overall effect of higher prices persists. The largest transfers from consumers to producers are for poultry, corn and sugar.

Subsidized loans

The Development Bank of Jamaica (DBJ) provides financing to farmers either directly, or through other financial institutions. At the end of 2014, the average commercial loan rate was around thirteen percent, whereas DBJ loans were assigned with a ten percent interest rate for borrowers. The Development Bank of Jamaica reduced its loan rates further, to 5 percent for dairy farmers, and for the revitalization of the banana industry.

Input subsidization

Key agricultural inputs – such as fertilizers, feed and fuel – are imported. As a result, the agriculture sector has become increasingly vulnerable to the volatile prices of imported inputs. Many development projects, whether financed locally or from abroad, include a component of free allocation of inputs to farmers, such as seeds, fertilizers, machinery and irrigation equipment. However, without adequate monitoring and evaluation of the distribution of inputs, the advantages of the different programmes cannot be quantified.

Tax concessions

Special tax regimes for the agricultural sector have a long history in Jamaica. The Agricultural Incentives Act was introduced in 1972, and property tax derating was introduced in 1973. Jamaican farmers could apply to a number of tax concessions; however, a 2013 tax reform erased some tax concessions for farmers. Nevertheless, some benefits were redefined, including the following measures:

- Employment Tax Credit (ETC) – reduced effective corporate income tax.
- Capital allowances.
- Duty-free Importation of Equipment and Machinery.
- Productive Input Relief (PIR) – duty free importation of certain agriculture-related equipment and machinery.

- The exemption of imported farming inputs from the General Consumption Tax; the exemption of imported raw materials for agriculture from the Common External Tariff (CET) and the Additional Stamp Duty.

Grants and public investment

There are many channels for grants and investment support, including (1) marketing and value chain development; (2) irrigation infrastructure development; (3) extension services; and (4) natural disaster relief.

From 2006 to 2014, the Ministry of Industry, Commerce, Agriculture and Fisheries implemented a number of policy projects and programmes, which are listed in Annex 1. These measures focused on improving productivity and competitiveness (agri-food parks, export expansion); food security initiatives; privatizations (coffee and cocoa restructuring); and subsector-specific support measures for banana, sugar, and dairy producers. Other measures of support to the non-traditional subsectors included training in international business practices, promotional trade shows and missions, value chain strengthening, and assistance for complying with international standards.

Nevertheless, the rules and conditions for the distribution of grants and subsidies are not described in the respective programmes. Therefore, farmers are often unaware of the existence of these funds, while a lack of clear guidelines can lead to the inefficient use of funds. For example, compensation for losses due to natural disasters are provided on an ad hoc basis, in the absence of clear rules and formulas for the distribution of the assistance.

7.2.3 Agricultural policy and institutional framework in Guyana

Guyana's structural adjustment and trade liberalisation policies have had a favourable effect on the economy in general, and on the agricultural sector in particular. As a result, these policies have become widely accepted among policymakers, the private sector and the general public.

In addition, the government of Guyana has made the rehabilitation of rural infrastructure (drainage and irrigation, sea defences, and roads) a top priority; it has also prioritized social infrastructure, such as water supply and sanitation, rural schools, and health clinics.

Strategic objectives

During the 1980s, the agricultural sector experienced a continuous decline, along with the rest of the economy. Guyana's most recent agricultural directives are included in the strategic document, *Vision for Agriculture 2020: A National Strategy for Agriculture in Guyana 2013 – 2020*.[69] The strategy adopts a multisectoral approach, and provides clear indicators to ensure a robust monitoring and evaluation mechanism.

In the Analysis of Agricultural Policies in Guyana, Derlagen *et al.* (2017) explain that the strategy is primarily based on the notion that agriculture serves not only to provide a subsistence livelihood, but also to generate wealth and create an entrepreneurial sector that produces food and non-food commodities to meet local and export demand. Compared to earlier agriculture strategies, which primarily focused on specific sets of commodities, Vision for Agriculture 2013–2020 takes a more holistic approach, and seeks to promote both food and non-food agricultural development – such as biofuels. The strategy is based on the F-5 Strategic Approach for Agriculture, which covers the following areas:

69 For more details on the Vision for Agriculture 2020: A National Strategy for Agriculture in Guyana 2013 – 2020, see http://www.fao.org/faolex/results/details/en/c/LEX-FAOC165953/.

1. Food Security – eliminating hunger in Guyana by ensuring equal access to food across the country.
2. Fibre and nutritious food accessible by citizens – ensuring quality nutrition.
3. Fuel production – promoting the development of the biofuel industry, and reducing the dependence on fossil fuel in the country.
4. Fashion and health Products – developing a food processing industry in the country.
5. Furniture and crafts – building a relatively new industry with growth potential.

The strategy also defines the main objectives that will shape the food and agricultural sector, while a set of indicators are defined to measure the level of progress in each domain. Goals include:

- Reducing food import dependency, in particular for corn, soya, and potatoes.
- Increasing exports of rice and sugar.
- Increasing exports of non-traditional crop products.
- Ensuring local demand for milk and dairy products with local production.
- Improving export level potential for meat products.
- Increasing agro-processing activities for both local and international markets.
- Achieving an annual agricultural GDP growth rate higher than 5 percent.

One of the directions that Guyana wants to follow is to diversify the production of the agricultural sector by promoting cassava, peanut, orchard, coconut, and cattle products. The country also aims to improve the milk subsector and offers policy support for: (1) state ownership for sugar; (2) budget transfers to state-owned enterprises for sugar; (3) budget transfers to rice producers; and (4) high import duties for some commodities, such as poultry.

Budget allocation

The total budget of the Ministry of Agriculture has increased significantly in recent years, from GYD 3.25 billion in 2010 to GYD 15.46 billion in 2014, in a period of low inflation. In 2010, this was 2.2 percent of the total government budget, while by 2014, expenditures had grown to 7.2 percent of the government's total budget. For 2015, the Ministry's budget amounted to GYD 20.89 billion, or 10.8 percent of the government's total budget.

Guyana's Ministry of Agriculture ensures the formulation and implementation of policies and programmes that enhance agricultural development in the country. The Ministry operates through four activity areas:

1. Ministry administration, which manages and coordinates the human, physical and financial capacities to ensure the implementation of strategic programmes and plans.
2. Crops and livestock services, which provide support for agricultural development through technical and regulatory services.
3. Fisheries, which regulates and manages fishery activities.
4. Hydro-meteorological services, which execute meteorological, hydrological and oceanographic activities.

Policy instruments

Import and export taxes

Import taxes are a key component of Guyana's overall government revenue generation. Various taxes are collected on imports. These include value-added tax (VAT), excise tax, environmental tax, and stamp duties. In total, the tax revenue on imports generated 43 percent of all tax revenue collected in Guyana in 2013.

All tariff lines in Guyana are bound. The simple average bound tariff rate is 58.3 percent, more than four times higher than the simple average most-favoured nation (MFN) rate (12.1 percent in 2014). The overall MFN rate for agricultural products is significantly higher than for non-agricultural products, averaging 22.7 percent against 10 percent for other products. Imports from CARICOM, as well as from Colombia, Costa Rica, Cuba and the Dominican Republic are duty-free across the tariff lines.

Export duties are applied to all exports of "non-manufactured goods" at a general rate of 1.5 percent. In 2012, duties on exports to the European Union and to the Dominican Republic were eliminated due to the implementation of the Economic Partnership Agreement (EPA) between the Caribbean Forum (Cariforum) and the European Community (EC): CARIFORUM-EU EPA.

Tax concessions

Under the VAT Act, zero rates apply to various food items, including baby formula, flour, milk and milk powder, fresh fruits and vegetables, sugar, eggs, and chicken. In addition, various agricultural inputs are also zero-rated, including fertilizers, pesticides, fungicides, herbicides and weedicides, seeds, machinery, and equipment; prepared animal feeds, hatching eggs, and veterinary medication also fall within this group.

Support to the sugar sector

The government-owned and -operated sugar corporation, Guysuco, is responsible for sugar cane cultivation and sugar production in the country. Raw sugar imports and exports are only licensed to Guysuco, through an exclusive trade license. In case of net losses, the government provides support in the form of budgetary transfers, while the corporation's tax-exempt status provides relief from corporate, property and VAT taxes. In 2009, the Government of Guyana also waived a loan repayment – the loan aimed to modernize the sugar processing plant.

Support to the rice sector

The rice sector is supported through several government policies, including tax concessions, drainage and infrastructure investment, research and development, and extension.

The key rice sector support institution is the Guyana Rice Development Board (GRDB), a government agency that reports to the Ministry of Agriculture. The GRDB was established in 1994, and its mandate is to enhance the industry's development in terms of research, technology transfer, marketing, and product quality control. The GRDB's Burma Rice Research Station develops and releases Guyana's own high-yield and disease-resistant varieties.

7.3 Food and nutrition security policy

Food security and nutrition policies are implemented both at the regional level, in particular through the CARICOM Regional Food and Nutrition Security Policy and Action Plan, and at the country level. In this section, we discuss both CARICOM and two focus countries: Haiti and Grenada.

7.3.1 CARICOM Regional Food and Nutrition Security Policy and Action Plan

The 2007–2008 food price crisis triggered the articulation of a Regional Food and Nutrition Security Policy (RFNSP) in October 2010. The RFNSP established four goals:

- Food availability: Promote the sustainable production, processing, preparation, commercialization and consumption of safe, affordable, nutritious, high-quality Caribbean food commodities/products.
- Food access: Ensure the regular access by Caribbean households, especially the poor and vulnerable, to sufficient quantities of safe, affordable, quality food at all times, particularly in response to diverse socio-economic crises and natural disasters.
- Food utilization/nutritional adequacy: Improve the nutritional status of the Caribbean population, particularly with respect to non-communicable diseases, overweight and obesity.
- Stability of food supply: Improve the resilience of the national communities and households to natural and socio-economic crises.

The Regional Food and Nutrition Security Action Plan (RFNS/AP) provides practical guidelines for the implementation of the RFNSP, while the implementation of the RFNS/AP is directly connected to National Food and Nutrition Security Policies and Action Plans (NFNSP/AP).

7.3.2 National food and nutrition security policies and action plans

National Food and Nutrition Security Policies and Action Plans (NFNSP/AP) are developed in most Caribbean countries. They are aligned with the Regional Food and Nutrition Food Security Policy/ Action Plan, which facilitates technical and financial resource allocation. This alignment helps to address challenges, such as chronic non-communicable diseases and other food and nutrition concerns, in a more systematic and coordinated way. National Food and Nutrition Security Policies and Action Plans build on previous nutrition directives developed by the Caribbean Food and Nutrition Institute, which focus on improved nutrition, specifically with regard to women, micronutrients, and infectious diseases. A wide array of initiatives are included in the NFNSP:

- Promoting country specific food-based dietary guidelines.
- Encouraging exclusive breastfeeding for the first six months.
- Supporting "Healthy Eating for Healthy Living", based on encouraging regular physical exercise, and diets based on foods from the six food groups in proportions stipulated in the recommended daily allowance.
- Implementing school feeding programmes that focus on healthy eating at schools and in homes.
- Celebrating World Food Day on 16 October and annual Nutrition Day on 1 June.
- Establishing weekly/monthly farmers' markets in urban areas to encourage the consumption of fruits and vegetables, and to create markets for small farmers.
- Encouraging backyard gardens to increase healthy food production at household level, mainly vegetables and herbs.
- Promoting healthy lifestyles among school children.
- Raising citizens' awareness of the link between food, nutrition, and health.

7.3.3 Food and nutrition security institutional and policy framework in Haiti

Multiple strategic objectives, such as reducing hunger and poverty, and promoting economic development, can be achieved with the aid of solid institutional structures and coordination. The National Coordination Agency for Food Security (CNSA), established in 1996, is in charge of formulating and implementing food security policies and programmes under the supervision of the Ministry of Agriculture. The CNSA also acts in times of crises. In particular, CNSA is responsible for

managing the use of foreign aid for food security activities, as well as developing and implementing a food security monitoring system. In addition, CNSA collects data, disseminates information regarding the state of food security, and observes food price patterns at different levels, to provide early warnings of impending food crises.

Several strategic documents and programmes include Haiti's goal to enhance food and nutrition security. These include:

- **The Strategic Development Plan** (2012), which is centred on the reconstruction of the country following the 2010 disaster, and on creating opportunities for Haiti to become an emerging country by 2030. Risk management and risk-coping strategies, together with food security policies and institutional arrangements are integrated in this Strategic Development Plan.
- **The National Plan for Food Security**, which was first developed in 1996, then adjusted in 2010 by the National Coordination Agency for Food Security. Its objectives are to address the multiple dimensions of food security so as to eliminate extreme hunger by 2025. The Plan highlights the agriculture sector's potential to not only increase the availability of food, but to also generate higher employment and incomes in rural areas, which are the most affected by poverty and food insecurity.
- **The Agricultural Recovery Programme** (2013–2016), which is based on the Agricultural Development Policy (2010–2025), promotes agricultural development with different policies and measures. One of its main objectives is to support agricultural households by improving access to the inputs and services which increase productivity and agricultural incomes, thereby ensuring food self-sufficiency. This Programme also includes public interventions to promote the sustainable management of natural resources, and aims to strengthen the capacities of the Ministry of Agriculture to manage, monitor and evaluate agricultural policies.

The government's commitment to eliminating hunger is also reflected by an increase in budget allocations to address food security. In particular, public expenditures on improving food security and reducing poverty have increased from 40 percent of total public expenditure between 2007 and 2009, to 59 percent in 2012/2013 (FAO, 2015).

In 2013, the Government of Haiti ratified the International Covenant on Economic, Social and Cultural Rights, which acknowledges the right of all people to adequate access to food and avoidance of hunger. This ratification, together with proposals to formulate a law on food security, is indicative of the government's commitment to achieving and guaranteeing food security. It is important to note that the Haitian Constitution emphasizes the right of every citizen to food.

7.3.4 Food and nutrition security institutional and policy framework in Grenada[70]

The Government of Grenada has engaged in a more holistic approach to achieve stable food and nutrition security. Achieving food security is a multisectoral and multidimensional challenge, which is why the Government of Grenada established a National Food Security Committee in 2008, comprising representatives from the following institutions, organizations and sectors: the Ministry of Agriculture and the Food Security Programme Manager, the Ministry of Finance, the Ministry of Health, the Ministry of Education, the Ministry of Youth Empowerment and Sports, the Ministry of Social Development Marketing and National Importing Board, the Grenada Food and Nutrition Council, non-governmental organizations, farmers' associations, and the private sector.

The responsibilities of the National Food Security Committee are the following:

70 Grenada Food and Nutrition Security Situation Analysis (2012).

- Develop a comprehensive, coherent national plan to improve the nation's food security.
- Monitor the progress of the plan.
- Ensure coordination, collaboration and coherence of activities.
- Set targets to monitor and evaluate the performance of the plan, including its implementing components and personnel.

The Grenada Food and Nutrition Council (Council) is another important institution, which was established in 1980 to promote adequate nutrition for the whole population. The Community Nutrition Programme is implemented by community nutrition officers assigned to each parish. The Grenada Food and Nutrition Council provides a variety of services to individuals and communities, such as nutrition education, nutrition counselling, surveillance, product development and training, and community nutrition programmes in group and individual sessions at health facilities and in homes.

The following strategic plans and programmes reflect Grenada's goal to enhance food and nutrition security:

- **Food and Nutrition Policy and Plan of Action for Grenada** (2007) – outlining the roles of the Ministries of Health, Education and Agriculture in the field of food and nutrition security, and the guidelines for policy and action implementation.
- **Grenada Food Security Enhancement Programme** (2010) – including budget allocations for 2010, with emphasis on the consumption of locally produced food.
- **School Feeding Programme** – providing nutritionally adequate school meals in all primary and secondary schools to children who are distant from their homes, from low-income families, or from single-parent households.
- **Regional Food and Nutrition Security Policy** (2010) – promoting increased regional food security, with reinforced agricultural development.
- **Grenada Agricultural Policy** (2006) – including the aim to ensure food security for the population.
- **Social Safety Net Policy Framework** (2011) – delivering social assistance, covering all the social safety net programmes.
- **Grenada Growth and Poverty Reduction Strategy** (2011) – enhancing economic growth with a five-year road map for poverty alleviation and poverty reduction.

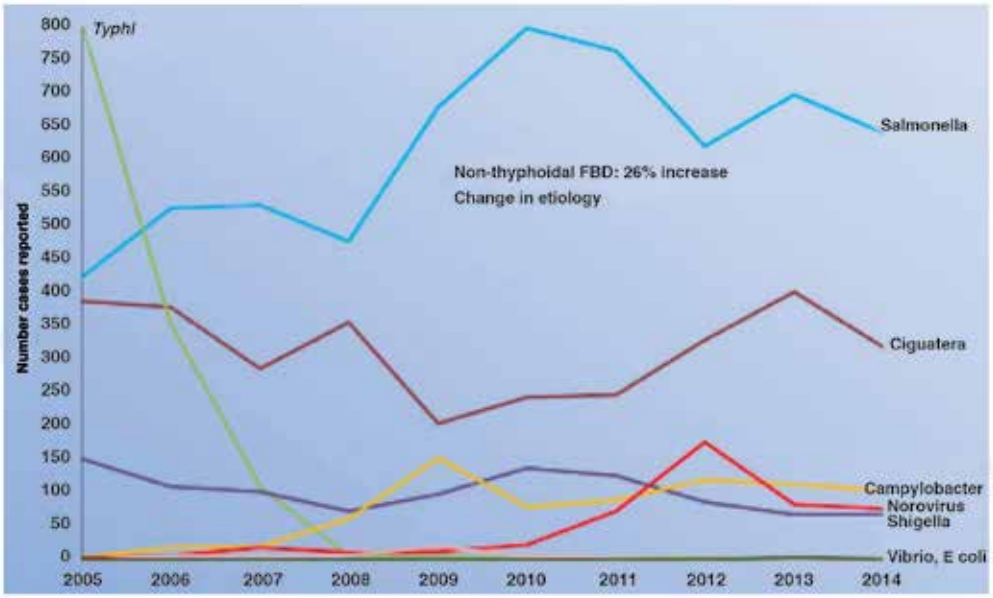
7.4 Food safety regulations

Data from the Caribbean Epidemiology Centre suggest that the burden of food-borne diseases (FBD) is increasing in the region. Figure 99 shows the reported cases of FBD pathogens in the Caribbean region from 2005–2014. Recent statistics also show that the consequences for some of the reported cases can be severe and long term. Many of these outbreaks occurred on cruise ships and in touristic areas and hotels; therefore, the tourism sector may also be negatively affected by the incidence of food-borne diseases. Data from laboratory test results confirm that the most commonly reported food-borne pathogen is Salmonella, followed by Ciguatera – Ciguatera fish poisoning (CFP).

In the Caribbean, there is limited information on the morbidity and mortality associated with food-borne diseases. The sources of pathogens and their introduction into the food supply chain remain unclear; however, governments and regional institutions periodically focus on infectious diseases as

part of their disease surveillance efforts. For example, Indar (2015) reports that one in every eleven persons in the Caribbean suffers from diarrhoea at least once a year.

Figure 99. Reported cases of food-borne disease pathogens in the Caribbean



Source: Indar (2015).

Such concerns have given rise to food safety policies and institutions in the region, such as the Caribbean Agricultural Health and Food Safety Agency. We also discuss the Jamaican Food Safety Policy in Section 7.4.2.

7.4.1 The Caribbean Agricultural Health and Food Safety Agency (CAHFSA)

The Caribbean Agricultural Health and Food Security Agency (CAHSFA) was launched in March 2010 in Suriname; it provides support to CARICOM countries to establish, manage, operate and implement agricultural health and food safety (AHFS) programmes along the value chain. The Agency (1) helps Caribbean states to develop and strengthen their national agricultural health and food safety standards and infrastructure; and (2) provides support to the different National Agricultural Health and Food Safety Agencies (NAHFSAs) to ensure the safety of imported foods.

The Caribbean Agricultural Health and Food Security Agency plays a central role in agricultural health and food safety matters in the region: providing assistance to strengthen compliance with SPS trade regulations; and surveying increased risk of pests, diseases and food-borne illnesses from imported foods. One of the main objectives of CAHFSA is to encourage the recognition of accreditation and certification systems based on internationally established criteria, and to facilitate the international competitiveness of Caribbean goods and services.

7.4.2 Food safety regulation in Jamaica[71]

In Jamaica, food safety is the shared responsibility of three main ministries, namely the Ministry of Agriculture and Fisheries, the Ministry of Health, and the Industry Investment and Commerce

71 For more details, see the National Food Safety Policy (2013).

Ministry. There are about 20 Acts and Regulations – regulated and administrated by the three Ministries – which inform the current food safety programme and activities.

In order to establish vertical compliance, all the regulatory parties would have to act in a coordinated and systematic manner. There have been attempts to create a single, food safety agency in charge of regulating food production, from farm to table: storage, processing, marketing, shipping/transporting, wholesaling, retailing, and so on. In October 2001, a National Quality Policy recommended that a single, national food safety agency be established. Until 2010, the Ministry of Agriculture was in charge of the Agricultural Support Services Project, which covered food safety. Subsequently, the National Agricultural Health and Food Safety Coordinating Committee (NAHFSCC) was established to coordinate the relevant regulatory activities of the food safety agencies – though the committee has no legal status. Currently, no single agency is responsible for coordinating Jamaica's food safety programme with legal authority.

The policy goal is to advance the national food safety and security systems, with respect to national and international standards aimed at (1) safeguarding human, animal, plant and environmental health; and (2) facilitating trade through compliance with international trade agreements and standards. The aim of the National Food Safety Policy is to cover all aspects of national, regional, and international practices, principles, guidelines, standards and agreements governing food safety systems; the goals are as follows:

- Establish one food safety system.
- Ensure that food consumed is safe, sound and wholesome.
- Implement a system of traceability for food from production to consumption.
- Institute a formal risk analysis system to enhance food safety.
- Integrate institutional arrangements and capabilities for the efficient and effective management of the food safety system.
- Promulgate appropriate legislation to support food safety.
- Effect behavioural change through heightened public awareness about food safety issues.

7.5 Climate change policies and agriculture

As a response to the expected impacts of climate change on agriculture and overall economic development in the Caribbean, various regional and national policy initiatives aim at an active integration of climate resilience and climate change adaptation into policies at various levels.

Several of these policies are discussed in Chapter 6, such as the Liliendaal Declaration on Agriculture and Food Security, and on Climate Change and Development (2009), which provide regionally agreed policy objectives with a strong focus on climate change in agriculture. The Liliendaal Declaration provided an overall political vision and commitment to take actions, at the regional and national level, for a transition towards climate-resilient development.

Subsequently, the Caribbean Community Climate Change Centre (CCCCC) developed the Regional Framework for Achieving Development Resilient to Climate Change, along with an associated implementation plan.[72]

72 For more details on the Regional Framework for Achieving Development Resilient to Climate Change, see https://www.caribbeanclimate.bz/2009–2021-regional-planning-for-climate-compatible-development-in-the-region/.

The CARICOM Regional Framework adopts a strategic approach to address climate change mitigation and adaptation, offering clear goals and a road map for action. The implementation plan provides clear guidance on how climate change can be mainstreamed into national development and planning processes in CARICOM Member States.

The implementation plan foresees that Member States develop (1) a coordination mechanism that oversees planning and implementation at the level of each member country, (2) a national implementation plan, and (3) a monitoring and implementation plan.

Climate change mitigation also plays a major role in climate change policy for agriculture. Fourteen BMCs have ratified the Paris Agreement: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago. Although Caribbean states were quick to ratify the Paris Agreement, the available Nationally Determined Contributions (NDCs) had, for the most part, not yet translated into actionable plans that could be financed and implemented at the national level. Yet, the Green Climate Fund endorsed three projects for the Caribbean in early 2018.

7.6 Gender equality: Institutional and policy framework

One of the remaining challenges across the BMCs is gender inequality (see Chapter 3). However, important progress has been made to lower the socio-economic and legal gaps between men and women, in particular regarding inheritance laws that give rights to women, and laws against domestic violence (CDB, 2015). Many BMCs have drafted their national gender policy, including Belize, the British Virgin Islands, the Cayman Islands, Dominica, and Jamaica.

7.6.1 Gender equality policy in Jamaica

In its efforts to build a society where gender balance, equality and equity are valued, the Vision 2030 Jamaica National Development Plan incorporates a commitment to eliminate any form of gender discrimination by identifying and addressing constraints to women's empowerment.

There are three main objectives of this policy:

1. Reduce gender discrimination and promote gender equality and social justice.
2. Build and strengthen institutional capacities to mainstream gender in different segments of the cultural, social, economic, and political set-up.
3. Ensure sustainable, pro-gender behaviour modification and improve the efficiency and the capacity of the public sector to develop, implement and monitor gender-oriented plans, projects, programmes, and policies.

Jamaica's cross-cutting, national policy for gender equality is aligned with several other national policy and legislative measures. The policy baseline is built on principles of social justice, human rights, equality and equity, good governance, accountability and transparency, and participation. Its strategies and tools include gender mainstreaming, gender budgeting, gender-aware programming, gender analysis, cross-sectoral collaboration, gender training, gender-aware monitoring and evaluation, and gender legislative actions. Some of these tools are briefly described in the following sections.

7.6.2 Gender policies in other focus countries

Grenada, Guyana and Haiti have not yet developed national gender policies, although all of the focus countries were signatories to the United Nations Convention on the Elimination of Discrimination

against Women (CEDAW), and other international conventions related to the inclusion of gender issues in national policies and planning. However, other gender-oriented initiatives have been implemented in the countries, such as the establishment of Gender Commissions/Bureaus, and increased social protection spending.

Guyana's Women and Gender Equality Commission is a constitutional body that was established in 2010 to inspect and promote gender equality in the public and private sector. The Commission has developed a five-year strategic plan for the period 2013–2018. The Women Affairs Bureau of the Ministry of Labour, Human Services and Social Security contributes to the policy and programme formulation by promoting gender awareness and gender-related research.

In Grenada, the Division of Gender and Family Affairs in the Ministry of Social Development and Housing has the institutional responsibility to promote gender equality. In particular, the Division has two main roles: (1) to ensure gender equality and women's empowerment in Grenada, and (2) to promote and facilitate gender mainstreaming in other government ministries and entities. Grenada has progressed in its gender equality advancements: It has increased the participation of women in public decision-making and in exercising power, and has made efforts to address all forms of violence against women.

7.6.3 Gender policy tools

Gender budgeting is the use of fiscal policies and administration to advance gender equality. Several examples of gender budgeting efforts can be noted for the BMCs. One of the earliest examples took place in Barbados, in the form of a training seminar for government officials that required carrying out a gender-responsive analysis of the ministries' budgets. A similar gender budget exercise was meant to be held in Saint Kitts and Nevis within the Ministries of Finance and Agriculture; however, it did not take place, as the initiative was not supported by some public sector officials.

In Trinidad and Tobago, the Ministry of Gender, Youth and Child Development led a gender initiative – as part of the 2014 Budget Plan – aimed at developing guidelines to implement gender budgeting and to mainstream gender across ministries. In 2015, the United Nations Entity for Gender Equality and the Empowerment of Women (UN Women), the United Nation's Children Fund (UNICEF), and the Organisation of Eastern Caribbean States (OECS) Commission organized a regional workshop to promote the budgeting of child- and gender-related policies and social protection programmes. More recently, Saint Vincent and the Grenadines have increased their efforts to mainstream gender into macroeconomic planning.

While gender budgeting is not a widespread practice in BMCs, social protection policies are often implemented to address gender issues. Barbados, Jamaica and Trinidad and Tobago have well-established social protection and social safety-net programmes for women and children belonging to households with low incomes. In 2014, Grenada adopted a gender-oriented, Social Protection Policy Framework, while Saint Kitts and Nevis adopted the pro-gender Social Development Assistance Act. In Saint Lucia, gender initiatives are included in the National Social Protection Policy and Strategic Action Plan, and Budget and Fiscal Analysis for Social Protection. Guyana in particular has several social sector programmes and plans, covering areas such as water, health, education, housing, employment, and human services.

7.7 Youth development: Institutional and policy framework

More than half of the population in BMCs is under the age of thirty. Therefore, youth development issues are of central importance for the region, such as access to education, employment opportunities, safety and security, health and well-being.

The Caribbean Community's Youth Programme works with Member States, Youth Ambassadors, and parties (locally, regionally, and internationally) to formulate and implement programmes and projects to meet youth advancement goals in the CARICOM community. Currently, the CARICOM Youth Development Action Plan (CYDAP) is the principal CARICOM strategy that provides guidelines for interventions that will create decent jobs, enhance social protection, strengthen skills for employment and entrepreneurship, and promote active participation in the labour market. Overall, the CARICOM Youth Development Action Plan emphasizes that the youth are assets for development, not liabilities.

In 2015, the Caribbean Development Bank steered the pilot of a Basic Needs Trust Fund (BNTF) youth empowerment project. The aim was to foster financial support for youth entrepreneurship and other capacity-building strategies targeted towards high-risk youth in the Caribbean. The project led to an outcome-oriented initiative focused on youth resilience and empowerment in 2016.

7.7.1 Youth development policies in Grenada

Grenada is a signatory to the CARICOM Youth Development Action Plan 2012–2017. However, the government has not yet adopted a national youth policy. The Division of Youth Empowerment, within the Ministry of Youth Empowerment and Sports (MoYES), is responsible for youth issues.

The MoYES administers the youth-oriented, Imani Programme, which is Grenada's main youth employment initiative. For 18 months, a stipend is paid to participants, roughly the equivalent of USD 260 to USD 370, depending on the qualifications; although, the future of the Imani Programme is uncertain.

7.7.2 Youth development policies in Guyana

Guyana, a Commonwealth of Nations member, is still developing its national youth policy initiative, though it has long since signed the Commonwealth Plan of Action for Youth Empowerment (PAYE) 2006–2015. The institutional body that is responsible for youth issues is the Ministry of Culture, Youth and Sport (MCYS), which aims to ensure equal access to culture and sporting experiences for youth. The country plans to launch a national youth council, and to establish a national youth policy.

In Haiti, there are two governmental bodies which are responsible for youth issues: (1) the Ministry of Education, and (2) the Ministry of Youth, Sport and Civic Action. Haiti's 2010–2015 Operational Plan, prepared by the Ministry of Education, was aimed at addressing challenges in the education system, such as accessibility and quality. The aims changed, however, following the 2010 earthquake, as the focus shifted to providing solutions for the destruction of academic infrastructure and displaced youth without access to the education system. The responsibilities of the Ministry of Youth, Sport and Civic Action concerning youth are to develop, coordinate and monitor sports, including the training of sport administrators, and to enhance youth leadership.

7.7.3 Youth development policies in Jamaica

Jamaica is a signatory of the Commonwealth Plan of Action for Youth Empowerment (PAYE) 2006–2015. The country's national youth policy was revised and approved in 2017, and the main domains of intervention for youth include: living environments, education and training, employment and entrepreneurship, health, participation and empowerment, care and protection.

The National Centre for Youth Development, a division in the Ministry of Youth and Culture, is responsible for the coordination and implementation of programmes, services and activities to enhance youth development. The National Youth Council of Jamaica is an umbrella organization, including local youth clubs, which assists with the formulation, implementation and evaluation of

youth policy. The National Youth Council of Jamaica is a member of the Commonwealth Youth Council and the Youth Ambassadors of the CARICOM Youth programme.

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8 Challenges, opportunities, and investment priorities

8.1 Introduction

Historically, agricultural supply chains and trade in BMCs were heavily targeted towards export to the European Union. Large plantations of sugar and bananas produced agricultural commodities for exports. However, European Union policy reforms had a dramatic effect on export demand for Caribbean agricultural products, stimulating a restructuring of BMC farming systems, and a shift in exports from raw materials (agricultural products) to processed food products.

One of the major challenges facing the agriculture sector in the BMCs is the continued diversification process. Yet, while export markets to the European Union have dwindled, tourism in BMCs has increased rapidly; the global and local agri-food value chains have also been transformed. While natural hazards have always presented a challenge for agri-food systems in BMCs, climate change is expected to bring new challenges.

Despite these obstacles, there are many opportunities for agricultural development and economic growth in BMCs, and consequently for food security and poverty reduction. Though, being a heterogeneous set of countries, BMCs often experience challenges and opportunities differently.

In this final Chapter, we summarize the key challenges facing the agriculture sector in BMCs, and identify the main opportunities for investment. The priorities outlined are based on the analyses in the previous chapters, and on the expert reports that were conducted on horticulture, livestock, fisheries and aquaculture, gender equality and youth empowerment, nutrition, infrastructure, and climate change adaptation.[73]

The cross-cutting policy and institutional challenges discussed in Chapter 7 apply to many of the issues which were covered throughout the various chapters, and are integrated in the final sections of this report. For example, regional coordination and collaboration is important for most BMCs, which are relatively small, and thus have limited capacity to govern major emerging issues, such as on trade, climate change, resource management, food safety, and more. Many of the governance issues also have a regional and international component, demanding a regional/international response. Although many regional initiatives are well underway – CARICOM, the Common Agricultural Policy, OECS, and the Caribbean Agricultural Health and Food Safety Agency – there is still great potential to further strengthen intra-regional governance.

8.2 Economic growth, employment, and poverty

Borrowing member countries have experienced lower economic growth in the past 35 years than any other developing region in the world. According to the IMF (2018), most of the BMCs will continue to underperform in the near future. The economies of the BMCs are expected to grow at 2.5 percent per year for the period 2016–2023, while the world economy is expected to continue to grow at about 4 percent per year. Lower economic growth in BMCs has constrained poverty reduction in the region.

73 The expert reports focused on strategic investments and policy and institutional changes in specific areas are available in the online Annex to this report.

The potential of agriculture for development and poverty reduction remains largely untapped in BMCs. Agriculture can be an important source of economic growth and a key contributor to poverty reduction, particularly for households that benefit less from the growth in tourism, financial services, and natural resource extraction. In fact, research suggests that **agricultural growth is the most efficient way to reduce poverty in rural areas**.

At the same time, BMCs are **heterogeneous** in terms of economic development, poverty, and other socio-economic indicators**.** Haiti, however, is an extreme outlier with much lower incomes, much higher poverty and undernutrition rates, and a much higher level of natural disaster damage in recent years.

The average BMC unemployment rate is around 11 percent. Though it had decreased from the very high levels in the 1980s, unemployment rose again following the 2008–2009 global financial crisis. The youth unemployment rate is significantly higher than the overall average.

Relative to their income classification (mostly upper-middle-income), BMCs underperform in terms of the ease of doing business. The main issues are related to getting credit, registering properties, and construction permits, but there is also much room for improvement regarding contract enforcement and trading across borders.

Improving the policy and regulatory environment which promotes investments in agriculture and agribusiness can spur agricultural and economic growth. Reducing policy uncertainty, corruption, and administrative burdens to comply with government regulations, as well as clarifying ill-defined property rights (including land rights), will attract potential investors, thus resulting in more demand for high-quality agricultural products and more value chain innovations.

Increasing competition at various stages of the agri-food value chain is key to ensuring the fair distribution of surplus along the value chain, and therefore to agricultural development, poverty reduction and economic growth (World Bank Group, 2016). Competition authorities can monitor and intervene if certain subsectors tend to become too concentrated, or if cartels form. In addition, governments should be aware of how their own actions affect competition: Subsidies for inputs (such as fertilizers), state-owned enterprises, or selective support to companies can distort prices, create an unfair advantage, and crowd out the private sector.

Continuous public–private dialogue is necessary to ensure good governance and effective value chain development strategies. Input from private actors is important to identify the key binding constraints on the further development of value chains, and to prioritize public investments. Public-private dialogue can also enhance the private sector's acceptance of public concerns and policy anticipation. In general, **public–private dialogue can be used to map public and private objectives and to identify areas for collaboration**.

8.3 Food and nutrition security

The food insecurity and nutritional challenges of the BMCs include high and persistent rates of inadequate food access, together with rising rates of obesity. Currently food availability, in terms of calories, is adequate in all BMCs, except for Haiti. This makes food insecurity largely an access and utilization problem associated with poverty, inequality, and high prices. On average, about 15 percent of the population in BMCs is undernourished. Much heterogeneity within BMCs exists, however. In Haiti, for example, the prevalence of undernourishment is closer to 50 percent, while in Barbados, it is only 4.4 percent. These high levels of undernourishment coexist with rising rates of obesity. Between 2000 and 2015, the prevalence of obesity in BMCs increased from around 16 percent to about 25 percent.

The synergies between agriculture and food security can be strengthened. Food security and agriculture are closely related. The regional agricultural sector affects the local availability of nutrients and price levels, and thus the extent to which people can access these nutrients. In addition, many food insecure people depend on the agricultural sector for their livelihoods.

Agricultural policies and programmes directly affect the income and food access of food insecure households, while the types of crops being (implicitly) promoted have a direct impact on what people eat and on their nutritional status. Directly or indirectly promoting the production or imports of energy-dense foods, for example, makes the consumption of these foods relatively more attractive for consumers, and may lead to increased overweight and obesity rates. Conversely, undernutrition can be reduced by promoting imports and the production of foods which provide the essential nutrients for consumer diets. Synergies can be achieved by (1) making agricultural policies and programmes more nutrition-sensitive; (2) explicitly taking the nutritional effects of agriculture into account; and (3) preceding agricultural investments with a food system analysis that considers the consumer's nutritional needs above all.

Facilitating further intra-regional cooperation on food safety is important to address food safety concerns. Food safety is an increasingly important regional issue. The incidence of food-borne diseases is high and growing. Besides being important for public health, well-functioning food safety systems can play an important role in closing the gap between domestic/traditional and international/modern production standards, thereby reducing compliance costs and attracting agri-food investments. Good progress has been made through the establishment of the Caribbean Agricultural Health and Food Safety Agency (CAHFSA) in 2010, which supports Caribbean states to develop and reinforce national health and food safety standards and complementary infrastructure. The Caribbean Agricultural Health and Food Safety Agency provides assistance with compliance to SPS trade regulations, surveys increased risk of pests, diseases and food-borne illnesses from imported foods, and encourages the adoption of accreditation and certification systems based on internationally established criteria.

Investing in agriculture and food systems can improve the availability, accessibility and consumption of nutritious food. **The following are key, nutrition-sensitive investment priorities:**

- **Strengthen the policies and legislative environment** to ensure that consumer health and safety considerations are fully taken into account in national and regional agricultural policies and implementation strategies, in terms of food safety and hygiene, food labelling laws and regulations, and compliance and enforcement mechanisms.
- **Encourage behavioural change across the production-to-consumption continuum by providing nutrition education,** which can foster healthy eating habits and lifestyles – such as through training for farmers, the promotion of food-based dietary guidelines for public food procurement including school meals, and partnering with the private sector to review the advertisement and promotion of foods and beverages. Women in particular require support, considering their nutritional requirements as mothers, and their key role to provide nutritious foods for their family members as the main caregivers at the household level.
- **Support nutrition-sensitive value chain (NSVC) interventions** to enhance the supply and demand of nutritious food by (1) increasing the production of key nutrients for the most vulnerable groups; (2) ensuring food safety; (3) minimizing post-harvest losses; (4) introducing bio-fortified crops; and (5) creating consumer awareness of diversified and balanced diets. Nutrition-sensitive value chain interventions can also promote the diversification and sustainable intensification of agricultural production (including the fishery sector). NSVC support can improve the availability, affordability, stability and consumption of diverse foods and promote

healthy and sustainable diets, while simultaneously increasing climate resilience and enhancing the provision of ecosystem services. Diversification at farm level can also offer a seasonal coping strategy in contexts where income streams and the availability of nutritious foods vary within annual cropping cycles.

8.4 Gender inequality

Although the region performs well compared to other developing regions in the world, gender inequality is still a major concern. Female unemployment is systematically higher than male unemployment across the focus countries. Compared to men, women in the BMCs have less economic opportunities, earn lower incomes, are more likely to be unemployed, and have lower political representation. Women account for 22 to 30 percent of the registered farmers in the region. Nevertheless, they experience fewer opportunities in the agriculture sector, due to limited access to finance, land, networks, information, and decision-making in organizations (such as farmers' organizations, governmental bodies, and companies).

Gender equality and youth empowerment in agriculture can be more actively promoted. It is important to acknowledge male and female complementary roles in agriculture and rural development. Equitable access to productive resources and decision-making are key to enabling women and youth to take entrepreneurial action. There are a number of ways to ensure gender equality and youth empowerment:

- Strengthen existing and promote new legal and regulatory instruments at the regional and country level, which govern rights to productive resources for youth and women, including the right and access to land titles and capital.
- Support the development of targeted financing mechanisms, products and delivery modalities, which can reduce the specific entry barriers of youth and women into agri-businesses.
- Promote governance structures that improve equitable access to decision-making, by introducing realistic quotas for the participation of women and youth at all organizational levels, supporting and protecting women's leadership, and adapting meeting times, location and agendas to meet the needs and interests of women.

There is considerable potential to mainstream gender analysis in the design phase of agricultural programmes and policies. The advancements of the Gender Equality Policy and Operational Strategy (GEPOS) and the Special Development Fund are examples of successful gender mainstreaming: Projects explicitly highlighting gender issues increased by 57 percent (CDB, 2015). Several more gender equality projects across the region are financed by the CARICOM Gender Equality Programme and other programmes funded by the IDB and World Bank.

8.5 Structural transformation in the agri-food sector

Caribbean countries have successfully initiated and continued a structural transformation process, in which the role of agriculture in the economy has declined; however, this has not been driven by productivity growth in the agricultural sector. Unlike other regions in the world, the structural transformation process in BMCs has been driven by (foreign) investments in tourism, (financial) services, and the minerals and energy sector.

Overall, the transformation process in BMCs has not led to a significant transformation towards a productive and profitable agri-food sector. BMCs perform worse than both their regional neighbours in Central and Latin America, and many other regions in the world – including some with

lower per capita incomes. When comparing the average of yields for main crops in BMCs to the yield development in other world regions, BMCs are characterized by sizably lower yields as well as less favourable yield development over time. Notable exceptions include Jamaica, which has significantly increased both labour and land productivity, and the Continental States, which have made large improvements in labour productivity. However, the increase in land productivity in Continental States has primarily been achieved by increasing the land-labour ratio. The low productivity and profitability of agricultural production systems in BMCs perpetuate the sectors low competitiveness, preventing BMCs from meeting internal market demand as well as from establishing new export niches beyond the traditional sugar and banana export crops.

Large and Small Island States are dominated by smallholder farmers. An estimated 80 percent of farms are smaller than five hectares, though most are under one or two hectares. Smallholder farmers often have fewer opportunities to adopt new technologies or to tap into high-value markets, due to high fixed transaction costs. For example, small-scale farmers face entry barriers to livestock farming as a result of the high initial investments and production costs, compared to alternative farm activities.

In the past decade, the Continental States and Large Island States (Haiti, in particular) experienced a significant expansion in cropland area harvested. In the context of low agricultural productivity, agricultural land expansion at the expense of natural vegetation can lead to significant losses in soil fertility, biodiversity, and ecosystem services, while providing few benefits in terms of production increases. Land expansion in Haiti is adding to existing pressures on forested land that is of key importance for water flow regulation and soil conservation.

The productivity of the agriculture and livestock sector is constrained by a broad set of factors, including inadequate access to improved varieties and other technologies, low access to credit, high labour costs, insufficient monitoring and response to pests and diseases, and inadequate skills and entrepreneurship among farmers.

The reallocation of resources – such as land, labour, research, and extension – to crops that generate more value, has not reached its full potential. In the past decade, the value per hectare of certain fruits, vegetables, legumes, and oilcrops has increased. In response, the area devoted to these crops has increased, while the land devoted to traditional crops (banana and sugar) has decreased. Some BMCs, however, have been slow to respond to these changes.

Many farmers have yet to catch up with current best practices in the sector. Growth in total factor productivity in the agricultural sector is mainly driven by technological change – expanding the efficiency frontier. There are, however, many producers far from the efficiency frontier who have not yet been able to catch up with the current best practices in the sector. Therefore, **extension programmes and other policies are needed to promote the adoption of best practices in the agriculture sector**.

Increased productivity and competitiveness of the agricultural sector should go hand in hand with environmental sustainability. Integrated land-use strategies, which actively consider the various environmental and resilience benefits of natural vegetation are essential in order to ensure that cropland expansion does not lead to land degradation, loss of carbon stocks, and loss of biodiversity. The active targeting of conserving ecosystem services provided by natural vegetation is a precondition of productive agricultural systems over longer planning horizons.

The horticultural sector, which is promising in terms of both agricultural growth and investment opportunities, can be supported by:

- **Facilitating the clustering of smallholders, based on a product of common interest or common infrastructure**. The clustering of smallholders has proven successful in achieving economies of scale to enable growers to purchase cheaper production inputs and increase their bargaining power when selling produce.
- **Improving the performance and sustainability of plant quarantine services** to prevent the entry, establishment and spread of regulated pests, and to support the access to foreign markets through the certification of their phytosanitary status.
- **Investing in national food safety systems.**
- **Deploying a weather forecast system that reaches all small producers,** especially those farmers in more remote areas, such as highland areas, where chilling and sometimes freezing temperatures occur during the dry months.
- **Piloting weather-indexed crop insurance schemes.** Crop insurance is difficult to develop and establish, particularly within the small country nations that dominate the Caribbean, and private insurance companies are reluctant to venture into the agricultural sector. However, farmers need to be supported to invest in higher-value cropping activities; crop insurance can provide the security against weather-induced risks and stimulate investment.
- **Developing long-term, national development strategies for key horticultural products** in each country. These development strategies provide a road map – for national governments, industry associations and other stakeholders – of their scarce resources so they can build more viable, and more profitable, local horticultural industries.
- **Establishing incentives to attract more private investment into local horticultural sectors.**
- **Developing and supporting a research agenda focusing on sustainable production systems** relevant to key horticultural crops in specific Caribbean countries.
- **Creating incentives and an attractive enabling environment to develop rural business services**, especially those that are suitable for smallholders. Incentives such as tax breaks, technical assistance, or business planning could help develop valuable horticultural services, such as the provision of protected cultivation technologies (row covers, tunnels and greenhouses), technical advisory services, small-scale commercial laboratories for food testing, irrigation, packaging, small-scale cold rooms, and processing technologies.
- **Supporting efforts to introduce affordable finance**.
- **Promoting the participation of women in horticultural value chains.** The growth of modern horticulture supply chains has directly benefited rural women and reduced gender inequalities in rural areas. Horticulture offers opportunities for women to attain financial independence, such as through various on-farm jobs, seasonal packhouse work, processing horticultural produce, and operating trading enterprises.

8.6 Transformation of the livestock sector

The productivity of the livestock sector is constrained by several factors. For example, limitations in large-scale feed production and limited availability of grazing lands affect the low availability (and high prices) of quality feed. Theft, low-quality concentrate feeds, and low-quality breeding stocks are other factors that specifically limit the productivity of the livestock sector.

The lack of improved pasture and the high costs and low quality of concentrate feeds can be addressed by promoting national legume and forage species, as well as by developing related agricultural extension services. A thorough screening of marginal lands potentially available for

fodder production may further contribute to a relaxation of high feed costs. In addition, support to market development and trade in concentrate feeds between BMCs is a further complementary measure with the potential to reduce costs and improve the quality of concentrate feeds.

The small ruminant industry is ideally suited for intensification and development. Sheep and goats are well suited to the wide range of agroecological conditions in the Caribbean region. They can convert low-quality forages into high-quality products, are small, use minimal land space, and require low capital investment per head, making them ideal livestock for resource-poor Caribbean farmers. Most Caribbean countries already have well-structured supply chains for some livestock produce, such as poultry and milk. The semi-intensification of goat and sheep rearing offers the opportunity for subsistence level farmers to graduate to semi-commercial and eventually fully commercial farming entities. This would encourage more downstream investment in these industries that could evolve into more structured and efficient supply systems.

Investment priorities to improve the productivity of the livestock sector include:

- **Establishing national livestock identification, traceability and animal health certification.** This is essential for the management of disease outbreaks and food safety incidents, reducing praedial larceny, reducing illegal animal processing, tracking animal movement, and controlling for the use of veterinary drugs and pesticides.
- **Developing national, long-term investment strategies for each selected livestock subsector.** The development of livestock in Caribbean countries is constrained by minimal public-sector investment and inefficient and poorly coordinated support services.
- **Strengthening quarantine capacity for the early detection of potential pests and diseases in livestock.** This involves strengthening public health measures by enhancing quarantine facilities, increasing regular disease surveillance, building the capacity of veterinary officers, and improving the microbiological surveillance of animal produce to ensure food safety.
- **Developing a more enabling business environment** in order to attract more local and foreign investment into national livestock industries that support the farming, rural and agribusiness community. Strengthened policy support can contribute to improved veterinary services, access to credit, the delivery and uptake pathways of technologies, and better market infrastructure.
- **Supporting local livestock research capacity.** A strong domestic research capability is essential to identify and adapt promising technologies to local conditions. Most livestock research and development institutions lack resources and require significant investments, especially with regard to increasing the number of qualified staff. Development assistance can help improve technical capacities in terms of breeding and reproduction, and training in advanced reproduction technologies.
- **Improving local feed and fodder conservation practices.** A range of different practices and technologies should be identified, researched, and developed based on prevailing agroecological environments in livestock growing regions of the Caribbean**.**
- **Improving the quality of farmers' herds and flocks** by selecting breeding stock with high genetic merit and through cross-breeding, developing and improving artificial insemination, embryo transfer (where feasible), and progeny testing systems throughout the Caribbean region.
- **Upgrading the capacity of local veterinary services, particularly in more remote areas.** The availability of efficient veterinary services, staffed with competent and properly equipped personnel, is essential for the control, prevention and eradication of animal diseases.

8.7 Transformation of fisheries and aquaculture

The sustainability of the fishery sector is under threat as a result of overfishing and natural resource degradation. Other related threats include coastal development, pollution, the introduction of invasive species, illegal, unreported and unregulated fishing, and the impacts of climate change**.** While the fishing effort in the Caribbean Sea has almost doubled since the 1990s, the annual catch has since declined by more than 25 percent. An estimated 50 percent of the current annual catch is made up of species that are being overexploited. Overfishing is also closely interlinked with resource degradation. For example, the overfishing of algae and sponge-eating fishes can lead to the overgrowth of coral reefs with sponges and algae due to the removal of the respective predators, and therefore to further degradation of the resource base.

While the fisheries sector is a central contributor to livelihoods and well-being in the Caribbean, it struggles with a set of labour-related challenges. These include prevailing informality, seasonality, remoteness, the hazardous nature of the work as well as value chain complexity (FAO, 2016). Much like the agriculture sector, fisheries is often considered an outdated subsistence sector, which is lacking in attractive opportunities for youth and industry (Romuld and Bammann, 2018).

The fishery sector and the marine ecosystem in general, would benefit from improved intra-regional governance (including legal regulation and enforcement). Many countries in the region do not have formally adopted fishery management plans in place. Often, the laws and regulations that are in place are outdated and do not allow for effective enforcement. However, regional fisheries bodies have recently begun collaborating to close this governance gap.

The labour-related challenges in the fishery sector require targeted policy responses, as they may otherwise prevent sustainable sector development. Many policy initiatives and guidelines have the potential to support sustainable fisheries, such as the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines). The SSF Guidelines are aimed at addressing the diversity of development issues surrounding small-scale fisheries in an integrated manner, including social protection mechanisms for fisherfolk – an issue commonly overlooked in past sector development plans.

Natural resource conservation and sustainable tourism development can be combined in a synergistic manner – as outlined in the Blue Economy approach. The concept of a Blue Economy is aimed at achieving economic growth, social inclusion, and livelihood development in harmony with the environmental sustainability of oceans and coastal resources. It underlines the need and possibilities for decoupling growth in economic sectors that rely on maritime resources from environmental and ecosystem degradation.

The Blue Economy calls for the sustainable management of oceans and maritime ecosystems, which have been negatively affected by anthropogenic activities. This entails a shift, from traditional sector and governance models, towards the more comprehensive and holistic model of the Blue Economy, including the following principles:

- **Integrated (participatory) marine spatial planning** to stocktake and assess activity areas, and to help resolve issues regarding tenure, access rights, and the sustainable use of the marine resources by the multiple users.
- **Assessment of the economic and social benefits of the fisheries and aquaculture sector** to ensure inclusive social and economic growth in future planning.
- **Representative governance mechanisms** that reflect the growing need for inter-sectoral coordination and support at both regional and national levels.

- **Promotion of public–private partnerships** as a means of enhancing overall governance and sustainable investment.

Investment priorities in fisheries and aquaculture include:

- **Closing the gap between international, regional and national policies and strategies for sector development.**
- **Investing in sector research and capacity development.** Investment support for scientific research and capacity building is essential for planning and development as well as for responsible investment. Solutions to resource management involve building capacity and knowledge, which require support for R&D and overall capacity development in line with sector needs and absorption capacities.
- **Supporting the development of aquaculture.** There are two types of investments that need to be considered: (1) small-scale systems that address food-security issues; and (2) larger, more profitable investments that can not only become economic drivers, but also a source of gainful employment, and a contributor to the food economy.
- **Upgrading fisheries technologies and value chain infrastructure.** The upgrading of technologies should focus on improving efficiencies, reducing waste, and greening the various activities along the sector value chains.
- **Monitoring, Control and Surveillance of Fisheries (MCS), as well as Illegal, Unreported and Unregulated (IUU) Fishing enforcement** are complex and costly systems. Thus, countries – particularly Small Island States – require resources and support for the MSC of fisheries, as well as IUU fishing enforcement, both of which can help reduce conflicts over resources and fishing grounds.

8.8 Trade and value chains

Historically, traditional agricultural supply chains and trade in BMCs were heavily targeted towards export to the European Union. Reforms of European Union trade policies caused a dramatic decline in export demand for sugar and bananas from BMCs, resulting in the need to diversify the region's trade structure.

The agricultural sector in BMCs is, however, unable to adequately respond to growing local and regional demand for high-value produce from the tourism, processing, retailing and livestock sector. Food imports to these and other sectors add up to about USD 4.47 billion: almost three times the amount exported by BMCs. These high-value sectors tend to mainly import products from the United States of America. Farmers in BMCs have been constrained by a lack of irrigation, inadequate cold storage facilities, low productivity, and information asymmetry regarding the standards required by buyers.

Although the BMCs are close to the markets of the United States of America and Canada, their integration in the international trading systems is constrained due to low liner shipping connectivity, inefficiencies in port operations, and non-tariff barriers. As all the BMCs (1) are either islands or have direct access to the sea, and (2) are relatively small and generally constrained by natural and geographic conditions, trade and international value chains are important for them – both for agricultural production (and potential exports) and food consumption (and potential imports). However, maritime transport costs to Caribbean countries are significantly higher than to other regions. For example, it is cheaper to ship a container from Miami to Shanghai than from Miami to one of the BMCs. These high transport costs account for nearly half the cost of imported produce,

and thus strongly influence the price competitiveness of Caribbean farmers in the world. In addition, high standards regarding safety and quality prohibit farmers from entering these potentially highly remunerative markets. Meat exporters in Guyana, for example, face high barriers due to stringent Sanitary and Phytosanitary standards.

Facilitate intra-regional cooperation on trade. The analysis shows that many BMCs have a comparative advantage in the same agricultural commodities. The creation of a solid competitive/cooperative network of local enterprises and favourable institutional conditions may foster economies of scale, and can attract Foreign Direct Investments (FDI). Where BMCs have different competitive advantages, substituting international imports for imports from other BMCs is a good strategy. In particular, the production of land-intensive products can be outsourced to land-abundant countries, such as Guyana and Suriname. However, this requires trade cooperation among BMCs to reduce market distortions.

It is important to support the development of national food safety strategies, which consider international perceptions of food risks, international standards, and any international commitments in the food protection area. All stakeholders need to reach consensus on objectives, priorities, policies, the roles of different ministries or agencies, industry responsibilities, and the timeframe for implementation in order to prevent confusion, duplication of effort, inefficiencies in performance, and wastage of resources. The strategy should focus on the need for food security, and consumer protection from unsafe, adulterated or misbranded food, while also considering the economic interests of the country with regard to exports and imports, the development of the food industry, and the interests of farmers and food producers. The need for human resource development and the strengthening of infrastructure, such as laboratories, should also be considered. The strategy will be influenced by each country's stage of development, the size of its economy, and the level of sophistication of its food industry.

Support initiatives to address pertinent risks and opportunities associated with food safety. Rather than recommending large, capacity-building initiatives that would overhaul existing institutional structures and invest resources in physical infrastructure, facilities, and so on, the recommendation is for a limited set of catalytic and demonstrative initiatives that will raise food safety awareness and ensure the application of better practices.

Designing and supporting the implementation of Assured Quality Produce Schemes would be a stepping stone toward international standards – such as the GlobalGAP – and a means to reduce the fresh produce procurement risks faced by Caribbean retailers, tourist and hospitality operators, and food processors. The scheme is also a basis for promoting improved practices among local producers, enabling producers who do make operational upgrades to become longer-term 'preferred suppliers' to lucrative segments of the domestic (and regional) market.

Developing and strengthening the **national implementation of Good Handling Practices (GHP)** in selected industries can significantly reduce post-harvest losses. In fact, post-harvest mishandling accounts for up to 40 percent of productivity losses in many horticultural crops, largely because of limited knowledge and inappropriate technologies in the field and following the harvest.

Food safety can be ensured by strengthening the implementation of Good Manufacturing Practices (GMP) and Hazard analysis and critical control points (HACCP) in selected food industries. This would involve a demonstration programme which could be replicated in other subsectors; a gap analysis of select food industries and establishments; implementing GMP and HACCP (ISO 22000); providing company training, and training of trainers for food industry GMP, HACCP (ISO 22000) planning; and monitoring the implementation of GMP and HACCP (ISO 22000) in these selected industries.

Establishing and strengthening food inspection operations will improve inspection, follow-up and monitoring activities. Currently, these systems are mostly understaffed in BMCs, in terms of technically competent personnel, facilities, inspection tools, manuals, and so on.

An important aspect of the policy environment in the context of value chains is the extent to which contracts are enforceable. According to the ease of doing business indicators, there is room for improvement in this area. Imperfect contract enforcement increases the risk of transferring knowledge and farm inputs to farmers, as they might divert the technologies or side-sell their produce. Moreover, holdups on the side of the buyer, for example in the form of delayed payment, renegotiation of prices, or inappropriately rejecting produce after inspection, might lead to reduced investments by farmers.

"Integrated value chain development" programmes have the potential to directly assist farmers in specific high-potential value chains. Different modalities are possible, but all require close collaboration with major companies in the respective value chains – such as suppliers to the tourism sector, hotel and restaurant chains, exporters, and processors. One modality is to finance these companies with concessional loans or subsidies, such as through public–private partnerships, to develop the domestic value chain from which they can source their produce. This typically includes training and technology transfer to farmers to make them comply with public and private standards regarding quality, quantity, safety, and reliability.

A major advantage that local farmers have over food imports in the tourism sector is transport time and cost. The World Bank (2008) estimates that, within the OECS countries, the demand for imported food from the hotel tourism sector amounted to USD 93 million in 2008, representing about 25 percent of OECS agricultural imports. Only 32 percent of the food demand arising from the tourism industry is met locally. Locally grown food requires little transportation, is fresher and saves on high transportation costs. Proximity and flexibility is especially important for perishable products, such fruits, vegetables, and animal products.

Increased demand from the growing yachting sector also presents potential investment opportunities. In recent years, full service, modern marinas have been built in several BMCs, including the 170-berth Port Louis Marina, in Grenada, which opened in 2010, and the 60-berth Marina at Christophe Harbor, in Saint Kitts, which partially opened in February 2015. Both of these marinas can accommodate super-yachts of up to 300 feet.

Another high potential investment opportunity is the development of domestic cassava value chains for bread, poultry feed, and beer. Cassava can be processed into different grades of flour, which can form the basis of numerous products. Cassava flour, for example, is used to produce sliced bread in Barbados, Grenada, and Trinidad and Tobago. Additionally, cassava may substitute the corn in livestock feed (particularly for poultry), and it is used in local beer production, substituting the malt imports from the United States of America and Europe. However, farmers would need support to grow cassava and to meet the product and processing requirements of breweries

Meat production offers investment opportunities, especially for the domestic and regional retail and services sectors in land-abundant BMCs, such as Suriname and Guyana. Guyana already produces cattle and pig meat, and there is sufficient knowledge available to further foster cattle breeding, meat production, and export. Although Guyana is self-sufficient in meat production, it still imports meat due to a misalignment between the quality standards of local production, and those required by the fast-food industry and other internationally aligned sectors. As a result, the Government of Guyana recently launched the Sustainable Agricultural Development Programme (SADP) to support compliance with sanitary and phytosanitary standards (SPS).

Investing in air and maritime transport infrastructure can reduce shipment time and delays, which are particularly important for becoming included, as a country, in global agri-food value chains. Djankov, Freund, and Pham (2010) find that each additional day that shipment is delayed is equivalent to a country distancing itself from its trading partners by one percent (or about 70 km). They also show that for perishable products, such as fruits and vegetables, the effects of time delays are even more severe, making it impossible, in some cases, to export certain agricultural products from certain countries. Many BMCs have low shipping connectivity and inefficient port operations, and therefore forgo beneficial trade opportunities, especially for perishable products. One of the primary drivers of high trade costs (for Belize, Suriname, and Trinidad and Tobago in particular), is deficient economic infrastructure – ports, freight logistics, maritime and air transport, and communications networks. Other countries can learn from Jamaica, which has the most efficient port operations of the region.

8.9 Climate change and natural hazards

Climate change and natural hazards are likely to significantly affect agriculture in BMCs, both in the short and the long term. The main challenges include the increased frequency of droughts, trends towards higher average temperature and lower precipitation during the main agricultural growing season, sea level rise, the increased intensity of cyclones as well as shifting agricultural seasonality. Sea level rise is expected to affect agriculture through inundation, salt water intrusion into ground water and agricultural plains, coastal land erosion (including mangroves), and localized landslides.

Fishery resources will be affected by a wide array of climate change effects. It is estimated that climate change will lead to a latitudinal shift in catch, resulting in a reduction of up to 40 percent in catch potential for tropical countries. Coral bleaching and overall habitat degradation is expected to further reduce the overall availability of fishery resources. Climate change will also likely affect the distribution, composition, seasonality, and stability of fish stocks. However, the size of these effects are difficult to predict.

While climate change offers few direct opportunities, it may present more indirect, short-term opportunities in the form of additional financing sources for climate-related public sector investments in the Caribbean. For example, in 2018 the Green Climate Fund financed three major projects in the region to develop the climate-resilient water sector, climate-resilient infrastructure, and community resilience.

Investments in climate change adaptation and resilience strategies will be required to prepare the region for the challenges in the years to come. This includes decisive national and regional policy initiatives as well as targeted investments. For example, many BMCs and regional institutions require **support to (a) increase their knowledge and capacity** to assess climate change risk, and **(b) to design and implement appropriate climate-resilient policies** and programmes.

Integrated water resource management is a key investment priority area. Integrated water resource management is defined as the management of water and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. Concrete infrastructural investments are essential for water harvesting structures (from rainwater and surface water runoff), which can increase water availability and drip irrigation systems, thus facilitating more precise and efficient water application.

Besides "hardware", integrated water management requires "software": the institutions that govern how the water is used and how the infrastructure is operated and maintained. Institutional measures

that guarantee the avoidance of over-exploitation beyond sustainable water extraction rates are key. Most BMCs do not exceed their total renewable water resources, using no more than ten percent of renewable water resources for agriculture. Therefore, a moderate increase in irrigation infrastructure and water use can thus be carried out without structurally threatening water resources.

Investments in coastal zones are particularly important, as coastal zones are the first areas affected by inundation caused by sea level rise and storm surges. In addition, coastal ecosystems will be affected by changes in seawater temperatures. Investments that can reduce the pressures on coastal ecosystems and reduce coastal degradation include marine spatial planning, marine protected areas, fishing regulations, coastal land-use planning, sewage treatment requirements, and integrated watershed management.

Targeted and efficient agricultural extension systems can be carried out in close collaboration with research and development institutions. Accessible, low-cost technologies can help countries to adapt their agricultural systems to a changing climate through the development of drought-resistant and pest-resistant crop varieties; adequate irrigation technology; water-saving technologies; soil conservation practices; on-farm risk management practices; and climate-smart agriculture.

Climate-smart mapping and planning of sustainable value chains can allow BMCs to map temperature and precipitation, and estimate – with higher accuracy – the potential productivity and forecasting returns of investments. Knowing trends of such variables will allow stakeholders to invest accordingly and plan for the diversification of production.

Climate proofing value chain related infrastructure is key to ensuring the higher efficiency and effectiveness of value chains in agriculture, optimizing the use of natural resources, and upgrading practices. Agriculture is subject to both direct and indirect impacts of climate change: both will affect value chains and operators. By upgrading technologies and practices in target value chains, BMCs can improve livelihoods, ensure sector growth, and achieve food and nutrition security in the context of climate change.

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