



Saint Christopher and Nevis

St Kitts and Nevis Agricultural Transformation and Growth Strategy 2022-2031

Final Version

15th June 2022



Courtesy: Ministry of Agriculture, Fisheries and Marine Resources Photo Gallery

Contents

Acronyms	4
Glossary.....	5
Acknowledgements.....	6
Executive Summary.....	7
1. Introduction	9
1.1 Background and context	9
1.2 Country Profile	10
1.3 Agriculture.....	13
1.4 Socioeconomic profile of farmers and fishers	14
1.5 Institutional set up for management and administration of agriculture and fisheries	15
2. Why a new strategy to 2031	17
3. Strategy Framework.....	24
3.1 Vision and mission statements	24
3.2 Outcomes, outputs and activities	26
4. Operationalization of the strategy.....	62
4.1 Roles and Responsibilities of Key Stakeholders	62
4.2 Coordination	64
4.3 Phasing of implementation.....	65
4.4 Budget.....	65
4.5 Challenges to implementation of ATGS	66
5. Conclusions	67
6. References	68
7. Appendices.....	69
Appendix 1. Resource Requirements for Implementation and Achievement of Outcomes	69
Appendix 2. Action plan for the implementation of ATGS 2022-2031	72
Appendix 3. ATGS Performance and Results Management Matrix	80
Appendix 4. Ten year budget for the implementation of ATGS	85
Appendix 5. List of Key Informants Interviewed.....	89

List of figures

Figure 1. A Map of St Kitts and Nevis.....	11
Figure 2. Fertilizer consumption in nutrients, St Kitts and Nevis, 1961-2019	20
Figure 3. Average value of food production per capita (3-year average) in 2004-2006 constant international dollar	21
Figure 4. Prevalence of obesity (% of population 18 years and older), 2000-2016.....	22
Figure 5. Illustration of interlinked activities, outputs and outcomes.....	26
Figure 6. Illustrative framework for digitalization of St Kitts and Nevis' Agriculture	30
Figure 7. Roles and responsibilities of key stakeholders in the implementation of the ATGS	63

List of Tables

Table 1 Trends in key macroeconomic indicators, St Kitts and Nevis, 2000-2020	12
Table 2. Key challenges constraining St Kitts and Nevis' agri-food systems.....	Error! Bookmark not defined.
Table 3. Trends in key agricultural and food indicators, St Kitts and Nevis, 2000-2020	19
Table 4. Summary of outcomes and outputs.....	25

Acronyms

AR4D	Agricultural Research for Development
ATGS	Agricultural Transformation and Growth Strategy
CARDI	Caribbean Agriculture Research and Development Institute
DoA	Department of Agriculture
DFMR	Department of Fisheries and Marine Resources
FAO	Food and Agriculture Organisation of the United Nations
IICA	Inter-American Institute for Cooperation on Agriculture
MAFMR	Ministry of Agriculture, Fisheries and Marine Resources
MSMEs	Micro, Small and Medium Enterprises
NGO	Non-Governmental Organization
NIPA	Nevis Investment Promotion Agency
SKIPA	St. Kitts Investment Promotion Agency
SKNBS	St Kitts and Nevis Bureau of Standards
SKNCIC	St Kitts and Nevis Chamber of Industry and Commerce

Glossary

(Agri)-Food systems

Encompass the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal, institutional and natural environments in which they are embedded.

Agricultural Transformation

Is a process involving deliberate actions that leads to a major shift in an agri-food system. It brings about a significant positive change in the livelihoods of the majority of people engaged in the system, with complementary benefits to the economy and the environment. It requires action from multiple stakeholders who work toward common goals along transformation pathways.

Impact

A durable change in the condition of people and their environment brought about by a chain of events to which innovations and outcomes, outputs and activities have contributed.

Innovations

New ideas, products, services and solutions capable of facilitating impact.

Innovation system

The interconnected set of processes, assets, people and institutions that enable the introduction and scaling of new ideas, products, services and solutions capable of facilitating impact.

Agricultural Innovation

Agricultural innovation is the process whereby individuals or organizations bring new or existing products, processes or ways of organization into use for the first time in a specific context, to increase effectiveness, competitiveness and resilience with the goal of solving a problem. Innovation in agriculture cuts across all dimensions of the production cycle and along the entire value chain - from crop, forestry, fishery or livestock production to the management of inputs to market access and the underlying policy, legislative and institutional framework.

Outcome

Refers to a positive effect that is expected in the short or medium term as a result of the application, adoption, use of the outputs of a programme or project.

Output

An output describes products/services or changes in skills and abilities that result through the implementation of related activities.

Activity

A deliberate action taken to contribute to the achievement of an output.

Acknowledgements

This strategy (Agricultural Transformation and Growth Strategy (ATGS) 2022-2031) is the product of a Technical Assistance Project (TCP/STK/3801/C1) to the Ministry of Agriculture, Fisheries and Marine Resources of St Kitts and Nevis by the Food and Agriculture organization of the United Nations (FAO). Dr Timothy O. Williams (International Consultant) prepared the strategy. He was ably and competently supported by a team comprising of Mr. Daniel Arthurton (National Consultant), Ms. Aisha Howell (Senior Project officer, MAFMR), Mr. Kyle Flanders (Assistant Secretary, MAFMR), Mr. Fransen Jean, (FAO's Lead Technical Officer for the project) and Mr. Anthony Kellman (FAO's Field Programme Support and Monitoring Officer).

The author and the team wish to express their immense gratitude to Mr. Ron Dublin-Collins, Permanent Secretary, MAFMR and Dr Renata Clarke, FAO's Country Representative and Sub-Regional Coordinator for the Caribbean, for their vision and foresight in initiating the project and the overall guidance and advice they provided throughout the process of developing the strategy. Special thanks and appreciation go to Mr. Huey Sargeant, Permanent Secretary, Ministry of Agriculture, Nevis, Dr Tracey Challenger, Director of Agriculture, St Kitts, Mr. Randy Elliot, Director of Agriculture, Nevis, Dr Marc Williams, Director of Marine Resources, St Kitts and Nevis and other senior staff in MAFMR for their incisive inputs. The invaluable contributions of representatives of farmers and fishers' cooperatives, agro-processors, financial institutions, organized private sector, various government ministries and agencies, particularly Ministries of International Trade, Health and Tourism, St Kitts and Nevis Bureau of Standards, Physical Planning Department, Department of Statistics, St Kitts Investment Promotion Agency, Clarence Fitzroy Bryant College, Ross University School of Veterinary Medicine and so many others listed in Appendix 5 is deeply appreciated.

The author wishes to acknowledge the useful and insightful comments received from Daniel Arthurton, Jose VallsBedeau, Ruth Martinez, Ana PosasGuevara and Fransen Jean.

The views and recommendations in the ATGS are those of the author and do not necessarily reflect the views or policies of FAO.

Executive Summary

Over the past two decades, the performance of the agricultural sector in St Kitts and Nevis has been less than satisfactory in terms of economic, social and environmental outcomes. This poor performance is partly due to anthropogenic-related land, soil, water and coastal area degradation and partly as a result of climate-induced and non climate challenges. The urgent need to find durable solutions to these intertwined challenges creates an impetus for a forward-looking strategy to transform the agricultural sector to create resilient and sustainable agri-food systems.

The necessity of an agricultural transformation and growth strategy (ATGS) is recognized by the government. The Prime Minister, Dr Timothy Harris, in his Annual Fiscal Statements and Budgetary Proposals for 2022 reiterated the government's goal "to produce more of what we consume and commitment to make strides to achieve SDGs 2 – zero hunger – and SDG 12 – responsible consumption and production" This need was equally repeated by stakeholders consulted in the course of developing this strategy (i.e. farmers, fishers, MSME entrepreneurs, representatives of financial, civil society and research and training institutions and regional partners).

This document presents the 10-year St Kitts and Nevis ATGS 2022-2031 designed to tackle old and new challenges facing the agricultural sector by providing a common vision, guiding principles, framework and solutions to create sustainable, resilient and inclusive agri-food systems.

The ATGS will deliver multiple benefits across five **Impact Areas**:

- i) Agricultural Productivity and Income Growth
- ii) Food Import Reduction
- iii) Food and Nutrition Security
- iv) Decent Employment and Livelihoods, and
- v) Sustainable Ecosystems.

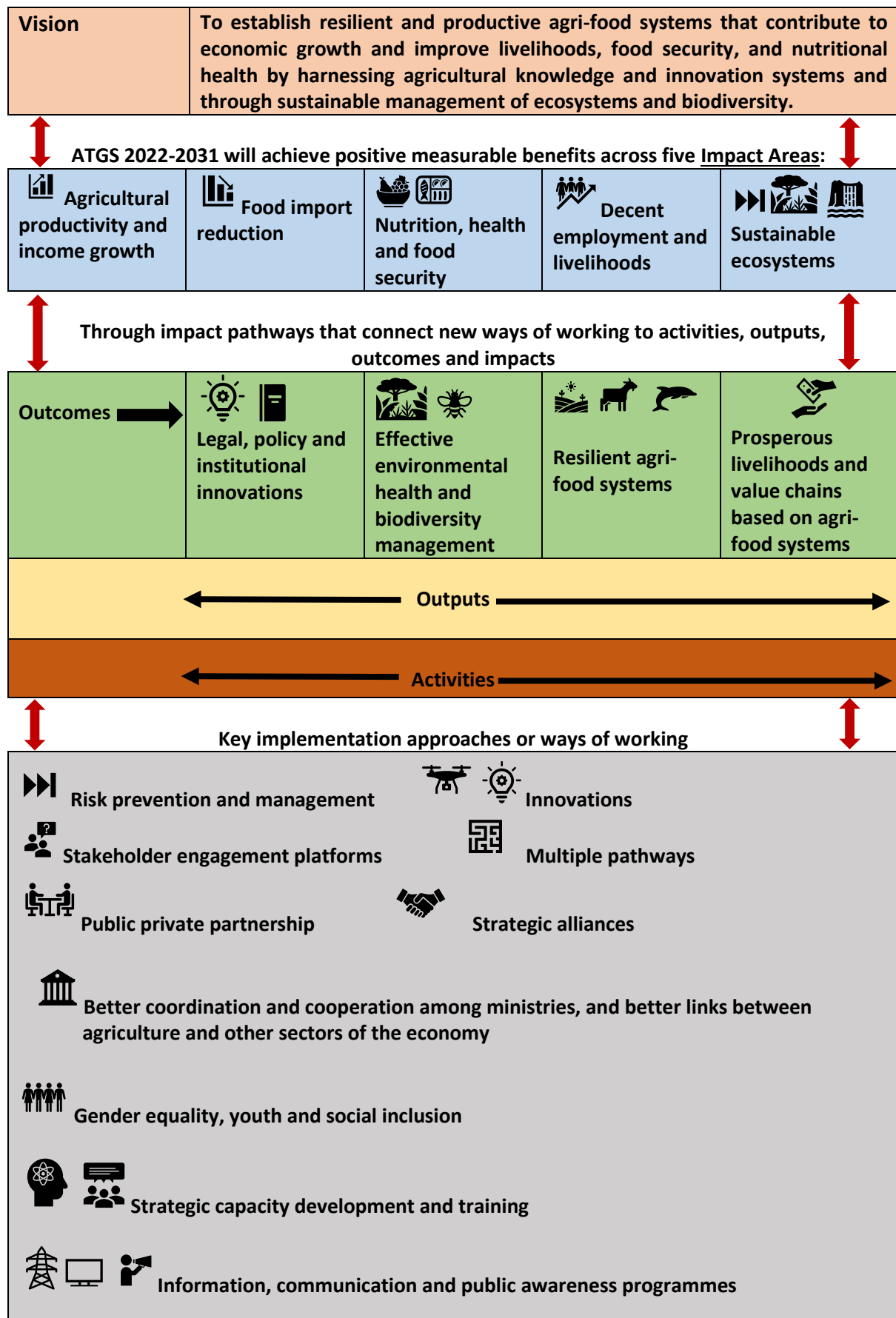
These impacts areas are in line with the government's policy direction for agriculture and will also put St Kitts and Nevis on the pathway to attain key SDGs, particularly SDGs 2, 6, 8, 12 and 13.

ATGS will link new ways of working to transformative activities, outputs and outcomes that are needed to achieve impact at scale, nationally and at the district and parish levels, across the twin-island federation. In this way, the ATGS lays the foundation for a new approach to agricultural development that puts emphasis on practical, effective and inclusive solutions developed through public-private partnership, stakeholder engagement, innovations and strategic alliances.

This document embodying the ATGS is also a guidebook for the implementers of the strategy as it lays out a 'how to do it' template, with explanation of the steps and actions required to achieve each output and outcome. Nonetheless, concerted effort is still needed to significantly improve the capacity of MAFMR staff who will lead the coordination and implementation of the strategy.

The interrelated components of the ATGS 2022-2031 are summarized in the infographic on the next page. Details on the outputs and activities are provided in section 3. Additional information is provided in the appendices on the budget, the phasing and timeline for different activities, impact targets and outcome and output indicators to monitor, evaluate, learn and ensure accountability in the implementation of the ATGS.

St Kitts and Nevis Agricultural Transformation and Growth Strategy 2022-2031 at a glance



1. Introduction

1.1 Background and context

Since the closure of the three-century old sugarcane industry in the twin-island Federation of St Kitts and Nevis in 2005¹, the country has not managed to put the agri-food systems on a sustainable pathway to feed the nation and contribute adequately to economic growth. Food import steadily increased over the last two decades amounting in 2017 to US\$76 million or 80% of total national food requirement. This structural problem has been worsened by climate-induced disasters and non-climate challenges, such as the recent COVID-19 global pandemic that disrupted both food supply and demand and exacerbated existing vulnerabilities among rural and urban poor. The government is keen to address these challenges and support the renaissance of the agricultural sector. In pursuit of this objective, the Ministry of Agriculture, Fisheries and Marine Resources requested FAO to provide technical assistance in the preparation of an Agricultural Transformation and Growth Strategy to guide the transition to a more productive, competitive, sustainable and resilient agri-food systems over the next 10 years.

This document presents the ATGS 2022-2031. The strategy takes a holistic perspective looking beyond short-term measures to more durable solutions to the underlying non-climate and climate-related challenges facing the agri-food systems. It provides a framework of activities, outputs and outcomes that are mutually reinforcing and would lead to desirable impacts that will benefit people, the economy and the environment.

It was developed through a participatory process that included several consultations with farmers, fishers, extension officers and representatives of the private sector, regional research and development agencies (CARDI and IICA) and FAO Sub-Regional Office for the Caribbean. This was followed with key informant interviews of senior officials of the MAFMR, Ministry of Trade, Ministry of Tourism, Ministry of Health, Executive Directors of SKNBS and SKNCIC, and representatives of agro-processors, farmers and fishers cooperatives, financial institutions, Ross University School of Veterinary Medicine, Clarence Fitzroy Bryant College and SKIPA². Two rounds of discussion were held with consultants from Deloitte working on the broader St Kitts and Nevis 'Economic Recovery and Development Strategy (ERDS)' to ensure alignment and synergy between the ATGS and ERDS. A review of Acts, government policy documents, grey and published literature and lessons learned from previous agricultural development strategies and past FAO Country Programme Frameworks was also conducted.

The responsibility for getting the strategy off to a good start rests with the government. The government will act as the principal enabler, while the execution will be done by farmers, fishers, civil society and the private sector.

In the following sections, details of the framework and the way it will be operationalized, including the performance and results management matrix, are presented and fully discussed.

¹ The closure was mainly due to falling world prices and the erosion of preferential access to European Union market, which made government continuing support to prop up the industry unsustainable.

² See Appendix Table 5 for a full list of stakeholders consulted.

1.2 Country Profile

Geography

The Federation of St Kitts and Nevis is a twin island country located in the Eastern Caribbean (Figure 1). It is bordered by other islands including Saint Barthélemy, Saint Martin and Anguilla to the north-northwest, Antigua and Barbuda to the east and northeast, and Montserrat to the southeast. The total area of the country is estimated at 260km², of which St Kitts accounts for 170 km² and Nevis accounts for 90 km².

The country is of volcanic origin, with the landscape of St Kitts dotted by 3 volcanic centres: i) Northwest Range, dominated by Mount Liamuiga (1,156 m); ii) Middle Range, dominated by Verchild's Mountain (975m), and iii) Southeast Range, dominated by Olivees Mountain (900m). The most prominent mountain in Nevis is Nevis Peak at 985m.

Land lying 305m above sea level is designated as the forest reserve where no development is permitted. Agricultural production (food and tree crop farming and livestock grazing) takes place at lower elevation. Forest area at about 11,000 ha has remained unchanged over the last 20 years, while agricultural land declined from about 9,500 ha in 2000 to about 6,000 ha by 2019 mainly due to land being used for other purposes such as housing and other infrastructure developments.

Climate

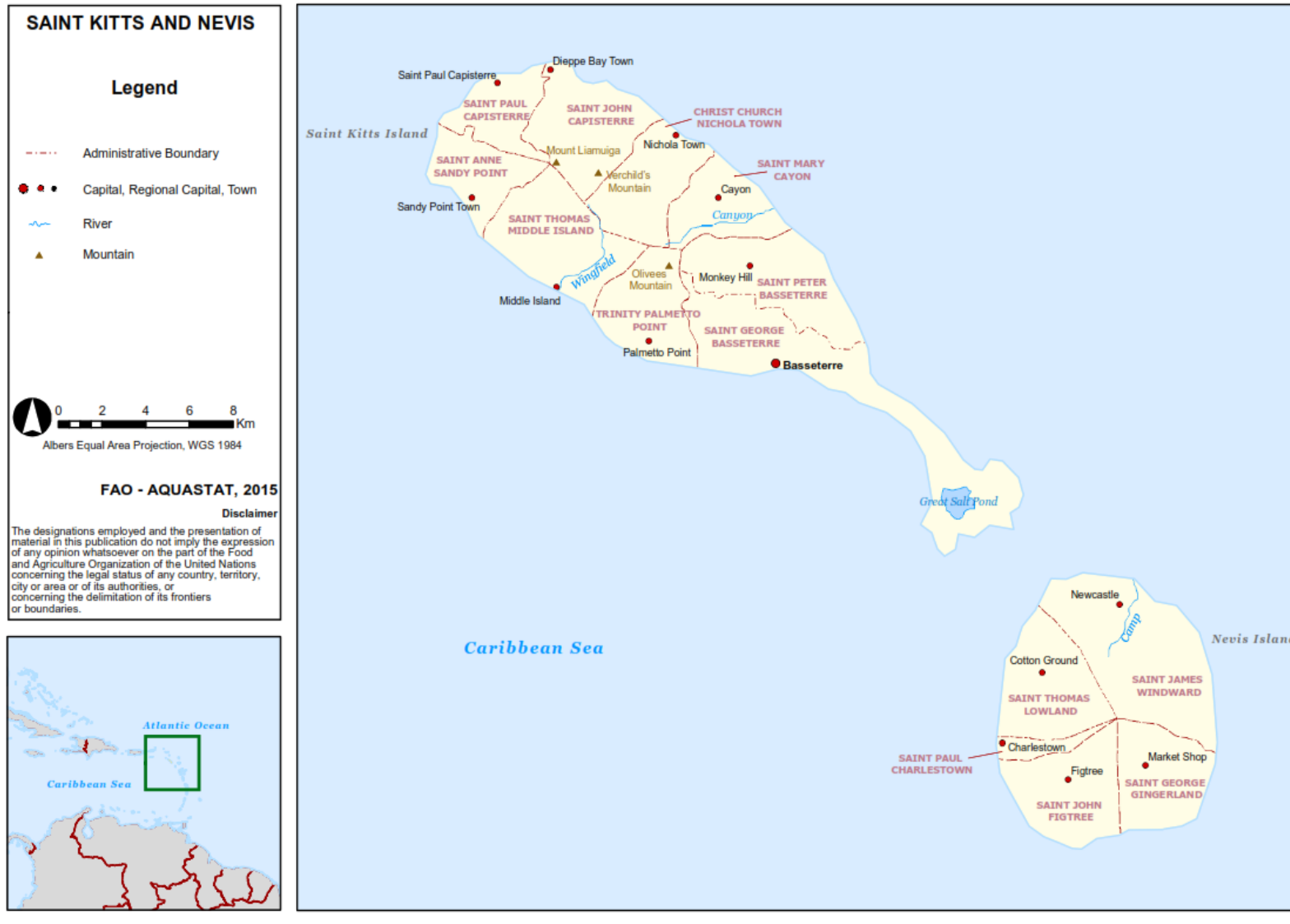
The climate of St Kitts and Nevis is heavily influenced by the marine environment, just like in most other Caribbean islands. Both islands enjoy a tropical marine climate influenced by the northeast trade winds of the Inter-tropical Convergence Zone. They experience warm and humid conditions throughout the year. Rainfall in St Kitts is strongly related to altitude. The average annual rainfall is 1,625mm, varying from 890-1,000mm along the coast to about 2,500-3,800 in the central mountain ranges. Mean annual rainfall in Nevis is lower, with an average of 1170mm. Both islands experience a wet season from July – December and a dry period from January – April. Mean rainfall over the twin islands has not changed with a significant trend since 1960, though drought and dry spells within the cropping season are now occurring more frequently. The hurricane season extends from June to November when low pressure systems and tropical disturbances pass through the area. Heavy rainfall associated with storms and hurricanes contributes markedly to wet season total rainfall.

The average temperature in summer months (June – September) is about 26-28°C dropping only fractionally to 24-25°C in the cooler months of December to February. Seasonal and diurnal variations in temperature are minimal and only at higher elevations do temperatures drop below 17°C. Historical data analysis indicates that mean annual temperature has increased by around 0.5°C since 1960, with warming been more pronounced in the June-November period.

A number of key vulnerabilities associated with climate change are coming to the fore, including increased hurricane frequency and intensity, storm surge, flooding and drought. The country suffered 5 major hurricanes between 1995 and 1999, and two - Hurricane Irma and Maria – in 2017 alone. Drought has been identified as a critical hazard for Nevis, where over 50% of the island receives less than 1,270mm of rainfall per year.

(<https://climateknowledgeportal.worldbank.org/country/st-kitts-and-nevis>).

Figure 1. A Map of St Kitts and Nevis



Population

The country's population in 2020 was estimated at 53,192 people, of which about 78% live in St Kitts with the remaining 22% in Nevis. Over 60% of the country's population lives in coastal areas making them vulnerable to sea level rise, storm surge and coastal flooding.

Economy

In 2019, the gross domestic product (GDP) was US\$1.165 billion but contracted to about US\$980 million in 2020, reflecting the impact of the global Covid-19 pandemic. The country recorded an impressive annual average real GDP growth of 10% in 2000, but the economy contracted by a massive 14.4% in 2020 largely due to the Covid-19 lockdown measures (Table 1)

Table 1 Trends in key macroeconomic indicators, St Kitts and Nevis, 2000-2020

Indicator	2000	2010	2018	2019	2020
GDP (current US\$ million)	421.7	760.2	1,078.5	1,164.8	980.7
Real GDP growth (annual %)	10.0	-0.6	2.7	4.8	-14.4
GNI per capita, Atlas method (current US\$)	9,120	14,690	19,790	21,160	19,080
Agriculture, fishing and forestry value added (% of GDP)	1.5	1.3	1.1	1.0	1.4
Industry (including construction) value added (% of GDP)	26.8	23.1	24.5	25.3	23.1
Manufacturing value added (% of GDP)	7.0	8.5	5.4	5.5	5.1
Services value added (% of GDP)	66.9	67.4	63.2	62.7	64.1
International tourism receipts (current US\$ million)	58	90	367	n/a	n/a
International tourism receipts (% of total exports)	38.7	43.2	61.4	n/a	n/a
Public sector external debt stock (current US\$ million)	153	198.1	n/a	n/a	n/a
Consumer price inflation (%)	2.1	0.9	-1.0	-0.3	-1.2
Current account balance (current US\$ million)	-66.2	-138.6	-59.2	-25.0	-78.4

Note: n/a means data not available

Source: World Development Indicators, World Bank (accessed 17 February 2022)

St Kitts and Nevis is classified by the World Bank as a high income country, with a Gross National Income (GNI) per capita (Atlas method) of US\$19,080 in 2020. The 2020 Human Development Report ranked the country 74th out of 189 countries in the Human Development Index.

Services sector dominates the economy, with tourism representing a major sub-sector contributing about 54% of total services value added in 2018. Agriculture's contribution to the economy is low varying from 1.0 to 1.5 over the 20-year period covered in Table 1. Although the relative share of agriculture in total GDP is expected to decline over time as increased agricultural productivity induces excess labour to move out of farming to take advantage of opportunities in other sectors of the economy, the data in Table 1 show that the

absolute value of farm output has not been rising (see also section 3). This is symptomatic of a much deeper structural problem in the agricultural sector and the economy as a whole which needs to be urgently addressed. This observation is corroborated by a lack of growth in the other sectors of the economy (manufacturing and industry), apart from services.

Public sector external debt increased by about 29% between 2000 and 2010. Price inflation has remained low and even negative in some years. The tide of worsening current account balance appeared to have been kept in check between 2010 and 2019, but has started to rise again in 2020 implying difficult choices ahead for the government in providing fiscal incentives to different sectors of the economy.

1.3 Agriculture

Crop subsector

Crop production is mainly rainfed. Sugarcane was the main export crop until 2005 when the sugar industry was wound up. Since then, the focus has been on crop diversification with emphasis on vegetables, fruits, peanut, roots and tubers.

Approximately 80% of the agricultural land in St Kitts is held by the government, while in Nevis 70% of agricultural land is under private ownership. Majority of farmers in the country rent or lease small allotments, of about 0.4 ha or less, from the government to grow short-duration crops (vegetables, peppers, tomatoes, roots and tubers). Lack of tenure security is a problem for many small-scale farmers which needs to be addressed as part of the transformation agenda.

Currently, irrigation level in the country is less than what is potentially feasible and optimal. FAO estimates that the country has an irrigation potential of 200 ha considering water resources and topography, with 180 ha in St Kitts and 20 ha in Nevis. In 2012, about 25 ha were irrigated in the country, accounting for only 12.5% of the irrigation potential. Moving away from this overall picture, drip irrigation is much more widespread in Nevis where farmers have access to government water supply than in St Kitts where access to irrigation water is currently very limited. Most irrigated crops are vegetables.

Protected agriculture, in green or shade houses, and hydroponics, is practised by a few well-resourced farmers who grow a variety of high-value vegetables and condiments for the domestic market and tourist hotels.

Livestock subsector

The livestock sub-sector, based on small ruminants, pigs and poultry, is relatively small compared with the crop sub-sector. Ruminants graze on open fields often causing damage to standing crops. Livestock farmers are vertically integrated into government-owned abattoirs and meat processing facilities. This linkage provides them with a ready market and an opportunity to earn good income. There is room for increase in productivity through improved feeds and feeding, housing and animal health packages.

Fisheries subsector

Small-scale subsistence and commercial fishing operations occur on reefs, slopes and coastal ocean areas in St Kitts and Nevis. Fishery resources include conch, lobster, reef fishes and coastal pelagic species (FAO, 2022).

In 2015, over 80% of the registered 260 vessels and more than 75% of the registered fishers were engaged in demersal reef fishing utilizing traps, handlines and spear guns. The conch is harvested by divers guided by GPS marking. There is a small coastal pelagic fishery operating in shallow waters using seines and occasionally gillnets. The country has a small and highly seasonal ocean pelagic fishery operations using vessels with trolling lines to catch dolphinfish, tuna and mackerels. St Kitts has 5 landing sites and Nevis one large and 4 minor landing sites. Each island has a fish processing plant.

Fisheries management is coordinated across the two islands by the Fisheries and Marine Resources Department, which is in contrast to the situation in the Department of Agriculture where each island has its own independent department.

The important and vulnerable fishery resources of the country, particularly conch, lobster and reef fishes require rebuilding through effective management measures, a point the ATGS will address.

There are high seas fleet that are foreign owned, operated and crewed but registered and flagged by St Kitts and Nevis. These vessels operate outside the country's exclusive economic zone.

Aquaculture is not yet commercially developed in the country. There is room for growth as aquaculture can be an important source of income, protein and essential nutrients. A project on 'Resilient Aquaculture for Food Security and Well-Being' supported by the Mexico-CARICOM-FAO Initiative to grow and expand the aquaculture sector is on-going in St Kitts and Nevis.

1.4 Socioeconomic profile of farmers and fishers

There is a paucity of detailed and up-to-date sex-disaggregated data on age, household composition, access to land and other factors of production, production activities and income of farmers and fishers. This is due to inadequate investment in modern innovative approaches to data collection, analysis and management, a point that will be further discussed in Section 3.

Nonetheless, the 2000 Agricultural Census indicated that there were 1795 holdings. About 94% of the holdings were held by individuals or households. Approximately 75% of these holders were male. Farmers in the age group 35-44 years constituted about 29% of holders, while people in the 65 years and over category made up about 17% of holders. Modal farm size was under 1 acre (0.4 ha). A total of 621 holdings belonged to livestock owners, who are actually landless.

In 2015, 802 people reported they were engaged in fishing and 3 in aquaculture. Twenty-four women were engaged in the marine coastal fishing sector.

The data reported here show clearly that women are under represented in direct farming and fishing operations, though they are involved in small-scale agro-processing and agricultural marketing as hucksters.

Farmers and fishers belong to various small cooperatives that also act as farmer and fisher's organizations. These cooperatives are mostly independent and have not worked well together to promote collective action in interacting with the government and the financial sector to promote the interest and welfare of their members.

Access to credit in commercial banks remains difficult for small-scale farmers and fishers in general, and for women and youth in particular. This is because of the stringent conditions and requirements of the banks designed to minimize their own risk and exposure to bad debt. Agricultural insurance is currently not offered to small-scale farmers and fishers by the financial and insurance sector in St Kitts and Nevis.

Access to domestic markets by individual small-scale producers is relatively good, though there is need for more investment to upgrade facilities in existing markets and to construct new modern ones in rural and urban locations throughout the Federation. Currently, there is no organized, coordinated and systematically planned approach to assist agricultural producers and agro-processors to gain access to regional and international markets. The few agro-processors who are currently exporting make their own arrangements to sell their products abroad.

1.5 Institutional set up for management and administration of agriculture and fisheries

Responsibility for the management and administration of agriculture and fisheries in St Kitts and Nevis lies with the MAFMR. The ministry consists of two departments – Department of Agriculture (DoA) and Department of Fisheries and Marine Resources (DFMR). Each of the two islands has its own independent DoA which works in close collaboration with the counterpart department in the other island. In contrast, there is only one DFMR for the entire Federation.

The DoA in each island provides a range of services for farmers including abattoir, ambulatory, land preparation, artificial insemination, sale of selected farming inputs, storage of produce and extension services. Some of these services are provided for a fee (e.g. abattoir and land preparation, or at a subsidized price (e.g. ambulatory and sale of farming inputs) or free of charge (e.g. storage of produce and extension).

The DFMR as far back as 2010 embarked on a programme to adopt 'Ecosystem-Based Management' of fisheries and aquaculture in St Kitts and Nevis. It is a 3-prong programme focusing on marine management area (MMA), aquaculture, and fish aggregating devices (FAD). The St Kitts and Nevis MMA was established in 2016 and extends two nautical miles outwards from the marine baseline around the Federation. Within the MMA, there are five

use zones: i) transport zone, ii) fishing priority zone, iii) recreation zone, iv) conservation zone, and v) a mixed-use zone for both fishing and conservation purposes.

At the beginning of 2018, all registered fishers were mandated to submit fishing data (in MAFMR-supplied data books) to the DFMR in order to receive any concessions (usually subsidized or completely free fishing inputs such as fishing trap wire, rope, line buoy etc). In 2019, registered fishing boat owners were provided, free of charge, vessel monitoring tracking devices to improve safety while at sea.

The DFMR is undertaking various projects on aquaculture, including sea moss production, as an alternative means of improving livelihoods, food and nutrition security and creating opportunities for value addition through agro-processing.

There are two interrelated challenges facing the DoA and DFMR that the government must urgently address to enable both departments effectively coordinate and facilitate implementation of the ATGS and deliver its benefits at scale to both existing and new entrants into the agri-food systems. The first challenge is inadequate human capacity – both in terms of number of personnel and diversity of skills and expertise required for agri-food systems transformation. A perusal of the approved staff positions in the two departments reveals gaps in certain expertise and competences required for the task ahead including, virology, nematology, epidemiology, marine biology, bio-toxin analysis, food technology, agricultural statistics/biometrics, digital solutions development, market analysis and agribusiness and value chain development. The second challenge is inadequate investment in physical capital (buildings, equipment, vehicles etc.) and modern technology that would allow staff to follow best practices in conducting AR4D and in delivering services to end users. Solutions to these two challenges are discussed in Section 3.

2. Why a new strategy to 2031

Justification

Old and new challenges confront the agricultural sector in St Kitts and Nevis. Long-standing challenges range from geography-related problems (manifested in limited availability of arable land), to inadequate investment, weak institutions and capacity in the agri-food systems. Interlocked with these old challenges are new threats posed by climate change, COVID-19 and other biological hazards (Table 2).

These challenges combined have hampered the growth of the agricultural sector and rendered its performance unsatisfactory when assessed on the basis of the 4 pillars of food security (i.e., availability, access, utilization and stability), improved livelihoods for those engaged in the agri-food systems value chains, foreign exchange earnings and contribution to economic growth.

Key indicators shown in Table 3 portray a summary scorecard for the agricultural sector. Total land area of St Kitts and Nevis is estimated at 260km² (26,000 ha) (FAO and World Bank). In 2019, about 23% of the total land area of the country was under agriculture. However, about 80% of agricultural land in St Kitts is held by the government, with part of it being leased or rented out to farmers. Irrespective of the pattern of land ownership, Figure 2 shows that since about 2003 just before the final closure of the sugar industry in 2005, there has been a significant decline in the application of soil nutrients that are needed, in addition to other inputs, to sustain and improve land productivity in the country.

Contribution of the agricultural sector to GDP was low and flat over the two decades covered in Table 3. Annual growth of agriculture, fishing and forestry value added was modest between 2010 and 2018 but suffered a set back in 2019, due to the onset of COVID-19 restrictions, followed by an impressive recovery in 2020 as the restrictions were partially relaxed. Figure 3 provides additional evidence to show that domestic food production has been declining in real terms since about 2002-2004. As a result, net food trade (i.e. value of exports minus imports) has remained negative over the last two decades, meaning that the country has relied on food imports during this period to satisfy national food security. Focussing specifically on food commodities that can be produced in the country if the agri-food systems are transformed to become more productive, competitive, resilient and sustainable, average annual import of fruits and vegetables, fish and meat stood at US\$ 5 million, US\$3 million and US\$ 11 million, respectively over the two-year period 2018-2019.

Apart from the financial cost of food importation, there is also a health cost. A good proportion of imported food is ultra-processed foods that are energy dense, high in fat, sugar and salt and can lead to health challenges related to overweight, obesity and other non-communicable diseases. Figure 4 indicates an increase in the prevalence of obesity in the adult population over the almost two decade period covered in the chart. This points to the need to promote consumption of healthy diets and reinforces the importance of focusing not only on production but also on the food systems – hence the emphasis on agri-food systems in this strategy.

Table 2. Key challenges constraining St Kitts and Nevis' agri-food systems

Challenge	Associated constraints				
Geography-linked	Steep topography	Proneness to land, soil and water degradation		Limited arable land leading to land fragmentation and cultivation of erodible slopes	
Climate change-induced	More frequent and intense hurricanes, severe storms, flood and droughts, sea level rise and threats to aquifers	Reduced crop and animal productivity, decreased fish abundance and catches	Increased incidence of pests and diseases and invasive species	Damage to infrastructure, equipment, loss of physical assets and increased risk to agribusinesses	Loss of income
Ineffective wildlife and domesticated animal management	Vervet monkey's destruction of cultivated fields, particularly in St Kitts		Feral donkey's destruction of cultivated fields in Nevis	Small ruminants destruction of standing crops	Attack by wild pigs and dogs on small ruminants
Weak adaptive management in response to natural hazards, climate and socioeconomic changes	Inadequate adaptation and widespread use of climate-smart technologies in crop, livestock and fisheries production		Lack of shock-specific early warning systems and agriculture-oriented weather forecasts	Lack of access to affordable insurance and social protection	Weak extension services and education programmes on adaptation measures
Inadequate hard and soft infrastructure	Inadequate investment in renewable energy for irrigation	Limited investment in integrated water management for irrigation	Lack of investment in food storage facilities and standards	Limited investment in digital innovation in agriculture	Insufficient investment in, agro-processing facilities, and market & trade promotion
Under-performing value chains	Lack of innovation in organisation of inputs supply to farmers and fishers	Poorly organised aggregation and transport of produce	Agro-processing sector with inconsistent capacity for effective value addition	Poorly developed capacity to identify and assess market-end opportunities and establish unique selling propositions to improve competitiveness	
Weak institutions and policy harmonization	Ineffective agricultural land administration and management	Inadequate investment in increasing number and capacity of staff in MAFMR	Limited Agricultural Research for Development; and investment in extension system	Weak policy harmonisation across sectors (agriculture, environment, trade, finance, tourism and education)	Weak agricultural finance and insurance markets
Weak social organisation and inclusion	Lack of collective action by atomistic cooperatives Ageing farmers and fishers and insufficient number of new young entrants		Limited social inclusion	Insufficient decentralized co-management systems	

Source: Author's own compilation from literature review.

Table 3. Trends in key agricultural and food indicators, St Kitts and Nevis, 2000-2020

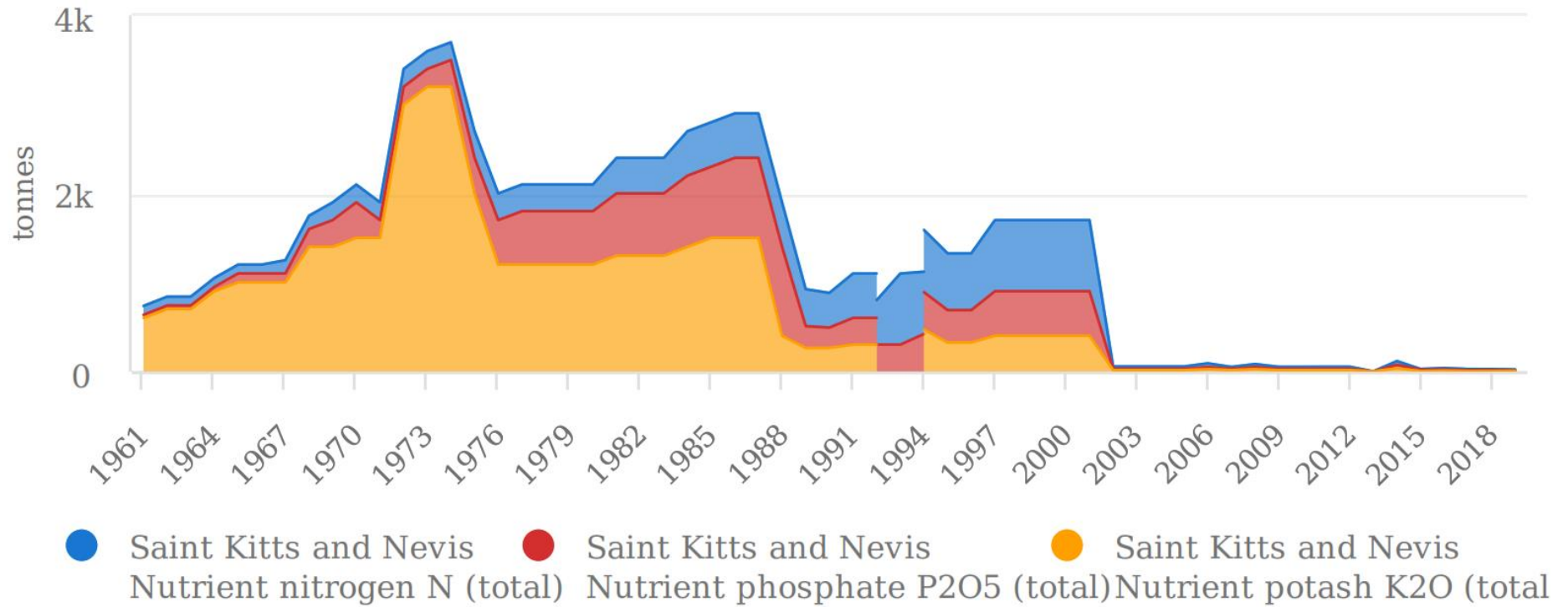
Indicator	2000	2010	2018	2019	2020
Agricultural land (% of land area)	36.5	21.9	23.1	23.1	n/a
Forest area (% of land area)	42.3	42.3	42.3	42.3	n/a
Terrestrial and marine protected areas (% of total territorial area)	n/a	n/a	n/a	0.3	
Agriculture, fishing and forestry value added (% of GDP)	1.5	1.3	1.1	1.0	1.4
Agriculture, fishing and forestry value added (annual % growth)	-32.2	2.5	3.0	-5.7	17.8
Net food trade (current US\$ million)	-27	-45	-35	-40	n/a
Consumer price inflation for food (%)	n/a	9.4*	2.4	1.9	n/a

Note: n/a means data not available

*2011 data

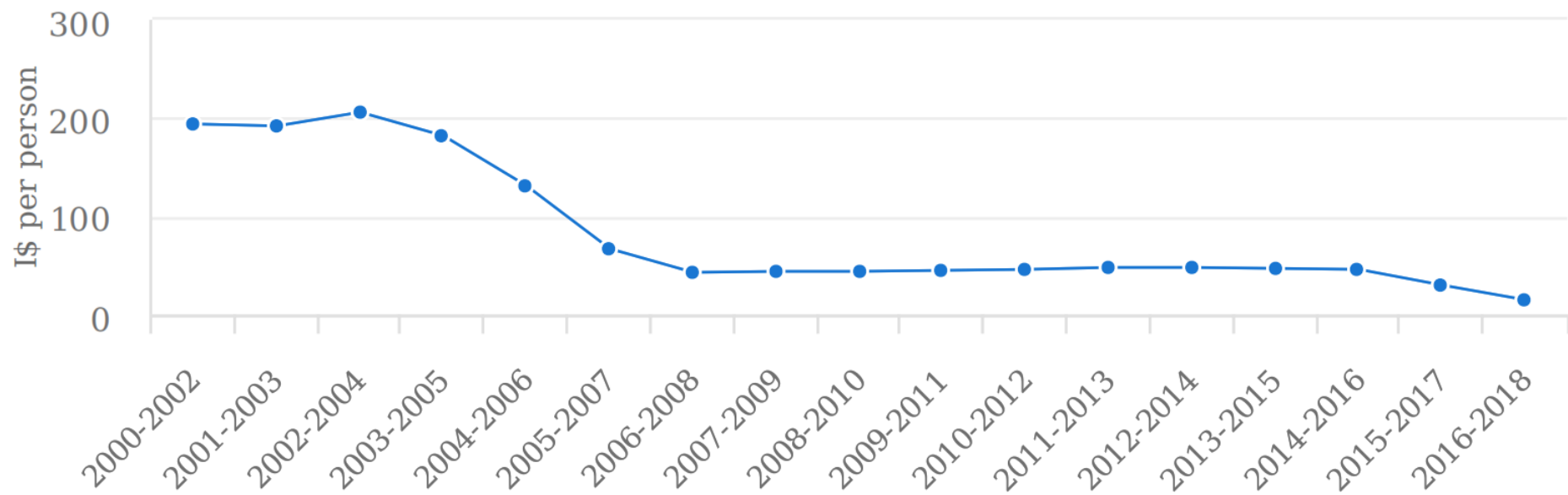
Source: FAO Statistical Yearbook 2020 & 2021; World Development Indicators, World Bank (accessed 17 February 2022).

Figure 2. Fertilizer consumption in nutrients, St Kitts and Nevis, 1961-2019



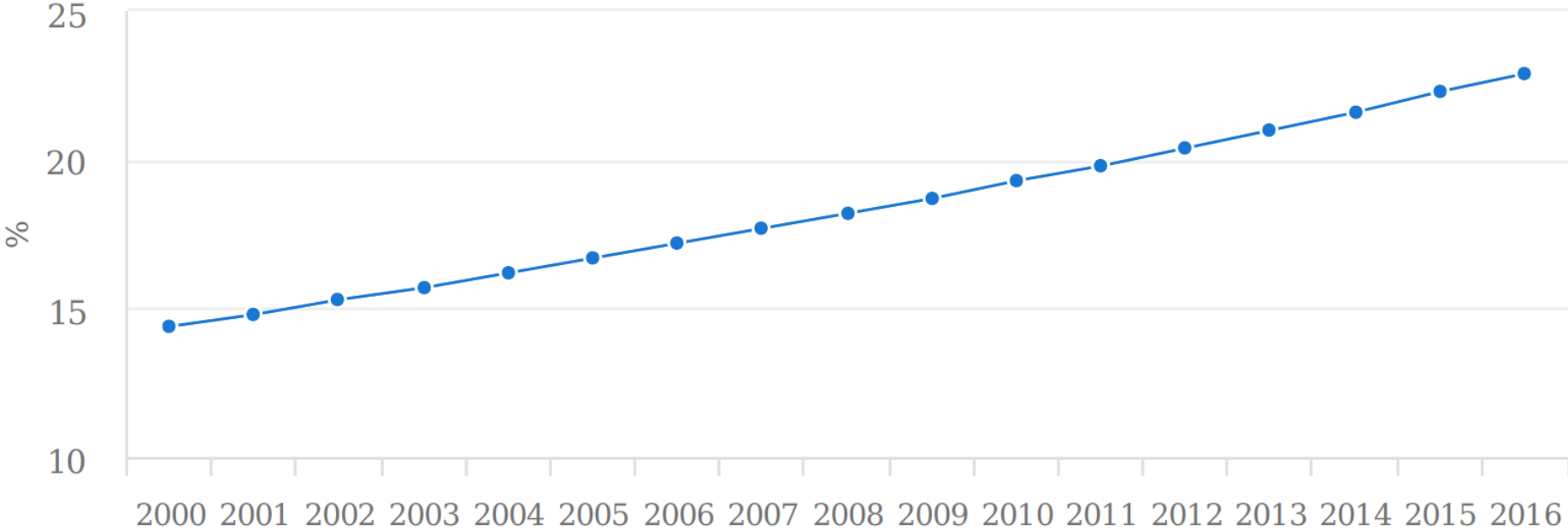
Source: FAOSTAT database

Figure 3. Average value of food production per capita (3-year average) in 2004-2006 constant international dollar



Source: FAOSTAT database

Figure 4. Prevalence of obesity (% of population 18 years and older), 2000-2016



Source: FAOSTAT database

The justification provided here and the interlinked challenges in Table 2 illustrate the scale of the problems that will need to be tackled. They also constitute entry points for intervention by the government, the private sector and development partners to support transformational and sustainable agricultural growth in St Kitts and Nevis. They also provide the context and a basis for understanding the outcomes, outputs and activities proposed in section 3.

Box 1. Solutions exist for the challenges facing the agri-food systems in St Kitts and Nevis

The challenges confronting the agri-food systems in St Kitts and Nevis are not insurmountable. Tackling them and charting a new pathway, however, will take time as there are no quick fixes. This realization informed the decision of the government to support the development and implementation of a 10-year ATGS to lay the foundation for a resilient and sustainable agri-food systems that will meet national objectives, as well regional and international commitments of the country.

3. Strategy Framework

The framework of ATGS 2022-2031 builds on and integrates lessons learned from the implementation of the Food and Nutrition Security Policy and Plan of Action for the Federation of St Kitts and Nevis (2012), the Agricultural Development Strategy (2013-2016), the St Kitts Strategy and Action Plan for Agriculture (2017-2021), as well as recommendations emanating from the FAO Initiative to Promote Investment Interventions to Advance Food and Agriculture Sector Transformation in St Kitts and Nevis (2020). The ATGS framework is also well aligned with the FAO's Regional Office for Latin America and the Caribbean's programme of work on 'Sustainable and Resilient Agriculture', and the five main recommendations emanating from the CARICOM/CDEMA/WFP/FAO regional report on the *Caribbean COVID-19 Food Security and Livelihoods Impact Survey* of February 2022. It takes into consideration ongoing work by IICA and CARDI in St Kitts and Nevis. It covers emerging priorities and needs based on government policy objectives, assessment of current practices and challenges in the agri-food systems. It benefitted from extensive consultation with a wide cross-section of farmers, fishers, agro-processors, representatives of the private sector, training and research institutions and government agencies as well as regional and international development partners (Appendix 4). An extensive review of published and grey literature was also conducted. The framework responds to the call for increased productivity, resilience and sustainability of the agri-food systems and for synergistic actions across the entire agri-food value chain in St Kitts and Nevis.

3.1 Vision and mission statements

The **vision** of ATGS is to establish resilient and productive agri-food systems that contribute to economic growth and improve livelihoods, food security, and nutritional health by harnessing agricultural knowledge and innovation systems and through sustainable management of ecosystems and biodiversity.

The **mission** is to transform the low productivity, low resilience agri-food systems in St Kitts and Nevis to high productivity, resilient and sustainable systems that meet national objectives and commitments.

Guiding principles

The development and implementation of ATGS will be guided by the following principles.

- Simultaneous focus on achievement of **increased productivity**, economic, social and environmental **sustainability** and **resilience** of crop, livestock, fisheries, aquaculture farming and associated food systems to climatic and non-climatic stressors.
- **Inclusive and differentiated approach**. Inclusiveness ensures that no one is left behind and everyone, without exception, can take advantage of the opportunities that transformation will create to improve their livelihoods and well-being. This is particularly important for smallholder farmers, women and youth. A differentiated approach recognises that there is a diversity of farmer types and assets and transformative actions will need to be tailored to the different categories of farmers.

- **Commercial orientation** with a focus on connecting farmers and fishers to markets, integrating them into viable and profitable value chains and allowing end-market opportunities to guide production and agribusiness development activities.
- **Partnerships.** Collaboration among the different stakeholders operating in the agri-food system space, including farmers, fishers, government ministries and agencies, financial institutions, NGOs, civil society organisations, educational institutions, and development partners to tap into their knowledge, expertise and other resources to enrich the transformation process.

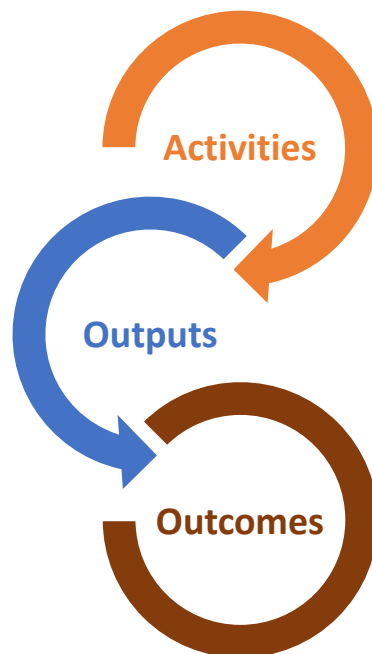
The framework to actualize the vision and mission statements is illustrated in the infographic on page 2. It focuses on four outcomes and their associated outputs and activities which, together with key implementation approaches and new ways of working, will lead to the attainment of five key impacts that will benefit people, the economy and the environment. Table 4 presents a summary of the outcomes and outputs.

Table 4. Summary of outcomes and outputs

Outcomes	Associated Outputs
Outcome 1 Legal, policy and institutional innovations	Output 1.1 Risk-informed policies to promote investment, innovation and competitiveness
	Output 1.2 Land tenure, water and fishing legislation and property rights reviewed and amended
	Output 1.3 Policy and institutional innovations to support agri-food systems transformation
Outcome 2 Effective environmental health and biodiversity management	Output 2.1 Integrated land, soil, water, and coastal zone ecosystems management
	Output 2.2 Coastal marine and aquatic ecosystems management improved
	Output 2.3 Strengthen local institutions and communities to support natural resource and risk management
	Output 2.4 Biodiversity mainstreamed into agricultural systems
Outcome 3 Resilient agri-food systems	Output 3.1 Climate change resilience and emergency response measures strengthened
	Output 3.2 Climate smart agricultural, fisheries and aquaculture practices scaled out
	Output 3.3 Agricultural health and human health through food systems enhanced
	Output 3.4 Genetic innovations promoted
Outcome 4 Prosperous livelihoods and value chains based on agri-food systems	Output 4.1 Access to improved production inputs, post-harvest equipment and services expanded
	Output 4.2 Market assessment capability developed, with better linkages of farmers and fishers to markets promoted
	Output 4.3 Risk-informed value chains developed
	Output 4.4 Quality assurance and regulation improved

Figure 5 illustrates the interdependence and mutually reinforcing features of outcomes, outputs and activities. The remainder of this section describes the outcomes, outputs and activities in more detail.

Figure 5. Illustration of interlinked activities, outputs and outcomes



3.2 Outcomes, outputs and activities

Outcome 1. Legal, policy and institutional reforms

A major role for the government is to create the enabling environment, i.e., legal and regulatory framework, institutional arrangements and policies to support agricultural transformation and spur growth. In St Kitts and Nevis, agricultural policies are often reactive and fragmented rather than being proactive and coordinated. Yet several areas of the agri-food systems value chain need forward-looking and interlinked policies, institutional innovation, and modern laws to enable agricultural transformation to take off. The outputs and activities described below are meant to put in place appropriate agricultural policies, institutional arrangements and legislation which, together with appropriate investments, will give impetus to agricultural transformation and growth. Some of the reforms discussed below will require the engagement and involvement of other ministries and government agencies and civil society. Thus, cooperation and harmonization of policies and plans across the public sector in a timely manner will be important and cannot be overemphasized.

Output 1.1 Risk-informed policies to promote investment, innovation and competitiveness

Government policy can play a vital role in incentivising the private sector to engage in the transformation programme. Agribusiness entrepreneurs bring investor mindset to agri-food

systems transformation and this will be important in developing their own enterprises and new public-private partnerships. In this regard, government will need to review and, if necessary, revise current investment policies and instruments (e.g. fiscal and financial incentives and regulatory environment) to promote sustainable investment in agriculture, new value chains, market channels and food safety standards and to improve the country's competitiveness in agricultural trade. World Bank data indicate that in 2020, St Kitts and Nevis ranked 139 out of 190 countries in the ease of doing business, with a score of 54.6 out of 100. The score and ranking suggest that more needs to be done to improve the business environment in the country. In addition, policies specifically targeted to de-risk agriculture, livelihoods and value chains will be useful. This will include policies to facilitate the implementation of innovative finance and insurance schemes (e.g. blended finance, fintech, index-based flood, drought, hurricane and landslide) to incentivise technology uptake and investment in new profitable but initially capital-intensive value chain operations.

Activities

Activity 1.1.1 - Improve regulatory, business, trade and investment environment

Activity 1.1.2 - Implement policies to de-risk agriculture, value chains and livelihoods

Activity 1.1.3 - Implement policies to improve and invest in social protection programmes

Activity 1.1.4 - Improve coordination and harmonization of policies and programmes across government ministries and with other non-state actors (i.e. the private sector, civil society and development partners).

Output 1.2 Land tenure, water and fishing legislation and property rights reviewed and amended

With a limited land area there is, understandably, competing demands for land resources in St Kitts and Nevis. As a result, many government departments have overlapping responsibilities in land administration and management. From an agricultural perspective, the main issues pertain to: i) the distribution of agricultural land, particularly the so-called 'crown lands' (i.e. lands from the former sugarcane estates held in trust by the government), and ii) land tenure security. The small parcel of land (< 0.4 ha) now rented individually to many small-scale farmers is less than ideal for optimal production activities. Also, land tenure security, with clearly defined property rights, is needed to spur labour and capital investment by farmers to promote sustainable land management and agricultural intensification. A review of existing acts and mandates of the various departments with responsibilities for agricultural land is, therefore, needed in order to streamline and better coordinate land administration and management.

Water resources management and development fall under the purview of the Water Services Department in St Kitts. However, there is no relevant legislation in place for the development of integrated water management for agricultural production. This void makes access to water for productive agricultural use a challenge in St Kitts. Even though farmers in Nevis are able to connect to government water supply to irrigate their farms, this is not a long-term

sustainable solution. Climate change predictions identify drought as a critical hazard for Nevis which, coupled with lower than average rainfall, will compromise fresh water availability (World Bank, Climate Change Knowledge Portal at worldbank.org). This implies that increased water demand may lead to over abstraction of groundwater. Thus, on both islands, appropriate legislation and investment to augment and stabilize water supply is the first step towards improving access to water for productive agricultural use.

Box 2: Investment in integrated water management for agricultural production

Once appropriate legislation is put in place for the long-term development of freshwater resources on both islands, the next step is to invest in infrastructure, technologies and equipment to augment and stabilize freshwater supply for productive use in agriculture. A practical plan needs to be developed to:

- Improve rainwater harvesting
- Develop and sustainably manage groundwater resources
- Develop wastewater treatment and management to provide safe water for urban and peri-urban farming
- Develop a variety of built and natural water storage infrastructure at farm, community and basin levels.

Improved water supply will need to be coupled with energy- and water-efficient irrigation systems powered by renewable energy (solar and wind) and appropriate kits (drips and sprinklers).

The on-going Mexico-CARICOM-FAO project ‘addressing the water-energy-food nexus in agriculture in St Kitts and Nevis’ as part of the ‘Cooperation for Adaptation to Climate Change in the Caribbean’ initiative and the on-going work by IICA on water use efficiency are appropriate and steps in the right direction. The lessons learnt in the implementation of these projects will provide a good starting point for the design of future projects on integrated water management for agri-food systems transformation.

Fishers consulted in the course of developing the ATGS talked about lack of knowledge and information on their rights to fish outside coastal marine areas, even though they see other (foreign) vessels fishing on the sea. Relatedly, one of the main objectives of the Department of Fisheries and Marine Resources is to implement systems and procedures to combat Illegal, Unreported and Unregulated (IUU) Fishing. These issues and many others are well addressed in the Fisheries, Aquaculture and Marine Resources Act 2016. The task then is to develop programmes and projects to implement the pertinent provisions of the act to support agri-food systems transformation.

Activities

Activity 1.2.1 - Modernise land tenure and property rights legislation. Once this is done, a land redistribution programme to certified and enterprising (individual or group of) farmers will be necessary.

Activity 1.2.2 - Support integrated water management for agriculture through forward looking legislation and investment to augment water supply and irrigation (see Box 2 above)

Activity 1.2.3 - Develop programmes to rapidly implement pertinent provisions of the Fisheries, Aquaculture and Marine Resources Act 2016 (see activities under Output 2.2 and Output 3.2 below).

Output 1.3 Policy and institutional innovations to support agri-food systems transformation

Institutional innovations backed by appropriate policy changes are needed to expand and diversify the **agricultural research for development (AR4D) system** and facilitate the diffusion and adoption of new technologies through a well-trained and well-equipped extension service. Development of pilot research and application units on existing agricultural research stations will allow for effective assessment of new seed and planting materials, breeds, and technologies and their adaptation to the agroecology and environmental conditions in St Kitts and Nevis. Investment in human capital and provision of adequate complementary resources (e.g. ICT equipment, vehicles etc) will be key to success.

Similarly, policies to promote the use of digital technology to support farmers, fishers, input suppliers and agro-processors will be needed. **Digitalization of agriculture** will facilitate timely provision of climate, financial and market advisories, as well as data collection, analysis and knowledge management for informed decision making. Digital policy and regulations will be required to lay the foundation for the introduction of digital agriculture, while financial and fiscal incentives will be deployed to reduce barriers to digitally-enabled services and tackle the digital divide (so as to them accessible to all), and ease restrictions on goods and services that underpin access to digital networks. Institutional innovations that will allow the use of digital technologies to streamline border procedures will promote trade (see Box 3 on the Digitalization of Agriculture).

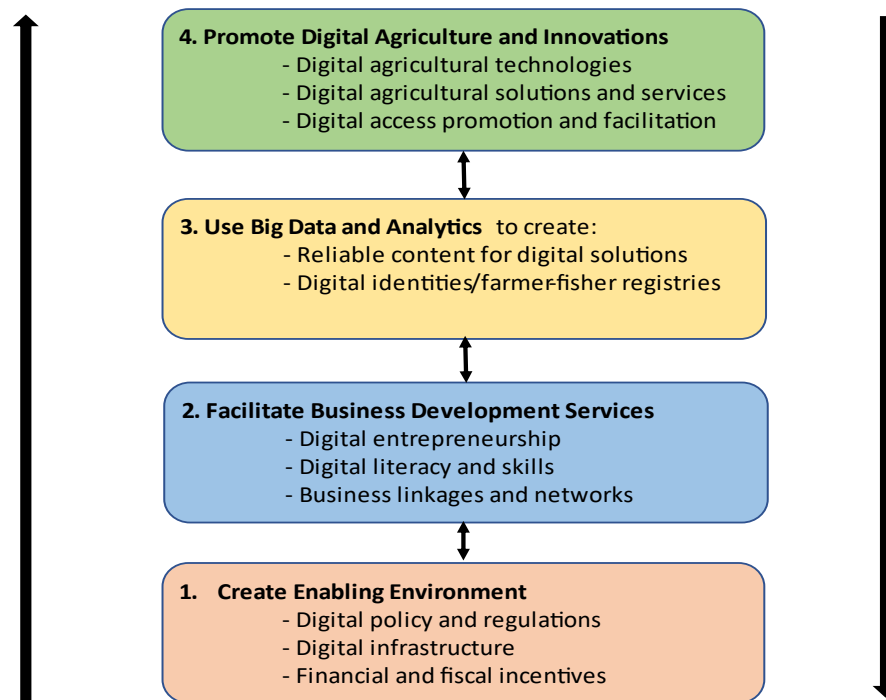
Box 3: Digitalization of Agriculture

Digitalization of St Kitts and Nevis agriculture can serve, in several complementary ways, to advance the objectives of agri-food systems transformation. It can be used to:

- Collect and store data to improve the current dearth and poor quality of agricultural data.
- Improve early warning systems through predictive analytics of hurricane, storms and drought risks and thereby reduce damage and loss.
- Improve crop production and productivity through soil and crop monitoring, pest and disease prevention diagnosis and control and extension advisory services.
- Improve value chain activities by addressing bottlenecks in supply chain management and improving access to finance and insurance (FAO & ECLAC 2020), *Artificial Intelligence in Agriculture, 2020*.

However, the promise and benefits of digitalization will only be realised if it is developed holistically by putting in place the four pillars depicted in Figure 6 below.

Figure 6. Illustrative framework for digitalization of St Kitts and Nevis' Agriculture



Source: Adapted from Baumüller and Addom, 2020

Box 3: Digitalization of Agriculture (continued)

Pillar 1 covers the enabling policies, institutions, infrastructure, support services and other conditions that are needed to create a favourable business environment to support agricultural digitalisation.

Pillar 2 focuses on service providers, particularly start-ups, and ways to support them through incubation, coaching, business linkages and networking.

Pillar 3 focusses on modern tools (satellite images, drones, sensors, Internet of Things) that can be used to capture and offer quality data to develop content and appropriate registries for end users. Developing good content and appropriate and inclusive end user profiles that leaves no one out will help to improve the quality and targeting of solutions and advice offered to all gender and age groups.

Pillar 4 Digital innovation in agriculture consists of two parts – ‘digital technologies’ and ‘digital solutions and services.’ Digital technologies may include infrastructure (masts, cables, wireless routers etc.) and hardware (mobile telephones, sensors, blockchain, drones etc.) needed to operate, offer and access digital services and solutions. Digital agricultural solutions and services encompass services and products offered to end users with the support of digital technologies. These solutions and services need an enabling environment to allow inclusive and affordable access by all farmers, fishers and other value chain actors to enable them improve agricultural productivity, incomes and their well-being.

Focusing on one pillar and neglecting the others will be inadequate to promote digitalisation of agriculture. The MAFMR will need to work collaboratively with the Ministry of ICT, SKNCIC, and the St Kitts and Nevis Information Service to implement this initiative.

Currently, **availability of quality data** for planning and implementation of agricultural programmes and informed decision making is at best patchy and inadequate. Data on several key agricultural variables are either unavailable, outdated or not collected in ways useful for agricultural planning. These shortcomings, if not rectified, will undermine effective planning, implementation, monitoring and evaluation of the ATGS. There is, thus, a compelling case for urgently implementing the activity and sub-activities on data collection and management described below.

Equally important will be economic incentives and legislation to **strengthen farmer and fisher’s cooperatives and communities** to promote collective action so that they are able to successfully negotiate with service providers and private sector entrepreneurs on behalf of their members.

Policy and institutional reforms designed to recognise the **different adaptation and transformation pathways of different categories of farmers and fishers** will be required. Identifying and classifying farmers into different groups will allow different technologies and innovations to be targeted to their specific needs. For instance, those ready to “step-up” will need different incentives compared with those just ‘hanging-in’, for whom the best option might be to provide them with cash and in-kind transfers, under a well-designed social protection programme, to enable them exit agriculture and transition to other livelihood activities.

Institutional innovations that will allow **key principles of sustainable and resilient agri-food systems management to be included in the education curriculum** of primary, secondary and tertiary institutions will be useful and will serve to inculcate in young people at an early age the importance of agriculture and food systems in society and the national economy.

The creeping problem of overweight and obesity in the adult population needs to be tackled by creating a **Nutrition Monitoring Unit within the MAFMR** that will work in collaboration with other relevant Ministries (Health, ICT, Education etc.) to develop the capability to collect relevant nutrition data, take amelioratory action, and deliver public awareness programmes on safe and healthy diets and nutritional content of food and beverages sold in the country.

Activities

Activity 1.3.1 - Institutional innovations and investment to strengthen agricultural research for development focusing on sustainability and resilience, extension advisory services and capacity development for extension agents, farmers and fishers.

Activity 1.3.2 - Implement policy and legal framework to support and promote investment in **digitalization of agriculture** (see Box 3 and Figure 6 above).

Activity 1.3.3 – Invest in digital innovations and human capacity development to strengthen agricultural and household **data collection, analysis and management** for evidence-based planning and decision-making.

- Strengthen capacity within MAFMR and Department of Statistics to design agricultural data collection instruments and use digital equipment and tools to collect high quality disaggregated data on household and individual characteristics (age, gender, income, education, geographic location), production activities, natural resources and environmental variables.
- Strengthen capacity to analyse data and generate credible statistics and information on agricultural development and outcome and output indicators required to monitor, evaluate and ensure accountability in the implementation of the ATGS.
- Promote data management and strengthen data sharing across different ministries and agencies responsible for and involved in agri-food systems transformation.

Activity 1.3.4 - Institutional and legislative reforms to strengthen the technical and organizational capacities of farmers and fishers’ cooperatives and promote collective action.

Activity 1.3.5 - Institutional innovations to promote teaching and practical demonstration of agri-food systems transformation principles in schools.

Activity 1.3.6 - Institutional innovations and public awareness programmes to promote healthy and safe diets and prevent spread of non-communicable, food-related diseases.

Outcome 2. Effective environmental health and biodiversity management

This outcome will promote sustainable use and management of terrestrial and coastal marine ecosystems to improve production and ecosystem services. Agriculture and ecosystem services are interrelated in many ways. Ecosystems generate beneficial ecosystem services such as food, feed, and fibre. They also regulate climate and water services, generate biodiversity, provide carbon storage, soil retention and aesthetic benefits that support income-generating activities such as scuba diving, snorkelling, and hiking. Inappropriate agricultural practices can negatively impact ecosystem services such as fresh water supply and pollination. Similarly, dysfunctional ecosystem services can negatively affect ecosystems and compromise their productive capacity. Thus, securing ecosystems, ecosystem services and biodiversity is a critical first step in transforming the agri-food systems of St Kitts and Nevis.

Output 2.1 Integrated land, soil, water and coastal ecosystems management

This output aims to secure the natural resource base on which agricultural production and fishing depends by adopting and implementing sustainable practices, technologies and policy measures that will halt degradation and restore landscape and coastal habitat health. Land degradation is occurring partly due to natural hazards and climate change-induced extreme events and partly as a result of unsustainable land use practices. Simultaneously, coastal habitats are threatened by land-based pollution and illegal soil mining. Land degradation reduces crop and animal productivity, while coastal zone degradation diminishes fish abundance and catches.

By taking an integrated approach to land, soil, water and coastal ecosystems management, the multiple uses and competing demands on land and coastal habitats are taken into consideration in developing adapted and holistic management practices that reflect not only the physical features of the landscape and coastal zone, but also the socioeconomic, political and administrative decisions that affect their use.

Activities

Activity 2.1.1 - Implement landscape management approach

A landscape approach deals with land use and management in an integrated manner, combining natural resource management with environmental and livelihood considerations in a bid to achieve multiple economic, social and environmental objectives

(multifunctionality) through processes that recognize, reconcile and synergize the interests, attitudes and actions of multiple actors (FAO, 2012, Minang et al., 2015). This approach recognizes that the root causes of problems may not be site-specific and that solution requires multistakeholder interventions. It aims to balance competing demands on land through the implementation of adapted and integrated management practices that take cognisance of the physical features of the landscape, as well as the socioeconomic and political decisions affecting land use.

In the context of St Kitts and Nevis, a number of existing documents (e.g. National Environmental Management Strategy, National Physical Development Plan (NPDP) and Nevis Physical Development Plan (NEPDP); Acts (e.g. National Conservation and Environmental Protection Act, Development Control and Planning Act); and studies (e.g. St Kitts and Nevis Land Policy Issues paper, Final Country Report of the Land Degradation Neutrality Target Setting Programme etc.) have laid out the broad principles to follow in implementing the landscape approach. They are a useful starting point, though they need to be updated given the changing climatic and anthropogenic influences on land use. More specifically, the following activities will need to be undertaken to implement the landscape approach.

- Demarcate the geographical area to be managed, map the biophysical features and take stock of various land use practices. This information will provide baseline data and information to use in planning, monitoring and evaluating the landscape management.
- Over the area, through a participatory and consultative process, implement an integrated forest and agricultural land management that clarifies the rights and responsibilities of communities and various government departments. Incentives and updating of existing legislation to encourage adherence and compliance with sustainable land management practices. Interagency collaboration between the MAFMR, the Ministry of Environment, Department of Physical Planning and Land and Surveys Department will be needed.
- Update and use land planning principles laid out in the NPDP and NEPDP to guide agricultural land use, road construction, building and other civil engineering projects and land acquisitions by investors. Provision by government of adequate resources (both human and material) to strengthen the monitoring and enforcement activities stipulated in the Development Control and Planning Act, 2000 will be necessary.

Activity 2.1.2 - Improve soil health

Sustained management of soil health, i.e. biological, chemical and physical properties of soil, is important and needed to increase agricultural productivity. It is also an integral part of sustainable land and ecosystem management.

Information gathered from key informants paints a picture of steady increase in soil degradation since the collapse of the sugar industry brought an end to the land and soil management support provided to farmers by the sugarcane estates. In this situation, the first step in addressing soil degradation is to update knowledge on the current status of soils

through soil mapping and developing **soil data and information systems** to allow soil condition, including organic carbon, monitoring. The second step is to set up a comprehensive system of soil management that is tailored to the needs of different cultivated crops. In this regard, the adoption, adaptation and implementation of **the “Voluntary Guidelines for Sustainable Soil Management (VGSSM)”** developed by FAO through a multistakeholder, consultative process is recommended. The guidelines provide guidance on measures that will help to:

- Control and minimize soil erosion caused by water and wind
- Enhance soil organic matter content
- Foster soil nutrient balance and cycles
- Prevent, minimize and mitigate soil salinization and alkalization
- Prevent and minimize soil contamination
- Prevent and minimize soil acidification
- Preserve and enhance soil biodiversity
- Minimize soil sealing
- Prevent and mitigate soil compaction
- Improve soil water management (FAO, 2017a).

Implementing the VGSSM will promote sound soil management practices that will provide a firm foundation for agri-food systems transformation. St Kitts and Nevis can learn from the experiences of other countries that have implemented or are implementing the VGSSM by engaging in the forum of the Global Soil Partnership hosted by FAO.

Activity 2.1.3 - Promote integrated coastal zone and watershed management

Integrated coastal zone and watershed management (ICZWM) is a key requirement and building block for agri-food systems transformation. Coastal zones and watershed are linked ecologically and through related biophysical processes, services and functions. They are also among the most vulnerable areas to anthropogenic pressure, natural hazards and climate change. Any unsustainable development activity in a watershed has the potential to cause damage to coastal zones and ecosystems. ICZWM recognises this interdependence and interaction and provides a holistic approach to balance environmental, economic, social, cultural and recreational objectives within a geographical area. It enhances the protection of coastal and watershed resources, whilst promoting rational use of resources through better coordination of policy, practice and action at national, parish and district levels and among different government agencies and development partners. Sub-activities to be undertaken to implement ICZWM include:

- Identify biophysical features and socio-economic and livelihood conditions in the specified watershed and coastal zone.
- Conduct an inventory and map resources in the area to provide a baseline against which improvements will be assessed.
- Systematically examine and understand existing and potential interactions that affect different activities and resources in the area and analyse how these interactions are likely to develop over time.
- Establish ICZWM committees made up of key stakeholders (e.g. local land and coastal area users, community representatives, government agencies and NGOs) to discuss community goals, identify ways of promoting complementary beneficial activities and limiting negative externalities and harmful effects of competitive and antagonistic interactions. Actions such as the construction and strategic location of built (e.g. new dams and reservoirs) and natural infrastructure (wetlands) to manage erosion and store water for irrigation and drinking purposes, greening activities (e.g. planting of trees, shrubs and grasses) around waterheads and denuded slopes, and rehabilitation of reefs and coastal mangroves will all be needed.
- Empower the ICZWM committees with appropriate legislation and negotiation and arbitration powers to encourage a mix of activities that will promote sustainable integrated coastal and watershed development.

Output 2.2 Coastal marine and aquatic ecosystems management improved

The marine and aquatic ecosystems in St Kitts and Nevis face multiple threats. Increasing human pressure is leading to overfishing and pollution. Increasing temperature, extreme rainfall events and changing rainfall patterns, sea level rise, acidification of oceans and aquatic invasive species (e.g. sargassum) all complicate ecosystems management and contribute to biodiversity erosion. Apart from broad knowledge of the different species found in coastal marine areas, there is a dearth of data on vulnerability of different species to the impacts of climate change and effects of alternative management scenarios. This lack of detailed fishery statistics hampers ecosystems management and sound decision making. This output identifies activities that will help to protect and restore coastal marine and aquatic ecosystems and promote biodiversity conservation

Activities

Activity 2.2.1 - Improve coastal marine fisheries data collection, monitoring and analytical capacity

- Establish data requirements that would be practical to collect and that would allow seasonal and annual comparisons. The data should reflect the diversity of fisheries, fishing methods and ecosystem types.
- Standardize methods of data collection, database management, data sharing and reporting. Methods for data collection should include traditional catch effort monitoring and new approaches such as remote sensing of population densities and

habitat types linked to fish production models, coupled with regular household surveys.

- Increase the number, capacity and training of fisheries officers to spearhead the data collection effort, analyse the data and use the results to inform fisheries management decisions.

Activity 2.2.2 - Implement measures to control, reduce and manage marine pollution and litter

- Evaluate alternative options to remove litter from coastal marine waters, such as development of different waste management methods or the use of special waste collection bags.
- Develop, in collaboration with relevant partners, a regional adaptation plan to reduce pollution and address the effects of pollution on marine ecosystems.

Activity 2.2.3 - Develop capacity to monitor and reduce environmental footprint of aquaculture

- Implement spatial planning (e.g. zoning) for siting of aquaculture ponds to minimize pollution.
- Develop guidelines for promotion of aquaculture best management practices to increase awareness and responsibility among farmers to reduce waste and environmental pollution.
- Build capacity to implement environmental monitoring programmes.

Output 2.3 Strengthen local institutions and communities to support natural resource and risk management

Some of the natural resource management problems (e.g., land, coastal and watershed degradation, soil erosion, poor drainage and maintenance of the few existing public sector small reservoirs servicing irrigated perimeters in St Kitts) and the devastation of crops by monkeys and donkeys lead to systemic risks. These risks, left unaddressed, will in the long run jeopardize the ability of the agri-food systems to sustainably deliver expected agricultural products and ecosystem services. Pervasive problems that may affect an entire community are best tackled through joint action at the local level. This calls for incentives to promote collective action that will inspire joint effort to address these problems with benefits to individual farmers and fishers and communities as a whole. Capacity building programmes will be needed to upgrade the skills and knowledge of community representatives in mobilising for joint action and developing effective plans for risk and natural resource management.

Activities

Activity 2.3.1 - Facilitate the formation of committees at local level for natural resource and risk management

Activity 2.3.2 - Build the capacity of local institutions and committees to develop risk-informed plans for natural resource management and maintenance of infrastructure

Activity 2.3.3 - Promote and reward joint action on natural resource and risk management by groups of resource users

Output 2.4 Biodiversity mainstreamed into agricultural systems

Agriculture, if improperly managed, can be a driver of biodiversity loss, including the diversity that is crucial to healthy diets and nutrition for humans and feed provision for ruminants, especially during the dry season. Sustainable agricultural practices, including multi-functional farming landscapes can help to increase, sustain, restore and conserve both managed and wild biodiversity. The following activities will help achieve the objectives of this output.

Activities

Activity 2.4.1 - Promote integrated food and feed systems in cultivated fields using agroforestry practices. This will involve the planting of fruit trees, shrubs and browses alongside annual crops.

Activity 2.4.2 - Enhance biodiversity functions of gene banks

- Establish gene banks at parish and district levels under sound regulatory and management protocols to support and enhance the genetic diversity of seeds, cultivated plants, farmed animals and fish stocks and their related wild species.
- Develop plans for long-term accessions in gene banks to provide solutions for future climate changes and shocks.

Activity 2.4.3 - Strengthen area-based, co-management of coastal areas to conserve biodiversity and enhance productivity of marine fishery resources

- Use participatory approaches that involve shared responsibility between the regulatory authority (DFMR) and local user groups to establish new protected areas and in the designation of new area-based measures to safeguard vulnerable species and essential habitats and the management of fishery resources. DFMR is already undertaking a programme along the lines sketched above. What is needed is to deepen and implement additional complementary measures to what is being done now.
- Monitor fish and feed population shifts to support adaptation.
- Change timing or location of fishing as species arrive earlier/later or shift to new areas.
- Set catch limits based on monitoring and precautionary principles to prevent overfishing.
- Evaluate the impacts of protected areas and area-based measures in relation to the objectives of setting them up.
- Develop attractive livelihood strategies to support generational turnover (from old to young) in fishing communities.

Outcome 3. Resilient agri-food systems

This outcome focuses on building agri-food systems that are better adapted to climate and non-climate stressors, thereby making them more resilient. Simultaneously, emphasis will be placed on increasing productivity through sustainable intensification of agricultural production in order to improve livelihoods while enhancing household and national food security and agri-food systems contribution to economic growth.

Output 3.1 Climate change resilience and emergency response measures strengthened

Currently, agriculturally-focused early warning of extreme events (e.g. floods and droughts) and climate information services that provide real-time seasonal and short-term forecasts on the amount of rainfall expected in a growing season, the occurrence of dry spells, etc. are not readily available and transmitted to farmers and fishers. Systematic availability and sharing of such information (in the form of alerts and advisories transmitted using various forms of ICT) can help to build farmers and fishers awareness and inform farm and fishing-level risk-sensitive decision making. Climate services co-developed with farmers and fishers using a participatory approach (e.g. PICSA³) help to reduce the climate information “usability gap” because the information is tailored to their needs, level of exposure and adaptive capacity. On a different but related issue, the country lacks critical tools for regular crop forecasting, food and nutrition security monitoring and early warning on transboundary pests and diseases of animal, fish and plants.

This output seeks to bridge the gap described above by using available technological innovations, including digital technology and ICT tools and equipment, to facilitate the delivery of effective shock-specific early warning climate advisory services. Emphasis will be placed on bundling of complementary services (e.g., climate information, flood, drought, pest and disease early warning, and technical, financial, insurance and market advisories) in order to achieve economies of scale to reduce the cost of delivering services and accelerate uptake. This bundling of services will hinge on the availability of a cadre of well-trained and well-equipped extension agents.

Activities

Activity 3.1.1 - Shock-specific early warning systems and climate services co-developed with end users

- Use participatory and collaborative approaches to develop climate services and various early warning information disseminated using digital tools and ICT to value chain actors. Cooperation between the MAFMR, St Kitts Meteorological Department, Nevis Meteorological Office, the Caribbean Meteorological Organization and end

³ The Participatory Integrated Climate Services for Agriculture (PICSA) as the name implies is a participatory approach for climate services and agricultural extension developed by researchers at the University of Reading, UK. PICSA is a good example of an approach to co-develop climate services with end users. A number of development partners, including UNDP and Rockefeller Foundation are supporting developing countries to adopt and scale-out the approach to facilitate effective delivery of climate services to farmers and fishers.

users will be important and will be a good manifestation of the new ways of working described in the infographic on ATGS at a glance.

Activity 3.1.2 - Increase investment in disaster risk preparedness

This entails acting early to take preventive action ahead of multiple systemic hazards and threats to the agri-food system. Early action will mitigate the adverse impacts of these threats and save huge sums that would otherwise be spent on response and rehabilitation. Specific activities include:

- Build disaster risk analysis into public investments
- Build resilient roads, bridges, flood reservoirs, drainage systems, sea walls etc through **public-private partnerships**.

Activity 3.1.3 - Establish emergency reserves and distribution systems – for seeds, planting materials, livestock breeding stock, fish fingerlings, feed and food. This is a key step in the disaster recovery phase that will allow farmers, livestock producers and fishers to quickly re-establish production and livelihood activities. To implement this activity:

- Invest in climate-proof warehouses that meet resilience structure requirements and standards
- Invest in rural infrastructure – roads, bridges, transportation, telecommunication etc.

Output 3.2 Climate smart agricultural, fisheries and aquaculture practices scaled out

Activities

Activity 3.2.1 - Implement climate-smart and productivity enhancing crop production solutions

Farmers in St Kitts and Nevis are already experiencing the adverse impacts of climate change manifested in flooding and water logging, drought and dry spells within the cropping season, land and soil degradation and increased incidence of pests and diseases. A range of proven solutions exist that farmers practising open field agriculture can use to adapt and mitigate the impacts of climate change (FAO, 2021). Some of the main solutions that are applicable in St Kitts and Nevis are listed below by specific hazards.

Flooding and water logging

- **Flood tolerant crops** – i.e. crops that can withstand submersion under water for a moderately long period without losing their productive potential
- **Field dredging** – removes excess water during plant growth and prevents fungal diseases and accumulation of salts in crop's root zone.

- **Raised bed system** – improves soil structure and promotes optimal growth of root systems

Drought and dry spells

- **Drought tolerant crops** – i.e. crops with low water requirements
- **Short-cycle varieties** – reduce plant exposure to drought due to the shorter growing cycle and total water requirements over the growing season
- **Small reservoirs** – collect rain and storm water to make water available for irrigation to counteract the effects of drought and dry spells during the growing season
- **Deficit and supplemental irrigation using renewable energy (e.g. solar and wind) powered pump and drip/sprinkler kits** – The approach that is recommended blends water-smart and climate-smart agricultural practices. It couples water storage in on-farm tanks, ponds and reservoirs with farmer-managed micro irrigation powered by renewable energy and appropriate kits (drip or sprinkler) and soil saturation sensors. This system is cheaper and easier to maintain than public sector managed large/medium scale irrigation system. It has proved successful in other developing countries and is already being practised by some farmers, especially in Nevis. Using appropriate kits increase water use efficiency by providing water according to crop needs and reduce soil erosion and macronutrient losses from leaching. The main constraint to adoption of this type of irrigation by smallholder farmers is the high initial capital cost. As discussed under Output 4.1, innovative finance, credit and insurance schemes will help to improve access to this increasingly essential input into crop production in St Kitts and Nevis.

Land and soil degradation

- **Terracing** – reduces soil erosion and increases macronutrient deposition
- **Minimum or zero tillage** – promotes minimum disturbance of soil structure and organic matter.
- **Agroforestry** – root systems stabilize the ground and reduce soil erosion; improves soil health by increasing soil organic matter (SOM) and microbial activity; it enhances carbon sequestration; and provides timber and fodder for animal feeding and medicinal uses.
- **Mulching** – increases soil moisture by reducing losses due to direct evaporation and moderates soil temperature.
- **Organic matter application** – increases SOM and microbial activity.
- **Crop rotation and crop association** – increase soil fertility as each crop has different nutrient requirements and plant-soil dynamics; increase crop yields as a result of diverse nutrient availability.

- **Biofertilizers** – reduce the environmental impacts (from volatilization and leaching) of chemical fertilizers, improve nutrient availability for plants and increase yields.
- **Organic farming** – is both a climate-smart practice and a holistic system of production that promotes and improves agro-ecosystem health. Organic farming can enable producers to gain access to niche markets and earn high price premiums, though they first need to meet sanitary and phytosanitary standards and other voluntary sustainability standards (relating to environmental, social, ethical issues and food safety) that may be stipulated. Organic farming as a practice and as a production system has not been actively promoted in St Kitts and Nevis to date, but must be considered an essential component of the agri-food system transformation programme both in terms of the environmental and economic benefits that can accrue from its widespread adoption and implementation.

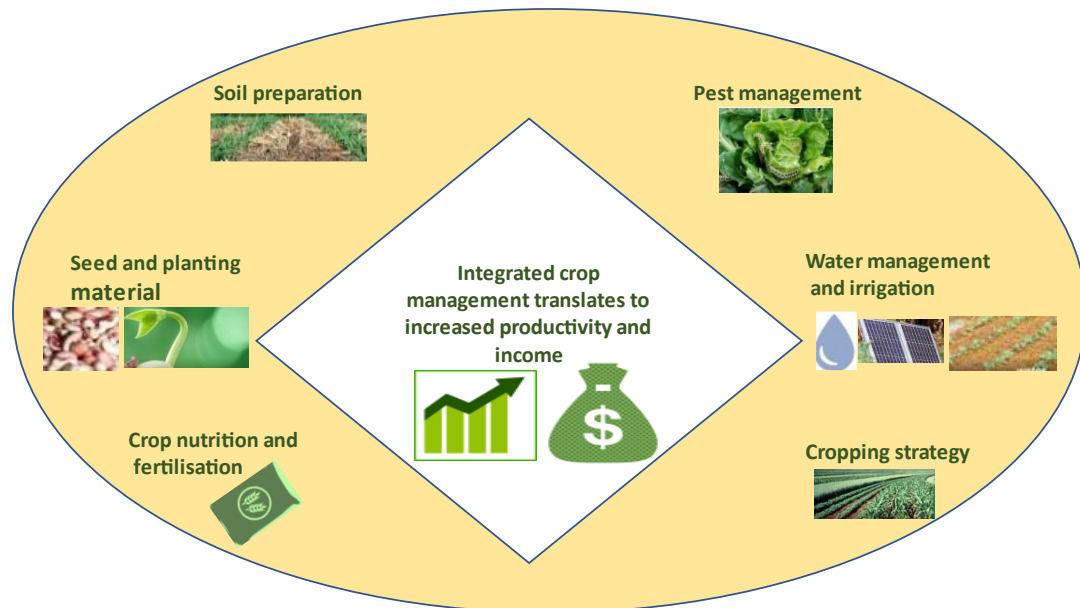
Pests and diseases

- **Crop rotation** – limits concentration of pests and diseases as each crop has different pathogens
- **Biological control** – use of beneficial entomopathogens to reduce the need for chemical pesticides
- **Biopesticides** – reduce environmental impacts as they are organic and biodegradable and reduce the negative effect on human health associated with chemical pesticides
- **Integrated pest management** – involving agronomic and plant pathology methods, e.g. resistant crop varieties and grafting to suppress insect pests, association with other plants that deter insects (e.g. lemon grass can reduce pests on leafy vegetables or relay intercropping of tomato and cabbage), addition of beneficial fungi and bacteria to horticultural crops vulnerable to root diseases etc.

Application of any specific combination of the solutions listed above should be determined by the local challenges faced by farmers. It is important that farmers apply context-specific climate-resilient solutions, based on the concept of integrated crop management, in order to increase productivity and income (Figure 7).

It will be equally important to develop attractive livelihood strategies to support the transition of older farmers out of farming and facilitate the entry of younger people into farming.

Figure 7. Integrated crop management infographic



Protected cultivation systems

Currently, protected cultivation systems such as green houses, shade houses and hydroponics are being practised by a few well-do farmers in St Kitts and Nevis. However, such systems have a crucial role to play in the agri-food systems transformation agenda and should be scaled out for adoption by smallholder farmers. Hydroponics, i.e. soil-less agriculture or cultivation of plants in a water-based nutrient, is particularly relevant in the context of the limited availability of arable land in St Kitts and Nevis, and as a way to improve the inclusion of women, youth and landless groups in agriculture because of the technology's lower and more efficient resource use. It is also well suited for the cultivation of vegetables to improve household diet. The main advantages include: a) the absence of weeds and other soil-borne pests, b) better use of water, c) better control over nutrient and oxygen, d) increased control over growing conditions which allows for year-round production, and e) good crop quality and yields.

To scale out hydroponics and other protected cultivation systems, MAFMR should establish demonstration 'plots' and organize farm visits by smallholder farmers to those farms where protected cultivation systems are currently being practised in St Kitts and Nevis. In addition, lessons learnt from the implementation of the St Kitts and Nevis component of the on-going FAO-funded project on 'Innovative Protected Cultivation Systems in the Caribbean' will guide future investments by government and development partners in further expanding these systems.

Activity 3.2.2 - Implement climate-smart and productivity enhancing livestock production solutions

As in the case of crop production, adoption and implementation of practical and proven climate-smart solutions can help to improve animal productivity and incomes of livestock producers. A number of key hazards and climate-smart solutions to mitigate their impacts are summarized below.

Drought and heat

- **Drought and heat tolerant breeds** – use of adapted breeds, compared with less tolerant breeds, can help to reduce mortality and ensure relatively high productivity by minimizing animal's susceptibility to drought and heat stress conditions.
- **Agroforestry shrubs and browses** – can serve as shelter belts to reduce animal exposure to heat stress and thereby reduce mortality and productivity loss and provide feed for ruminants.
- **Irrigated fodder production** – increases feed availability during drought.
- **Alternative feed resources** – e.g. cassava pellets for pigs and poultry.

Pest and diseases

- **Disease resistant breeds** – ensure relatively high productivity and reduce mortality.
- **External parasite control measures** – reduce productivity loss and mortality.
- **Vaccination** – reduces mortality and productivity loss and probability of disease outbreak.
- **Improved housing** – ensures good ventilation and animal spacing to minimize disease spread and mortality.

Windstorms and intense rain

- **Resilient barns and housing units** – reduce exposure of animals to extreme weather events.

Unhygienic environment/greenhouse gas emissions

- **Manure management** – use manure for biogas production and as biofertilizer, thereby reducing methane gas emission when manure heaps up on the farm.
- **Feed and ration management** – improvement of forage quality, diet supplementation with concentrates and enzymes and diet modification can reduce enteric methane emission

Some of the solutions described above are presently beyond the reach of most smallholder farmers. Nonetheless, they are the kind of solutions that MAFMR must be prepared to roll out and introduce to farmers as part of the agri-food system transformation agenda. Roll out of these solutions will require investment to upgrade existing research stations and capability of research staff and extension agents. Cooperation already exists between MAFMR and Ross University of Veterinary Medicine on animal health management and breeding. This cooperation will need to be deepened and expanded, as agri-food systems transformation advances, to cover other areas including epidemiological risk assessment of animal pests and diseases, diagnostics etc.

As in the case of crop production, an integrated livestock management approach that combines adapted breeds, good feed rations and improved animal health practices, facilitated through expanded public and private animal health services, is the key to raising livestock productivity and incomes of producers.

Activity 3.2.3 - Implement evidence-based climate adaptive coastal fisheries management

The sub-activities listed below will need to be combined and implemented in conjunction with activities 2.2.1, 2.2.2 and 2.4.3 in order to develop a comprehensive resilient and sustainable coastal fisheries system.

- Continue to operationalize and deepen the ecosystem approach to fisheries that was first initiated in 2011 through the development of a framework that takes into consideration climatic and non-climatic changes that have occurred since then.
- Develop multi-annual small-scale fisheries management plan, incorporating social, economic and ecological aspects, based on solid data and regular stock assessment of priority species.
- Assess the effectiveness of management plans and revise as necessary to meet national objectives in line with domestic imperatives and regional commitments.
- Provide advice, in easy to understand and accessible form, on alternative small-scale fisheries management options.
- Establish research programmes (in collaboration with other partners) to address key fisheries management needs and the conservation of vulnerable species and ecosystem.
- Facilitate access of all gender groups, particularly women and youth in the coastal fisheries sector to education and training, technology, credit and entrepreneurship activities.
- Support adoption of ***FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication***. This is a commitment to work towards sustainable development of small-scale artisanal fisheries. Development of participatory and gender-sensitive national action plans for

the implementation of the Guidelines will lead to relevant adaptations consistent with the social, environmental and economic conditions in St Kitts and Nevis.

With respect to some specific hazards, the following actions are recommended.

Ocean acidification

- **Better and selective breeding** – invest in and support breeding of species and stocks that can thrive well in a wide range of environments.

Invasive species

- **Pathway analysis** – identification and monitoring of invasion pathways.
- **Quarantine measures** – to stop entry and spread of invasive species.
- **Eradication measures** – use cultural, biological, chemical and mechanical control.

Waste dumping

- **Fisheries, Aquaculture and Marine Resources Act (FAMRA) 2016** – implement relevant sections to regulate and sanction against waste dumping.

Storm surges

- **Protective and resilient grey-green infrastructure** – such as seawalls and mangrove reforestation can help to minimize damage and loss of life and assets.
- **Support safety at sea and improved working conditions through** improved fishing boats with better stability and communication equipment together with appropriate gear and fishing methods to help save lives at sea.

Sea surface temperature rise

- See actions listed under Activity 2.4.3

Activity 3.2.4 - Promote risk-informed resilient and sustainable aquaculture systems

Aquaculture is not well developed in St Kitts and Nevis despite its enormous potential to improve livelihoods and food and nutrition security in the Federation. Encouragingly, a number of on-going projects are addressing this gap to promote aquaculture, including aquaponics⁴. What is needed at this opportune time is to lay the foundation, through appropriate policy, fiscal and technical measures, for a climate-resilient and sustainable aquaculture system that is economically viable, socially inclusive and environmentally benign.

⁴ This include the FAO-GEF funded Climate Change Adaptation in the Eastern Caribbean Fisheries Sector (CC4FISH) project, and the Mexico-CARICOM-FAO initiative on Resilient Aquaculture for Food Security and Well-being in the Caribbean.

A three-step complementary approach is proposed and should be implemented in conjunction with actions listed under Activity 2.2.3.

Develop programmes and projects to implement relevant sections of FAMRA 2016 – paying particular attention to: land tenure and water rights, area-based management at landscape and seascape levels (to spatially plan and zone land and maritime areas for current and future development and growth of aquaculture and mariculture), regulations and standards (e.g. for hatchery and product certification), fiscal incentives to allow women and youth to get involved, and public sector funded research, extension and training.

Develop a framework for aquaculture risk management – to address 3 challenges: i) climate change impacts, ii) disease risks, and iii) food chain contamination risks. Examples of available and proven solutions to address these risks are described below.

- **Habitat degradation, eutrophication and pollution** – implement spatial planning including zoning in siting aquaculture facilities.
- **Poor water quality** – can be addressed through breeding or selection of species tolerant of oxygen deficiency.
- **High feed and management costs** – focus on: a) introduction of local species to reduce costs and nutritional deficiencies, and b) integrated systems (e.g. aquaponics) to reduce cost of supplementary feeding and fertilisation and to reduce waste.
- **Disease** – diagnostics, surveillance and monitoring can serve to reduce the risk of disease epidemic from imported pathogens and parasites or from poor management.

Improve productivity and environmental performance – through

- **Breeding and genetics** (or for initial purposes buying adapted brood stock lines) to promote efficient resource use, reduce problems of disease and escape and lower production costs.
- **Feed and feed management** – to minimize costs and waste.
- **Low impact production systems** (e.g. integrated systems such as aquaponics and integrated multi-trophic aquaculture) to ease resource constraints and lower costs.
- **Disease control** through diagnostics, inspection services, surveillance, monitoring and reporting.
- **Research and development** - to come up with locally relevant adapted aquaculture systems, understand and manage trade-offs in integrated systems and best management practices suited to the conditions in various parts of the Federation.

Aquaponics, a system that combines hydroponics and aquaculture within a closed system, has been mentioned in the discussion above. It deserves to be promoted and scaled out for adoption by women, youth, landless farmers and other vulnerable groups on account of its livelihood, food and nutrition benefits. In aquaponics, two products (fish and vegetables) are produced in a symbiotic relationship - fish water is used as fertilizer for the plants and the plants clean the water for the fish. Major benefits of aquaponics food production include:

- two agricultural products (fish and vegetables) are produced, thus providing a means of improving nutrition
- efficient water use
- does not require soil;
- does not use fertilizers or chemical pesticides;
- prevents aquaculture waste from polluting nearby watersheds
- higher control on production leading to lower losses
- can be practised on non-arable lands such as degraded lands (Somerville et al., 2014).

The main constraint is the high initial investment cost, which can be minimised by reducing the size of the unit and providing start-up support for disadvantaged groups who might be interested in getting into aquaponics business.

Looking beyond fisheries and aquaculture to unlock the potential of the blue economy

The blue economy is more than just fisheries and aquaculture, though they are important components. Other critical components that must be developed include tourism, maritime transport, offshore renewable energy, seabed extraction activities, marine biotechnology and bioprospecting. Environmental sustainability of coastal areas and oceans is also a key issue to consider. St Kitts and Nevis, as an island nation, stands to benefit from rational use and management of the marine resources embedded in the blue economy. However, blue economy development requires public and private sector investment. In addition to government investment, improving access for investors and entrepreneurs is vital to support the development of new opportunities. To this end, integrated policies and enabling environment to attract domestic and foreign investment, coupled with government investment in education, skills and expertise development will be critical. Providing appropriate technology, equipment and tools to the Department of Marine Resources will enable it to play a proactive and facilitative role in developing the blue economy.

Output 3.3 Agricultural health and human health through food systems enhanced

Agricultural health and human health are linked through food systems. Agricultural health is predicated on good agricultural practices, including safe and judicious use of chemical inputs and implementation of integrated pest and disease management principles during the

growing and post-harvest seasons. While ready availability, access and appropriate utilization of food as well as stability of food production form the basis of household and national food security, human health can be threatened by poor food quality, safety and diseases transmitted through food systems. Diet-related non-communicable diseases such as diabetes, cardiovascular disease and cancer are on the rise in all regions of the world, including the Caribbean. The task of ensuring that agricultural health enhances human health starts with a focus on improving food production, quality and safety, and simultaneously implementing programmes to target consumer behaviour, make healthy and nutritious food affordable and improve social protection. A number context-specific activities that can be implemented to achieve the objectives of this output in St Kitts and Nevis are described below.

Activities

Activity 3.3.1 - Coordinate and strengthen monitoring, surveillance, risk assessment and management of pests and diseases of plants, animals and fish

- **Invest in digital tools, upgrade laboratories and strengthen staff capacity** – to streamline and better integrate similar work activities currently conducted by different units within the DoA and DFMR. Digital tools and equipment to monitor pests and diseases, conduct risk assessment, issue e-phyto, e-animal health and food safety certificates must be considered going forward as part of the transformation process, in addition to standard practices such as livestock dipping to control ticks and reduce the incidence of tick-borne diseases.

Activity 3.3.2 - Pilot and scale-out practical, cost-effective and humane animal treatment control methods to limit damage caused by monkeys (in St Kitts) and feral donkeys (in Nevis) to crop production

Green monkeys (and feral donkeys in Nevis only) are a special type of pests in St Kitts and Nevis. Monkeys arrived in St Kitts and Nevis in the 17th Century as pets of slave traders and merchant settlers (Dore, 2017). They have always been a threat to crop production, eating up sugar cane and other cultivated crops. At the height of the operations of the sugar industry, crop damage by monkeys was well controlled through a variety of measures including fences and hiring of rangers by each sugar estate to ward off monkeys. Following the closure of the sugar industry in 2005 and with it the infrastructure and ancillary operations used to keep monkeys at bay, monkeys have moved down from the mountains to crop cultivation areas in the lowlands. Farmers now routinely experience crop devastation by monkeys. This has forced a few farmers to abandon their fields.

The activity recommended here aims to promote a proactive stance by the government to tackle this menace. The proposed activity is in the realm of a public good that can only be provided by the government. Leaving the control of monkeys to individual farmers will not work and will cause agricultural transformation to stall as farmers will not adopt and invest in new agricultural technologies knowing there is no certainty that they will not lose their crops to monkeys.

The government needs to invest in science-based control methods that combine wildlife management with appropriate monkey deterrent measures. Researchers based at CARDI office in St Kitts have studied monkey behaviour and effective control methods for several years. The government should work collaboratively with them to pilot a few control options with the aim of scaling out the most cost-effective, humane and environmentally friendly options over the entire Federation.

With respect to livestock, wild pigs and dogs are a menace to small ruminants. Measures to control free roaming and to periodically cull these animals will help to protect small-scale livestock producers' investment.

Activity 3.3.3 – Increase production of nutrient-dense crop, animal and fish source food

- **Utilize the full range of activities under Outcomes 2 and 3** – to increase food production and promote horizontal diversification to expand the range of locally produced food, thereby improving dietary diversity and availability and stability pillars of food security. Focus should be on the crop, livestock and fish products in which the Federation has a comparative and competitive advantage. This will include the main staples, including neglected but nutritious varieties of roots and tubers, indigenous vegetables and fruits.
- **Focus on nutrient-rich food products** – In addition to increasing output of main staples, attention should also be paid to nutrition-sensitive food production, i.e. increased production of nutrient-dense crop, animal and fish source food commodities through breeding and biofortification as described in Output 3.4 below. An example is the orange-fleshed sweet potato (OFSP), with its high vitamin A content, developed by the International Potato Centre (CIP) based in Lima, Peru. Apart from the high vitamin A content with its health benefits, the crop has several other desirable traits. It is drought tolerant, early maturing and can be harvested in 3-4 months. With this short maturing period, a household can grow 2-3 OFSP crops in a year. There are now over 60 biofortified OFSP varieties developed by CIP and its national partners around the world. Investment by St Kitts and Nevis in this kind of crop and similar food products through good genetic material propagation and distribution systems (see Output 3.4 below) can help improve nutrition and human health.
- **Link consumers to markets** – For consumers to benefit from increased food production, a good network of hygienic and well-maintained rural and urban markets must be established to serve people locally close to where they live. This will help to improve access to healthy, safe and nutritious food.

Activity 3.3.4 – Support nutrition monitoring and analysis and integrate in food security planning, information and communication

- Using digital technology, conduct individual and household surveys to monitor access to food, overall food consumption, the variety and nutritional contents of foods

consumed and nutritional status of household members by gender and age. This kind of data have not been routinely collected in St Kitts and Nevis but are essential for informed decision making on human nutrition and health, and in the design of public sector food supply and distribution programmes such as school and hospital feeding, ante- and post-natal care for pregnant women and public awareness campaigns. This work will entail close collaboration between MAFMR, Ministry of Health (especially the Nutrition Surveillance Unit), Ministry of Education, Department of Consumer Affairs and Department of Statistics.

Activity 3.3.5 - Improve food storage, processing, quality and safety standards

- **Introduce low-cost, energy efficient on-farm and market floor food storage units – to reduce food loss, waste and environmental pollution.** Dry and cold storage units with simple technologies that can be easily replicated are now widely available. Financial and fiscal incentives to stimulate production and uptake of these storage units will be needed. For agro-processors and food manufacturers, warehouse storage will be needed and could be funded through public-private partnership.
- **Improve education and training to reduce food loss and waste** – Reduction of pre- and post-harvest loss and waste in all parts of the agri-food systems value chain can be achieved through awareness building, education and training in the use of improved storage methods and equipment and safe handling, distribution and processing.
- **Establish within MAFMR a Food Technology and Nutrition Analysis Laboratory and recruit a Food technologist** - to work on new product development and training of agro-processors.
- **Strengthen food quality and safety** – through appropriate standards to ensure production of wholesome and healthy foods. Standards setting with agribusinesses and consumers should be encouraged to promote ownership, insights and partnerships for education and awareness campaigns. At the same time, promote hygienic animal slaughter, fish and food handling and preparation practices to prevent contamination and food borne diseases. This will also help to reduce health management costs associated with treating food borne diseases.

Output 3.4 Genetic innovations promoted

Genetic innovations along the lines described in the three activities listed below are central to any effort aimed at transforming agri-food systems. They will build on on-going work by the Department of Agriculture, for example on improved goat breeding, at the Bayfords Livestock Centre. The activities are needed to enable farmers and fishers adapt to a changing climate and other shocks. Adapted varieties and breeds that are heat-, drought- and flood-

tolerant, disease resistant, more nutritious and more productive are needed to increase agricultural productivity, drive higher and more stable incomes for farmers, fishers and agro-processors, promote dietary diversity, and improve food and nutrition security. Biofortification and breeding for market relevant traits will be a component of this work. While taking care of current needs, MAFMR officials need to keep a clear line of sight on long-term accessions in decentralized, strategically located gene banks to provide solution for future climate changes and other shocks.

Implementation of the underlisted activities will entail public sector investment and support from development partners to upgrade agricultural research for development (AR4D) hard and soft infrastructure – research stations, breeding techniques, equipment and tools and capacity development of researchers and technicians. Collaboration with universities (e.g. University of West Indies, Ross University School of Veterinary Medicine) and research centres of the One CGIAR (e.g. Bioversity International, CIAT, CIP, IWMI and World Fish) would be beneficial both in terms of acquiring improved germplasm and technologies, and professional training and capacity development.

Activities

Activity 3.4.1 - Improve supply and distribution of adapted, resilient and more productive varieties of crops, animal breeds and farmed fish stock

Initially before national breeding programmes become well established, it would be expedient to obtain adapted genetic materials from national, regional and international sources. This means that policy and regulations to facilitate acquisition and exchange of genetic resources must be streamlined and made affordable and accessible to farmers and fishers, especially women and youth, to provide them with the most suitable materials for the changing climatic conditions in different parts of the Federation.

Activity 3.4.2 - Establish national breeding programme to increase supply of nutrient-dense crops and nutrient dense animal and fish source foods

Existing breeding programmes focus mainly on adaptation of beef and goats to climate change and efforts aimed at increasing their productivity. However, complementary work to breed for nutrient-dense vegetables, legumes, root and tubers, bananas and more productive fish is needed to increase supply of these food products and improve dietary diversity, thereby increasing availability of nutritious food.

Activity 3.4.3 - Conservation and effective management of genetic materials of cultivated crops, livestock and fish stock and their wild relatives

This activity aims to expand and enhance the biodiversity function of gene banks. It calls for collaboration between the government, agribusinesses and communities to establish community-based gene banks under a regulatory (certification) system in a number of strategic locations around the Federation. This will be in addition to national gene banks under the control of MAFMR. This arrangement involving public-private and community cooperation will minimize risk of loss, ensure widespread availability and effective conservation of quality genetic resources.

Outcome 4. Prosperous livelihoods and value chains based on agri-food systems

Increased prosperity for farmers, fishers and other value chain participants is a key goal of agricultural transformation. Development and expansion of appropriate commodity value chains, access to lucrative markets, finance, knowledge, and extension advisory services are needed to achieve this goal. The outputs and activities that will lead to the achievement of this outcome are described below.

Output 4.1 Access to improved production inputs, post-harvest equipment and services expanded

Assisting small-scale farmers, fishers and other value chain actors to change their production practices through improved access to productive resources, new knowledge, finance and markets is one of the hallmarks of successful agricultural transformation.

Activities

Activity 4.1.1 - Promote innovative business models to allow SMEs to supply inputs, post-harvest and agro-processing machines, equipment and tools to farmers, fishers and agro-processors

Currently, the public sector through MAFMR is the dominant player in the procurement and supply of essential farm and fishing inputs (seed, fertilizer, tools and equipment) to small-scale farmers. Relatively large-scale farmers source their inputs from commercial companies (e.g. Trading and Development Company, Ltd.). All farmers, small- or relatively large-scale, currently benefit from a subsidy scheme for farm and fishing inputs. **Government's involvement in the procurement and supply of farm inputs to small-scale farmers may work when there is a limited number of farmers and fishers to cater for. But even now farmers talk about untimely access to inputs in quantities needed. As agricultural transformation takes root and new entrants (youth, women and retired professionals) are attracted into farming and fishing business, the range and diversity of inputs and technologies needed to promote agri-food systems transformation will increase and this will make government's involvement in input procurement and supply unsustainable over time. Continued government involvement will also stifle MSMEs entry and participation in this important downstream segment of the value chain. For this reason, government's involvement in input procurement and distribution should be gradually phased out and replaced by a scheme that will provide seed money to banks and local credit societies to lend out to aspiring MSMEs so they can take on the function and responsibility of supplying farm inputs to farmers and fishers.** One successful farm input supply system that has been implemented in other developing countries is the establishment of a network of certified MSME 'agro-dealers' or input stockists who are able to competitively source and supply inputs to farmers and fishers. Apart from selling inputs, the agro-dealers are trained to offer advice on the use and maintenance of the inputs and equipment they sell. If they are well distributed across the Federation in parishes and districts, they will be able to ensure timely and cost-effective supply of inputs to farmers. An added advantage is that agro-dealership creates employment

opportunities in rural areas for youth and women. **Cooperatives, as they are already well established and regulated by law in the Federation, may also be organized and empowered to perform the roles and functions of agro-dealers for their members.**

Activity 4.1.2 - Improve access to finance and insurance for farmers, fishers and other value chain participants

For many small-scale farmers and fishers, the upfront capital cost of some of the climate-resilient technologies, e.g., solar panels, pump and kits for irrigation, well-equipped fishing boats etc. may be too high for them to afford. Similarly, agro-dealers who are not able to rely on equity capital to finance their operations will need loans. Currently, agricultural lending as a percentage of overall lending portfolio of financial institutions in St Kitts and Nevis is very low (< 1%), compared with lending portfolios of similar organizations in other countries of the OECS and SIDS in general. This low level of lending to the agricultural sector is partly due to the challenge of establishing the credit worthiness of small-scale farmers and fishers who do not routinely keep financial records and may lack suitable collaterals. The risk involved in such lending discourages banks from offering credit to them. In this situation, institutional innovations will be needed to encourage small-scale, client-responsive approaches to finance, such as value-chain lending, mobile-based finance, equipment leasing. Other arrangements that go beyond private collateral as the basis for lending can also help to ease the burden of establishing the credit worthiness of small-scale farmers, fishers, women and youth (see Box 4 below).

Box 4: Innovation in development of agricultural loan products for small-scale farmers and fishers

In many developing countries in Africa, MSMEs in the ICT field are developing products that financial institutions are using to develop loan products for small-scale farmers and other vulnerable groups. For example, FarmDrive, a small enterprise in Kenya (see <https://farmdrive.co.ke>) builds cost-effective and customised risk assessment models for financial institutions to use in evaluating the credit worthiness of smallholder farmers who apply for loans. FarmDrive provides a simple record-keeping platform that allows farmers to input their financial information via SMS and an Android app to build a credit score. The farmer's data are combined with agronomic, environmental, economic and satellite data through machine learning to develop a comprehensive credit profile that is used by a financial institution to assess a farmer's credit worthiness. This helps to enhance access of smallholder farmers and other small value chain participants to finance and working capital by eliminating the credit risk information gap that prevents banks from lending to them or lead banks to offer them financial products that are incompatible with their circumstances and needs.

The SKNCIC can encourage its members in the ICT field to develop similar credit scoring schemes, which financial institutions interviewed in the course of developing this strategy indicated they will be interested in using. **There is thus an opportunity for the SKNCIC, the Small Business Development Centre and the banks to work together to eliminate one of the main bottlenecks to adoption and uptake of new agricultural technologies and thereby contribute in a significant way to agri-food systems transformation in St Kitts and Nevis.**

In addition, risk management products (e.g. insurance) are needed to complement credit and finance provision to small-scale farmers, fisherfolk and MSMEs. **Currently, agricultural insurance in any form is not provided to small-scale farmers and fishers.** Government through partnership with national and international insurance companies should explore the introduction of insurance products (e.g., index-based flood and drought schemes, multiple crop peril insurance, group risk plans etc.). However, the greatest barrier to insurance may be limited awareness and unaffordable insurance products. **Public-private partnership to increase awareness and sensitize the public and design affordable insurance products that meet consumer demand will help to improve access for small-scale farmers, fishers and other value chain actors.**

Apart from insurance, contingency funds tied to capacity building and saving schemes have been used successfully in other countries to help poor and vulnerable people better manage risk.

Activity 4.1.3 - Strengthen extension advisory services to promote good agricultural practices and training of farmers and fishers in record keeping and business management skills

An effective technology transfer system, based on a strong extension service system, is indispensable for agri-food systems transformation. Currently, the agriculture extension system in St Kitts and Nevis is under-resourced and inadequately integrated. Investment to enhance the capacity of extension agents and adequately equip them with physical and material resources (vehicles, computer laptops, GPS, soil diagnostic kits, animal health diagnostic kits etc.) will be needed to enhance the quality of advisory services they offer to farmers and fishers. Investment in digitalization of extension services (including chatbots, audio and video advice and training materials) and making use of the full suite of information and communication technologies (ICTs) will help to provide effective and timely advice and complement face-to-face interactions with end users.

Output 4.2 Market assessment capability developed and better linkage of farmers and fishers to markets promoted

One of the conditions common to all cases of successful agricultural transformation is that agricultural producers (men, women and youth) are well integrated into expanding and lucrative markets. Unless producers can sell profitably on a regular basis, they remain at best subsistence farmers and fishers. Good market access can incentivise producers to adopt innovative approaches that will increase productivity and long-term sustainability. Good access to lucrative markets, through the intermediary of MSMEs supporting aggregation, distribution and value addition activities, is vital for farmers and fisherfolk to be productive and profitable.

Market assessment to identify and evaluate market opportunities that can drive production activities is the bedrock of a successful strategy to integrate farmers and fishers into markets and build a viable value chain. This assessment applies equally to domestic and external markets. **Within the domestic market area, although individual elite farmers are well-linked to supermarkets and hotels, small-scale farmers and fishers are poorly linked to the tourism sector and supermarkets. Therefore, efforts to link them to this vibrant and dynamic sectors of the economy would be highly desirable and should be actively promoted.**

However, currently the preoccupation of decision makers and producers is with satisfying domestic market demand and import substitution. Although this is a valid preoccupation for many reasons, ambition needs to extend beyond replacing imported foods in the domestic market. Agri-food systems transformation, if the actions and activities proposed in this strategy are dutifully implemented, will lead to more output than the domestic market can absorb due to its limited size. Thus, it is now that plans, along the lines proposed in the activities below, need to be initiated to expand and modernize domestic markets while getting ready to diversify into external (both regional and international) markets.

The aim of this output, therefore, is to increase the capacity of farmers and fishers to serve domestic and external markets in fresh and processed food, vegetables and fruits, thereby increasing income, employment and foreign exchange earnings while reducing food imports.

Activities

Activity 4.2.2 - Develop market assessment capability

- **Establish within MAFMR a well-equipped market assessment unit staffed by well-trained personnel** to gather information on products in demand, looking at form (fresh or processed), seasonal and annual patterns of demand, mode and means of getting the products to the market, the product and process standards and associate traceability requirements etc.⁵
- **Conduct cost-benefit analysis** of servicing the market, including several market-end opportunities (i.e. segments within the market).
- From a Federation perspective and especially with respect to external markets, **target market-end opportunities** within a given market to have a sufficiently broad portfolio of produce to supply to reduce dependency (of relying on only one commodity) risks. This will also ensure inclusiveness as different producers and value chain actors can be organised to serve different market segments.
- **Continuously track the evolution of markets** – to remain nimble and able to adapt to changing market conditions as no market remains static.

The result of this market assessment will guide and drive on-farm production and fishing decisions and activities. This process represents a paradigm shift from the traditional system of produce first, then look for a market – that may or may not take what has been produced. Market demand creates supply, not the other way round.

Implementing this intervention will require a cadre of well-trained market assessors and advisers who are equipped with relevant digital and ICT tools and equipment. Investment in capacity development and training will be needed. Ideally, this intervention will involve collaboration between MAFMR, relevant divisions within the Ministry of International Trade and Ministry of Tourism, value chain actors and other stakeholders.

Activity 4.2.1 - Implement measures to improve price and non-price competitiveness

- Implement financial and fiscal measures to improve productivity and price (or cost) competitiveness of producers.
- Develop product differentiation and unique selling propositions and implement other measures such as product and service quality, variety, novelty, reputation and reliability to improve farms and firms non-price competitiveness.

⁵ This type of assessment in a limited form is being conducted in Nevis to reduce gluts and shortages of fresh produce in the market, stabilize producer prices and facilitate agro-processing. This effort is commendable, but needs to be systematically done and deepened to include other aspects of market assessment described above.

Implementing these measures is necessary because gaining access to a market does not guarantee long-term success. Implementing them will ensure that producers and other value chain actors remain successful and competitive. As a twin-island in the Caribbean, adoption of a geographic or environmental-based differentiation strategy is a logical step to increase non-price competitiveness. Following product differentiation up with unique selling propositions, for example, through branding or captured in the micro climates under which the product is grown or produced, can be used to specify the intrinsic or extrinsic qualities of the product. Within this strategy, it is feasible to designate a certain percentage of production as organic.

Developing and implementing the above-mentioned measures is, however, the end product of a system of good practices established along the entire value chain from production (GAP) to processing, manufacturing, packaging, labelling (GMP) through to the final consumer (HACCP). Furthermore, private standards (e.g., voluntary sustainability standards) certification will be required, and is often mandatory, to gain access to niche green and organic products' markets and to benefit from associated price premiums.

Implementation of these activities will require investment in upgrading infrastructure, technology, facilities (e.g., packhouses), laboratories and processes along the value chain and collaboration between MAFMR, International Trade Division, SKNBS, SKNCIC, SKIPA, value chain actors, financial institutions and development partners.

Activity 4.2.3 - Increase investment in hard and soft infrastructure to improve market linkages

Improving market linkages and value addition require infrastructure, access to technology and knowledge and other inputs. What is needed is not only the hardware of market and value chain infrastructure, i.e., rural access and feeder roads, bridges, ports, packhouses, abattoirs, fish halls and markets, but also the software e.g., competitive rules of market operations (as opposed to state monopolies), standardized weights and measures, health and food safety and trade standards, market information systems on evolving market prices, supply and demand, and improved literacy, education and training necessary for all operators along the value chain to understand the public market information disseminated.

As in other countries that have successfully transformed their agri-food systems, government leadership in setting up the necessary infrastructure can attract not only private businesses but also NGOs and development partners, which can provide technical assistance, credit and other services small-scale farmers, fishers and other value chain participants need.

Output 4.3 Risk-informed value chains developed

Risk is pervasive (i.e. systemic) in agri-food system value chains. Risks frequently encountered in agricultural value chains include price, production, asset, institutional, financial and human or personal risks. Proactively managing these risks can help value chain participants to build resilient and risk-responsive operations to protect against loss, increase productivity and reduce loss.

Activities

Activity 4.3.1 - Develop capacity for risk assessment and management along the value chain

A risk-informed and risk-responsive approach involves four iterative steps:

- Identification of potential risks
- Assessment of their likely severity (i.e. probability of occurrence x impact)
- Development of risk management options to mitigate negative impact
- Monitoring and evaluation of the effectiveness of the option (s) implemented in response to any identified risk.

To effectively implement these steps, value chain participants will require capacity development and training from competent and well-trained crop, livestock and fisheries officers, agribusiness advisers, extension agents. This is also an area where development partners can provide technical assistance.

Activity 4.3.2 - Improve commodity aggregation and distribution

Agro-processing and food and beverage manufacturing rely on a steady throughput of agricultural raw materials to remain viable, profitable and competitive on a year round basis. Agricultural produce aggregation whether carried out by cooperatives, hucksters or agribusiness MSMEs, is needed to collect small volumes of produce from hundreds of farmers and amass them to bigger volumes to promote effective agro-processing and bulk supply to markets. This function will become quite important as agri-food systems transformation progresses and deepens. Upgrading rural infrastructure and creating enabling environment for more agribusiness MSMEs to become aggregators and distributors will be a way of making agricultural raw material inputs readily available to agro-processors and manufacturers.

Activity 4.3.3 - Implement interventions to further improve access to agro-processing and promote new product development and value chains

Efforts to add value to farm and fish produce through agro-processing and agro-allied manufacturing can help to reduce post-harvest losses and imports, spur the emergence of agribusiness MSMEs, create employment opportunities and raise youth interest in agriculture as an attractive, commercially-oriented business. Currently, there are three government managed agro-processing facilities in St Kitts and Nevis with a product line of about twenty-five items, including patties, hams, ground meat, juices, pastes, smoked and dehydrated products. As commendable as government current investment in agro-processing is, there is room for improvement and more can still be done. Many of the independent small-scale agro-processors interviewed in the course of developing this strategy expressed frustration over insufficient space, long distance they need to cover and inadequate and timely access to operate in existing facilities. They also indicated that there is direct competition between their operations/products and those of the government-run agro-processing facilities.

To rectify this situation, government, in partnership with the private sector and financial institutions, would need to invest to establish **integrated agro-food parks**, where processing and manufacturing of various agricultural products can be concentrated alongside input supply, storage, packaging and transportation facilities and food research laboratories. Strategically locating these parks in high potential areas and leasing out space to agro-processors and manufacturers will help to alleviate logistical constraints to agro-processing and value addition. It will also strengthen value chain linkages between producers, aggregators, processors, manufacturers and distributors along key corridors/districts in the Federation.

In addition, it would be important to promote new product development and value chains to expand and diversify agro-processing and light manufacturing of food and beverages and establish better links to the tourism sector. Having a food research laboratory headed by a food technologist within the integrated agro-food parks will facilitate research and development of new products, including the choice of ingredients and components, shelf-life studies and sensory evaluation of products.

Similarly, development of new value chains focusing on readily available or accessible resources, e.g. sea moss, fishing tourism etc should also be proactively promoted to further diversify the Federation's foreign exchange earning base.

Implementation of these activities will entail collaboration between MAFMR, relevant divisions of the Ministry of International Trade and the Ministry of Tourism, SKNCIC, SKIPA and NIPA.

Activity 4.3.4 - Implement capacity development and training for agro-processors and manufacturers

Investment in capacity development and training of agro-processors and manufacturers in new product development, new food processing techniques to retain nutrients, methods of utilizing different food components, improved preservation and evaluation of products developed, good handling and manufacturing practices, Hazard Analysis and Critical Control Point (HACCP) and food quality and safety will be needed. The food technologists recruited by MAFMR will need to work in collaboration with the SKNBS, Clarence Fitzroy Bryant College, Ross University School of Veterinary Medicine and other universities operating in St Kitts and Nevis to implement this activity.

Output 4.4 Quality assurance and regulations improved

A long-term coherent and sustained investment in the biosafety and quality system infrastructure and capability in the Federation will be needed to allow the benefits of agri-food systems transformation to be fully realised.

Activities

Activity 4.4.1 - Strengthen national biosafety and quality system

As part of the agri-food systems transformation process, the Federation will need to upgrade its biosafety and quality system to improve capability to:

- Monitor plant, animal, fish and food materials and pathogens entering the country
- Conform to food and trade requirements in terms of quality, safety, health and the environment, and
- Expand laboratory capacity to test and certify goods for domestic and international markets.

All the constituent organs of the biosafety and quality system, including Plant Protection and Quarantine Services, Veterinary Services and Bureau of Standards will need to be included in this upgrade, which will cover both physical (laboratories, equipment, tools) and human capital. Attention will need to be paid to digital solutions, including block chain technology that is emerging as an efficient and robust mechanism to enhance food traceability and as a transparent and reliable way to validate quality, safety and sustainability of food production systems.

Activity 4.4.2 - Strengthen capacity for compliance with sanitary and phytosanitary (SPS) measures and trade standards

Strengthening capacity for compliance with SPS measures starts with the application of good practices in relation to agricultural production, hygiene and safety along the value chain – right from the point of production through to processing, packaging and transportation. Setting national standards that are well aligned with international standards and capacity development and training of value chain actors are critical in this regard. Similarly, strengthening capacity and capability for risk monitoring and management is important. Implementation of these activities will involve collaboration between the MAFMR, Bureau of Standards and educational institutions (Clarence Fitzroy Bryant College and Ross University School of Veterinary Medicine).

Trade or marketing standards are particularly important for export markets, though they are equally useful for the domestic market. They cover, amongst other things, marking and labelling, packaging, production method, conservation, storage, transport, restriction of use and disposal. Compliance with trade standards can be facilitated through increased awareness, knowledge and information on standards and strengthening the capacity of producers, agro-processors and manufacturers to implement the requirements.

4. Operationalization of the strategy

4.1 Roles and Responsibilities of Key Stakeholders

ATGS implementation is a both a national and multi-partner responsibility with government, private sector, civil society, and development partners having different critical roles, which should be implemented in an integrated manner, exploiting synergies and complementarities (Figure 7).

Government.

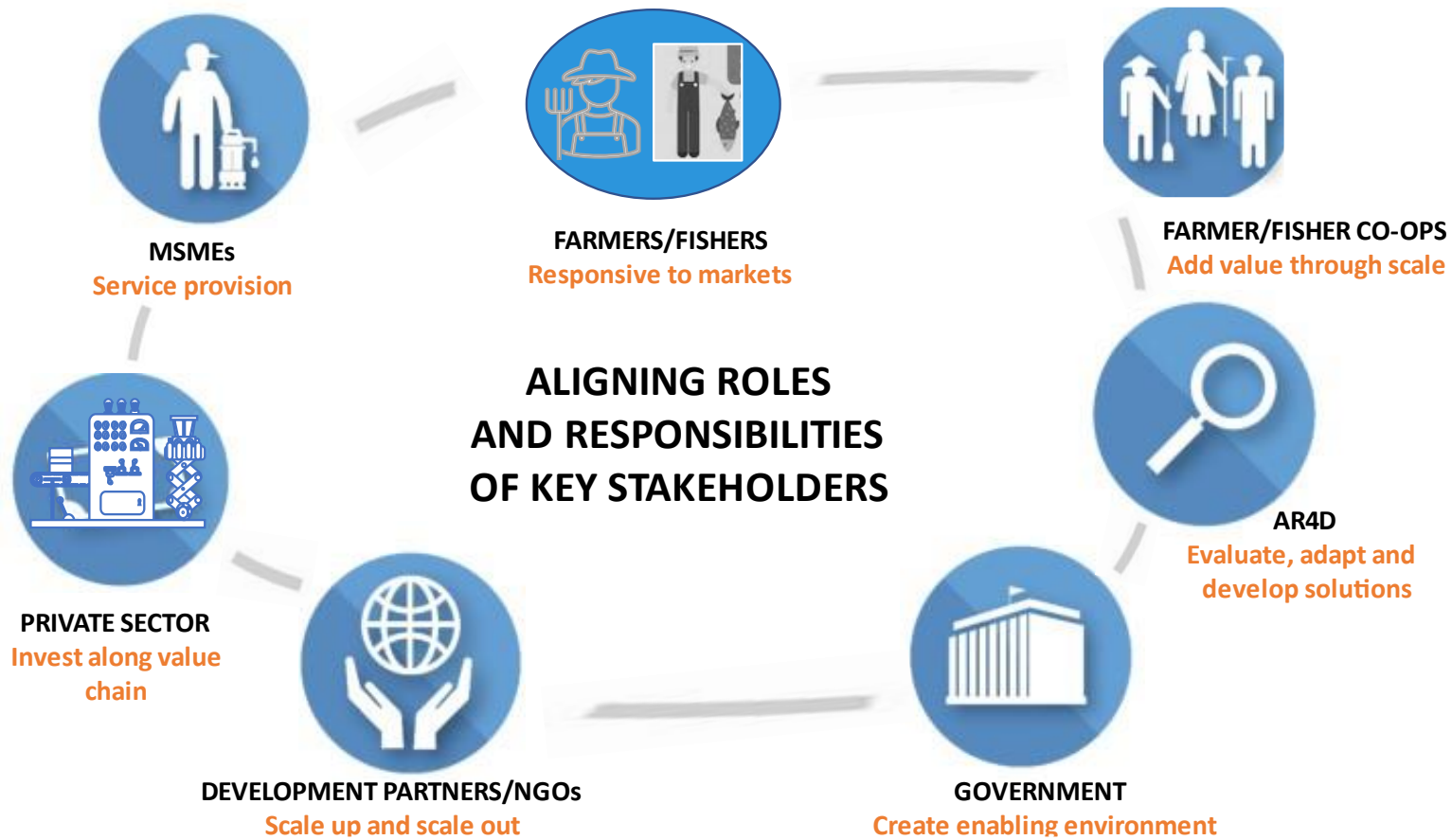
The government, through the public sector, is the chief enabler of the ATGS. Government's responsibilities cover provision of:

- Economic stability and incentive measures, including macroeconomic balance, conducive trade and business environment, fiscal measures (e.g. reduction of excise duties on imported food processing and packaging machinery), affordable credit and insurance products, including special credit lines for women and youth, priority sector lending, risk guarantees, and cost sharing in innovative public-private partnership.
- Productivity-enhancing measures, i.e. infrastructure, AR4D, extension advisory services, digitalization of agriculture, integrated agro-food parks and capacity building.
- Regulatory measures, i.e. legislation, acts, standards, water, seed, fertilizer and pesticide safety regulations, harmonization of agriculture-related policies across sectors (environment, trade, tourism, education and finance).
- Transfer-related measures, e.g. cash and in-kind transfers for those who may need to exit farming and fishing.
- Influencing behaviour/advocacy, e.g. producer and consumer education initiatives on building resilience, consumption of healthy diets, safe food handling, championing and 'selling' ATGS to development partners and financial institutions.

Private sector

There are multiple roles and ways the private sector can help to move the transformation agenda forward through service provision, introduction of market-based approaches, technological innovations and managerial and knowledge-based expertise. The diversity of the private sector, ranging from MSMEs (operating as agro-processors, food and beverage manufacturers, distributors and retailers), to cooperatives, financial institutions and not-for-profit civil society organizations, is a source of strength that should be fully leveraged. These diverse set of stakeholders should be encouraged to take on roles upstream, midstream and downstream of the agri-food systems value chains and in the provision of ICT services.

Figure 7. Roles and responsibilities of key stakeholders in the implementation of the ATGS



It is important from the outset to plan for private sector involvement. Without this engagement, transformation may proceed more slowly or not reach scale as a successful agricultural transformation is inconceivable without an enterprising and dynamic private sector driving productivity improvements and value addition, opening up markets and increasing private investment in the agri-food systems value chains.

The government will encourage and facilitate private sector's involvement by putting in place the enabling, regulatory and institutional support to spur private sector engagement and investment.

Two critical roles and responsibilities for **civil society** include advocacy for agri-food systems transformation and holding the government accountable for its actions and investments.

Development partners

Development partners are well-placed to support the implementation of the ATGS through coordinated and integrated programmes of technical assistance, capacity building and strategic investment in transformation-enhancing projects.

Technical assistance to the government to scale out transformative activities and outputs is of paramount importance. Unless farmers/fishers and other value chain actors adopt these interventions at scale, the impacts of transformation will not be achieved.

A long-term perspective on capacity building and training of MAFMR staff, farmers/fishers and other value chain actors is needed. This will focus on new practices that are critical for the successful implementation of agri-food systems transformation. Examples include climate-resilient practices, integrated crop management, entrepreneurial and agribusiness development skills, aquaponics, hydroponics, gender- and risk-sensitive value chain development, data collection methods using new technological innovations and tools, etc.

Another area of support pertains to investment in projects that a) connect small-scale farmers/fishers, especially women and youth to markets and include them as equal partners in viable value chains and value addition activities, b) upgrade and equip the national biosafety and quality system, and c) promote better nutrition and diets through education and public awareness programmes.

4.2 Coordination

MAFMR will be responsible for coordinating and facilitating the implementation of the ATGS. A Steering Committee, chaired by the Minister, and comprising of the two Permanent Secretaries, the two Directors of the Departments of Agriculture and the Director and Deputy Director of Fisheries and Marine Resources in St Kitts and Nevis will provide oversight for the implementation and delivery of ATGS.

The day-to-day management of the transformation agenda will be overseen by the recently established Agricultural Advisory Committee (AAC). The AAC's primary responsibility will be to provide advice on the execution and implementation of recommended activities and

oversee the monitoring, evaluation and learning. For this latter function, AAC will co-opt as necessary additional personnel from within and outside MAFMR, particularly key stakeholders from other government ministries (health, tourism, environment, ICT) and agencies (SKNBS, SKIPA), SKNCIC, farmer and fisher's organizations, private sector, regional partners (IICA, CARDI) and educational institutions. The AAC will also oversee the development of proposals to solicit funding from development partners to complement government and private sector investment in the ATGS.

4.3 Phasing of implementation

The implementation of the strategy is divided into 3 phases in order to manage the change process and learn and adapt as the strategy is rolled out.

Phase 1: 2022-2025 is expected to start at the beginning of the second half of 2022, with public awareness campaigns and the setting up of committees, administrative plans and partnership building with key national and international stakeholders.

Phase 2 will run from 2026-2028, while Phase 3 will run from 2029-2031.

The key human and physical resource requirements to achieve each outcome and associated outputs and activities are indicated in Appendix 1.

An Action Plan (incorporating timelines) to guide the implementation of activities under each phase is shown in Appendix 2. Depending on the nature of activities, some are expected to be executed and finalised within a single phase, while others will run through the entire duration of the ATGS. **Transformation is best achieved when complementary activities are implemented synergistically within each phase. This will allow maximum benefit to be reaped. Implementation of activities in a haphazard and unintegrated manner, just because some activities are easier to implement, should be avoided.** At the end of each phase, there should be an evaluation to take stock of what has been achieved and what lessons have been learned to inform actions for the next phase. A performance and results management matrix with impact targets and relevant indicators to measure how well outputs and progress towards expected impacts have been achieved is shown in Appendix 3.

4.4 Budget

A budget for the implementation of the ATGS is shown in Appendix 3. It is estimated that about US\$ 25.6 million over a 10-year period (i.e. about US\$ 2.6 million per year) will be needed to effectively implement the strategy. This funding will be above and additional to whatever annual budget is allocated to MAFMR.

A number of on-going projects supported by FAO and its partners that were mentioned earlier all have elements that are complementary to the transformative activities proposed in this strategy. For those projects that will continue for a few more years, carefully managing and leveraging their activities may serve to moderate the estimated budget presented in Appendix 4.

4.5 Challenges to implementation of ATGS

A number of challenges may crop up to obstruct effective implementation and scaling out of the recommended activities. These challenges represent 'critical factors' that can make or break the transformation process. Some of them relate to the capacity and willingness of farmers and fishers to embrace change, while others focus on the capacity and readiness of implementers and the private sector, and the political will to support and invest in transformation. Part of the responsibility of the AAC will be to anticipate and quickly take proactive action and play an advocacy role, in collaboration with other organisations and colleagues in and outside MAFMR, to address such challenges.

Two key challenges in particular are worth discussing further. One is lack of or waning political will to implement the ATGS, resulting in inadequate public sector funding to support agri-food systems transformation, and the second is inadequate capacity in MAFMR to effectively support the rollout and implementation of ATGS.

The first challenge can be easily resolved if there is collective will and commitment by all Kittitians and Nevisians to go the long haul to transform the agri-food systems in the Federation. This will ensure that the political will is maintained and **will enable the government to look into innovative ways to fund agri-food systems transformation, for instance by tapping into funds in the 'Citizenship by Investment' portfolio or making investment in agri-food systems transformation one of the options or avenues for becoming a citizen.** In addition, sustained political will enable the government to play an advocacy role in championing and promoting the ATGS to development partners (e.g., FAO, UNDP etc.) and regional and international financial institutions (e.g. Caribbean Development Bank, Inter-American Development Bank, World Bank etc.). Grants and technical assistance received from these institutions will complement available domestic resources to support the ATGS.

The second challenge is, perhaps, the most worrisome. MAFMR is currently under-resourced and understaffed to effectively play the crucial role envisaged for it in the operationalization of the ATGS. There is insufficient capacity in the area of agronomy, breeding, epidemiology, food technology, digital innovations, market assessment, agribusiness development etc. There is lack of capacity in developing a sound statistical framework for collecting and analysing data and for information management. The extension system is equally poorly funded. Yet, up-to-date statistics for informed decision making and an effective technology transfer system, based on a strong extension service, are two indispensable requirements for agri-food systems transformation. Investment is urgently needed to recruit highly skilled personnel to increase the number of staff and to enhance the capacity of in-service staff through requisite **upskilling and reskilling** training programmes both at home and abroad. Investment in digitalization of agriculture, including the digitalization of extension advisory services in a client-friendly way, and the full suite of ICTs currently available will be important to scale out transformation and achieve the expected outcomes and impacts.

5. Conclusions

The strategy presented in this document is a comprehensive and bold framework that is designed to modernize and diversify the agri-food systems in St Kitts and Nevis, while retaining a competitive edge. The various components of the framework are complementary and mutually reinforcing. They must be fully implemented in a prioritized manner in order to reap the full benefits of transformation.

Agri-food systems transformation demands a long-term commitment as there are no quick fix solutions. Efforts to focus on rapid production of a few commodities to reduce imports, without addressing the fundamental problems of natural resource degradation, land tenure insecurity, absence of an integrated water management plan for irrigation, poor access to credit and insurance, and plans to strengthen capacity and skills of MAFMR staff will not ensure long-term food security and improvement in the livelihoods of those engaged in the agri-food systems.

Because the agricultural sector is starting from a low base, due to its relegation to the background since the collapse of the sugar industry, a concerted reinvigoration of the sector is needed to regain lost grounds. The government will need to match its ambition and plan to revitalize the agri-food systems with investment that is higher than what has been in the annual budget of the agricultural sector over the last few years. Lessons from countries that have successfully transformed their agri-food systems indicate that at the early stages of transformation and until the private sector starts to fully engage, the government has to shoulder the responsibility of getting transformation off the ground by committing substantial budgetary support and catalytic investments. Additionally, by creating the enabling environment, appropriate governance structures, and coordinating programmes and plans across various arms of government, the government will be able to bring on board the private sector and civil society to play their part in increasing production and investing in market expansion and value addition activities.

It is critically important to leverage the success the country has achieved in the tourism sector to advance agri-food systems transformation in St Kitts and Nevis along the lines discussed in section 3.

Ultimately, the success of agri-food systems transformation will be determined by how well small-scale farmers, fishers and other value chain participants are helped to improve their operations and livelihoods, while contributing to job creation and economic growth and the stewardship of the environment. It is thus important that the new technological and institutional innovations that will be introduced should be appropriate, inclusive, implementable and sustainable in the context of St Kitts and Nevis.

Agri-food systems transformation is achievable within a ten-year timeframe in St Kitts and Nevis. With unwavering commitment, adequate funding from both domestic and external sources, strategic coordination with other sectors of the economy, collaboration with training and research institutions and effective implementation, the ATGS will usher in a new dawn of prosperity and growth through the agri-food systems. Now is the time to act.

6. References

- Baumüller, H and Addom, B.K. 2020. The enabling environments for the digitalization of African agriculture. In: Resnick, D., Diao, X., and Tadesse, G. (Eds.). *Sustaining Africa's Agrifood System Transformation: The Role of Public Policies*. Washington, DC, and Kigali: International Food Policy Research Institute (IFPRI) and AKADEMIYA2063.
- Caribbean Food and Nutrition Institute CFNI/PAHO/WHO. 2012. *Food and Nutrition Security Policy and Plan of Action for the Federation of St Kitts and Nevis*.
- CARICOM/CDEMA/WFP/FAO. 2022. *Caribbean COVID-19 Food Security & Livelihoods Impact Survey Report*. February 2022.
- Deep Ford J.R. and Dorodnykh E. 2016. Developing food value chains to meet tourism demand in the Caribbean: Case studies of St Kitts and Nevis and St Lucia. *Farm & Business* 8(1): 31-63.
- FAO. 2012. *Mainstreaming climate-smart agriculture into a broader landscape approach*. Background Paper for the Second Global Conference on Agriculture, Food Security and Climate Change. FAO. Rome, Italy.
- FAO. 2015. *AQUASTAT Country Profile – St Kitts and Nevis*. Rome, Italy.
- FAO. 2020. *FAO Initiative to Promote Investment Interventions to Advance Food and Agriculture Sector Transformation in St Kitts and Nevis (TCP/RLA/3802)*. Report prepared by Daniel A. Arthurton (Consultant).
- FAO. 2021. Alvar-Beltrán, J., Elbaroudi, I., Gialletti, A., Heures, A., Neretin, L. Soldan, R. *Climate Resilient Practices: typology and guiding material for climate risk screening*. Rome, Italy.
- FAO and ECLAC. 2020. *Food systems and COVID-19 in Latin America and the Caribbean: The opportunity for digital transformation*. Bulletin No. 8. Santiago, FAO.
- FAO. 2022. *Fishery and Aquaculture Country Profiles. St Kitts and Nevis. Country Profile Fact Sheets*. Fisheries and Aquaculture Division. Rome, Italy.
- Federation of St Kitts and Nevis. 2019. *Final country report of the Land Degradation Neutrality Target Setting Programme (LDN TSP)*. Prepared by Sebastian Quinones, LDN TSP Technical Consultant for Caribbean countries.
- Liu, S.Y.. 2020. Artificial Intelligence (AI) in Agriculture. *IT Professional*, vol. 22, no. 3, pp. 14-15.
- Minang, P. A., Duguma, L. A., van Noordwijk, M., Prabhu, R., & Freeman, O. E. (2015). Enhancing multifunctionality through system improvement and landscape democracy processes: a synthesis. In Minang, P. A., van Noordwijk, M., Freeman, O. E., Mbow, C., de Leeuw, J., & Catacutan, D. (Eds.) *Climate-Smart Landscapes: Multifunctionality in Practice*, 389-404. Nairobi, Kenya: World Agroforestry Centre (ICRAF).
- Somerville, C., Cohen, M., Pantanella, E., Stankus, A. & Lovatelli, A. 2014. *Small-scale aquaponic food production. Integrated fish and plant farming*. FAO Fisheries and Aquaculture Technical Paper No. 589. FAO. Rome.
- St Kitts Strategy and Action Plan for Agriculture (2017-2021). Prepared by Dr. Sharon Hutchinson (Consultant).
- St Kitts and Nevis. 2013. *Land Policy Issues Paper*. Prepared by Patrick I. Williams (Consultant).

7. Appendices

Appendix 1. Key Stakeholders and Resource Requirements for Implementation and Achievement of Outcomes and Associated Outputs and Activities

Outcome 1: Legal, Policy and Institutional Innovations

Key stakeholders with responsibility for coordination and facilitation of implementation

The lead stakeholder in implementing this outcome and associated outputs and activities is the **government**, through collaboration between MAFMR and relevant departments in the Ministry of Sustainable Development, Ministry of Justice and Legal Affairs, Ministry of Public Infrastructure and Utilities, Ministry of ICT, Ministry of Community Development and Gender Affairs, education authorities and St Kitts-Nevis Information Service. **Other important stakeholders** include farmer and fisher cooperatives, local land and coastal area users, their communities, non-governmental organisations (NGOs) and development partners.

Key material and human resource requirements for implementation

- **Public sector investment in:**
 - i) Digital technologies, equipment, tools and services (drones, sensors, satellite images, geospatial mapping etc) for real time data collection and dissemination to end users.
 - ii) Information and Communication Technologies (ICTs).
 - iii) Slope stabilization and erosion control measures through bioengineering and vegetative techniques.
 - iv) Establishing local management committees and building their capacity for effective management of landscapes and watersheds.
 - v) Establishment of incentive-based compensation mechanisms (payment for ecosystem services (PES)) based on upstream-downstream linkages.
 - vi) Recruitment of new environmental officers, extension agents, rural sociologists, irrigation engineers, digital and IT specialists, and statisticians.
 - vii) Continuous training of existing officers to set up and use automated real-time digital monitoring of land and coastal habitat to provide information for timely intervention and decision making on land, soil, water and ecosystems management; promote digital agricultural solutions and services, support accurate and disaggregated data collection and analysis and other activities under Outcome 1.
 - viii) Schools and training of teachers to include principles of sustainable and resilient agriculture in students at primary, secondary and tertiary levels.
- **Public-private sector investment and development partners** assistance in low-cost water conservation and storage techniques such as such as water-harvesting ponds, roof-water harvesting systems, and irrigation channels.

Outcome 2: Effective environmental health and biodiversity management

Key stakeholders with responsibility for coordination and facilitation of implementation

The lead stakeholder in implementing this outcome and associated outputs and activities is the **government**, through the two main departments (Agriculture and Marine Resources) and units in MAFMR. **Other important stakeholders** include Department of Environmental Health, farmers, fishers, communities, national, regional and international training and research organisations, including Clarence Fitzroy Bryant College, CARDI, Ross University School of Veterinary Medicine University of West Indies and One CGIAR centres (CIAT, CIP, Bioversity International and IWMI) and FAO.

Key material and human resource requirements for implementation

- **Public sector** investment in:
 - Human capacity development, i.e. recruitment of marine biologist/environmentalist, biotoxin specialist, soil biologist, soil chemist, pedologist, geneticist, agro-forester, as well as continuous training of existing and new staff.
 - Built and natural water storage infrastructure and technologies to augment water supply for irrigation.
 - Built and natural infrastructure to protect and enhance coastal ecosystems
 - Gene banks and associated inputs

Outcome 3: Resilient agri-food systems

Key stakeholders with responsibility for coordination and facilitation of implementation

The lead stakeholder in implementing this outcome and associated outputs and activities is the **government**, through the two main departments (Agriculture and Marine Resources) and units in MAFMR. **Other important stakeholders** include Ministry of Health, St Kitts and Nevis Meteorological Departments farmers, fishers, agribusiness MSME entrepreneurs, national, regional and international training and research organisations, including Clarence Fitzroy Bryant College, CARDI, Ross University School of Veterinary Medicine University of West Indies, University of Reading, UK and One CGIAR centres (CIAT, CIP, Bioversity International and IWMI) and FAO.

Key material and human resource requirements for implementation

- **Public sector** investment in:
 - Human capacity development, i.e. recruitment of an agroclimatologist, a virologist, a nematologist, an epidemiologist, agronomists, breeders, an aquaculture biologist and a food technologist, as well as continuous training of existing and new staff.
 - Expansion of agricultural research stations, field/open agriculture demonstration sites, laboratories, seed and planting material propagation centres, animal breeding centres and fish breeding centres.
 - Protected agriculture, hydroponics and aquaponics demonstration sites.
 - Upgrading infrastructure, tools and equipment required for monitoring, surveillance, risk assessment and management of pests and diseases of plants, animals and fish.
 - Expanding nutrition monitoring and reporting units.

- **Public-Private sector** partnership and investment in:
 - New improved storage (dry and cold) units and agro-processing equipment and methods.
 - Renewable energy technologies
 - Procurement, supply and distribution of adapted, resilient and more productive varieties of crops, animal breeds and farmed fish stock.

Outcome 4: Prosperous livelihoods and value chains based on agri-food systems

Key stakeholders with responsibility for coordination and facilitation of implementation

The lead stakeholder in implementing this outcome and associated outputs and activities is the **government**, through collaboration between MAFMR, Ministry of International Trade, Ministry of Tourism, Ministry of Finance, and St Kitts and Nevis Chamber of Industry and Commerce. **Other important stakeholders** include agro-processors and manufacturers, farmers, fishers, MSMEs, input distributors (e.g. Trading and Development Company Ltd.) national and international financial institutions (e.g. St Kitts and Nevis Development Bank, First Federal Credit Union, Nevis, Inter-American Development Bank, World Bank) and development partners.

Key material and human resource requirements for implementation

- **Public sector** investment in:
 - Human capacity development, i.e. recruitment of agricultural marketing specialists, value chain specialists, agricultural economists and agribusiness educators; laboratory managers and technicians, as well as continuous training of existing and new staff.
 - Hard and soft infrastructure (roads, bridges, packhouses, abattoirs, fish complexes, markets, market information systems etc.).
 - Integrated agro-food parks
 - Market assessment capability covering both physical resources (ICTs, equipment, tools etc) and human capacity development as described above.
 - Biosafety and quality system covering both physical resources (laboratories, standards setting equipment and tools, digital technologies etc.) and human capacity development as described above.
 - Agribusiness and entrepreneurial capacity development for extension agents, farmers, fishers and other value chain actors.
- **Public-Private sector** partnership and investment to:
 - Introduce and promote innovative and affordable finance, credit and insurance products.
 - Decentralize and increase participation of MSMEs in input procurement and distribution.
 - Promote innovation and ready availability of dry and cold storage units and renewable energy technologies.

Appendix 2. Action plan for the implementation of ATGS 2022-2031

Outcomes	Outputs	Activities	2022-2025		2026-2028	2029-2031
Outcome 1 Legal, policy and institutional innovations	Output 1.1 Risk-informed policies to promote investment, innovation and competitiveness	Activity 1.1.1 Improve regulatory, business, trade and investment environment	√			
		Activity 1.1.2 Implement policies to de-risk agriculture, value chains and livelihoods	√		√	
		Activity 1.1.3 Implement policies to improve and invest in social protection programmes	√		√	
		Activity 1.1.4 Improve coordination and harmonization of policies and programmes across ministries	√		√	√
	Output 1.2 Land tenure, water and fishing legislation and property rights reviewed and amended	Activity 1.2.1 Modernise land tenure and property rights legislation	√		√	
		Activity 1.2.2 Support integrated water management for agriculture through forward-looking legislation and investment to augment water supply and irrigation	√		√	√
		Activity 1.2.3 Develop programmes to rapidly implement pertinent provisions of the Fisheries, Aquaculture and Marine Resources Act (2016).	√		√	√

Appendix 2. Action plan for the implementation of ATGS 2022-2031 (continued)

Outcomes	Outputs	Activities	2022-2025	2026-2028	2029-2031
Outcome 1 (continued) Legal, policy and institutional innovations	Output 1.3 Policy and institutional innovations to support agri-food systems transformation	Activity 1.3.1 Institutional innovations and investment to strengthen agricultural research for development, extension advisory services and capacity development for extension agents, farmers and fishers	√	√	√
		Activity 1.3.2 Implement policy and legal framework to support and promote investment in digitalization of agriculture	√	√	√
		Activity 1.3.3 Strengthen agricultural and household data collection, analysis and management	√	√	√
		Activity 1.3.4 Institutional and legislative reforms to strengthen technical and organizational capacities of farmers and fishers' cooperatives and promote collective action	√	√	
		Activity 1.3.5 Institutional innovations to promote teaching of agri-food systems transformation principles in schools	√	√	
		Action 1.3.6 Institutional innovations and public awareness programmes to promote healthy and safe diets and prevent spread of non-communicable, food-related diseases	√	√	√

Appendix 2. Action plan for the implementation of ATGS 2022-2031 (continued)

Outcomes	Outputs	Activities	2022-2025	2026-2028	2029-2031
Outcome 2 Effective environmental health and biodiversity management	Output 2.1 Integrated land, soil, water, coastal zone and ecosystems management	Activity 2.1.1 Implement landscape management approach	√	√	√
		Activity 2.1.2 Improve soil health	√	√	√
		Activity 2.1.3 Promote integrated coastal zone and watershed management	√	√	√
	Output 2.2 Coastal marine and aquatic ecosystems management improved	Activity 2.2.1 Improve coastal marine fisheries data collection, monitoring and analytical capacity	√	√	√
		Activity 2.2.2 Implement measures to control, reduce and manage marine pollution and litter	√	√	√
		Activity 2.2.3 Develop capacity to monitor and reduce environmental footprint of aquaculture	√	√	√

Appendix 2. Action plan for the implementation of ATGS 2022-2031 (continued)

Outcomes	Outputs	Activities	2022-2025	2026-2028	2029-2031
Outcome 2 (continued) Effective environmental health and biodiversity management	Output 2.3 Strengthen local institutions and communities to support natural resource and risk management	Activity 2.3.1 Facilitate the formation of committees at local level for natural resource and risk management	√		
		Activity 2.3.2 Build the capacity of local institutions and committees to develop risk-informed plans for natural resource management and maintenance of infrastructure	√	√	
		Activity 2.3.3 Promote and reward joint action on natural resource and risk management by groups of resource users	√	√	√
	Output 2.4 Biodiversity mainstreamed into agricultural systems	Activity 2.4.1 Promote integrated food and feed systems in cultivated fields using agroforestry practices	√	√	√
		Activity 2.4.2 Enhance biodiversity functions of gene banks	√	√	√
		Activity 2.4.3 Strengthen area-based, co-management of coastal areas to conserve biodiversity and enhance productivity of marine fishery resources	√	√	√

Appendix 2. Action plan for the implementation of ATGS 2022-2031 (continued)

Outcomes	Outputs	Activities	2022-2025	2026-2028	2029-2031
Outcome 3 Resilient agri-food systems	Output 3.1 Climate change resilience and emergency response measures strengthened	Activity 3.1.1 Shock-specific early warning systems and climate services co-developed with end users	√		
		Activity 3.1.2 Increase investment in disaster risk preparedness	√		
		Activity 3.1.3 Establish emergency material reserves and distribution systems	√	√	√
	Output 3.2 Climate smart agricultural, fisheries and aquaculture practices scaled out	Activity 3.2.1 Implement climate-smart and productivity enhancing crop production solutions	√	√	√
		Activity 3.2.2 Implement climate-smart and productivity enhancing livestock production solutions	√	√	√
		Activity 3.2.3 Support evidence-based climate adaptive coastal fisheries management	√	√	√
		Activity 3.2.4 Promote risk-informed resilient and sustainable aquaculture systems	√	√	

Appendix 2. Action plan for the implementation of ATGS 2022-2031 (continued)

Outcomes	Outputs	Activities	2022-2025	2026-2028	2029-2031
Outcome 3 Resilient agri-food systems (continued)	Output 3.3 Agricultural health and human health through food systems enhanced	Activity 3.3.1 Coordinate and strengthen monitoring, surveillance, risk assessment and management of pests and diseases of plants, animals and fish	√	√	√
		Activity 3.3.2 Pilot and scale-out practical, cost-effective and humane animal treatment control methods to limit damage caused by monkeys (in St Kitts) and feral donkeys (in Nevis) to crop production	√	√	√
		Activity 3.3.3 Increase production of nutrient-dense source food	√	√	√
		Activity 3.3.4 Support nutrition monitoring and analysis and integrate in food security information and communication	√	√	√
		Activity 3.3.5 Strengthen food storage, processing, quality and safety standards		√	√
	Output 3.4 Genetic innovations promoted	Activity 3.4.1 Improve supply and distribution of adapted, resilient and more productive varieties of crops, animal breeds and farmed fish stock	√	√	√
		Activity 3.4.2 Establish national breeding programme to increase supply of nutrient-dense crops and nutrient dense animal and fish source foods	√	√	√
		Activity 3.4.3 Conservation and effective management of genetic materials of cultivated and crops, livestock and fish stock and their wild relatives.		√	√

Appendix 2. Action plan for the implementation of ATGS 2022-2031 (continued)

Outcomes	Outputs	Activities	2022-2025	2026-2028	2029-2031
Outcome 4 Prosperous livelihoods and value chains based on agri-food systems	Output 4.1 Access to improved production inputs, post-harvest equipment and services expanded	Activity 4.1.1 Promote innovative business models for local SMEs to supply inputs, post-harvest and agro-processing machines, equipment and tools to famers, fishers and agro-processors	√	√	√
		Activity 4.1.2 Improve access to finance and insurance for farmers, fishers and other value chain participants	√	√	
		Activity 4.1.3 Strengthen extension advisory services to promote good agricultural practices and training in record keeping and business management skills to farmers and fishers	√	√	√
	Output 4.2 Market assessment and farmer/fisher market linkages improved	Activity 4.2.1 Implement measures to improve price and non-price competitiveness	√	√	
		Activity 4.2.2 Develop market assessment capability	√	√	
		Activity 4.2.3 Increase investment in hard and soft infrastructure to improve market linkages	√	√	√

Appendix 2. Action plan for the implementation of ATGS 2022-2031 (continued)

Outcomes	Outputs	Activities	2022-2025	2026-2028	2029-2031
Outcome 4 (continued) Prosperous livelihoods and value chains based on agri-food systems	Output 4.3 Risk-informed value chains developed	Activity 4.3.1 Develop capacity for risk assessment and management along the value chain		✓	✓
		Activity 4.3.2 Improve commodity aggregation and distribution	✓	✓	
		Activity 4.3.3 Implement interventions to support new product development and promote new value chains	✓	✓	✓
		Activity 4.3.4 Implement capacity development and training for agro-processors and manufacturers	✓	✓	✓
	Output 4.4 Quality assurance and regulation improved	Activity 4.4.1 Strengthen national biosafety and quality system	✓	✓	✓
		Activity 4.4.2 Strengthen capacity for compliance with SPS measures and trade standards	✓	✓	✓

Appendix 3. ATGS Performance and Results Management Matrix

2031 Impact targets for agri-food systems

Impact area	Target	Related SDG Target
Agricultural productivity and income growth	At least increase productivity and incomes of small-scale farmers, fishers and other value chain participants by 100%	2.3, 2.4 and 8.2
Food import reduction	Food imports of the most essential commodities that can be competitively produced in the country reduced by at least 60%	n/a
Food and nutrition security	End hunger and enable affordable healthy diets for the most vulnerable people (i.e. those below the national poverty line)	2.1 and 2.2
Decent employment and livelihoods	Create job opportunities for at least 5,000 men, women and young persons in agricultural value chains	8.3 and 8.6
Sustainable ecosystems	Ensure that 50% of degraded land, water and marine ecosystems are restored and sustainably managed	2.4, 6.3, 6.6, 14.2 and 15.3

N.B. Baselines to be established with data from 2023 Agricultural Census (see additional notes below)

Explanatory Notes on 2031 Impact Targets

The targets are ambitious but achievable going by the experiences of other developing/emerging countries that have successfully transformed their agri-food systems. Transformation will not be achieved by adopting a business as usual approach. Resolute action focussed on new ways of working, timely problem solving and learning and adjusting plans during each phase of the transformation process will ensure achievement of the targets.

At a practical level, additional work is needed by the staff of MAFMR, aided by the Agricultural Advisory Committee, to quickly establish baselines based on accurate data that should be forthcoming from the 2023 Agricultural Census. Furthermore, the overall target figures shown in the above table will need to be broken into manageable size-bits that can be realistically achieved within each phase of ATGS. Indicative breakdowns are shown in the table below. However, these breakdowns will need to be confirmed and/or revised, by staff charged with the responsibility of coordinating the implementation of the ATGS, as good quality data become available and lessons learned are incorporated into the planning of the next phase. It is critically important that the revisions and decisions that will be made are science and fact-based in order to remain objective and effective in moving towards the overall desired targets.

2031 Impact targets for agri-food systems by phase

Impact Area	Overall target by 2031	Target by phase		
		Phase 1 2022-2025	Phase 2 2026-2028	Phase 3 2029-2031
Agricultural productivity and income growth	At least increase productivity and incomes of small-scale farmers, fishers and other value chain participants by 100%	20%	50%	100%
Food import reduction	Food imports of the most essential commodities that can be competitively produced in the country reduced by at least 60%	15%	35%	60%
Food and nutrition security	End hunger and enable affordable healthy diets for the most vulnerable people (i.e. those below the national poverty line)	20%	50%	100%
Decent employment and livelihoods	Create job opportunities for at least 5,000 men, women and young persons in agricultural value chains	1,000	3,000	5,000
Sustainable ecosystems	Ensure that 50% of degraded land, water and marine ecosystems are restored and sustainably managed	10%	30%	50%

N.B. Baselines to be established with data from 2023 Agricultural Census

Appendix 3. ATGS Performance and Results Management Matrix (continued)

Output indicators		
Outcomes	Outputs	Indicators
Outcome 1 Legal, policy and institutional reforms	Output 1.1 Risk-informed policies to promote investment, innovation and competitiveness	<ul style="list-style-type: none"> • Number of policies and legislation reviewed to align with ATGS • Number of new innovative programmes and plans established to support ATGS • Amount invested in supporting innovations (e.g. staff recruitment and digitalization of agriculture) • Number of capacity training programmes for staff of MAFMR •
	Output 1.2 Land tenure, water and fishing legislation and property rights reviewed and amended	
	Output 1.3 Policy and institutional innovations to support agri-food systems transformation	
Outcome 2 Effective environmental health and biodiversity management	Output 2.1 Integrated land, soil, water, and coastal zone ecosystems management	<ul style="list-style-type: none"> • Number of communities per parish where landscape management approach has been implemented • Percentage of agricultural land in a parish under landscape management • Number of communities where improved soil management practices have been introduced. • Percentage of agricultural land in a parish under improved soil management • Number of improved watersheds per island • Number of coastal marine area under improved managed per island • Amount invested in developing assessment methods for coastal fishery resources • Percentage of agricultural land under combined crop and agroforestry practices per island • Number of communities trained per parish to better manage natural resource and systemic risk. • Diet improvement and cash flow from agroforestry
	Output 2.2 Coastal marine and aquatic ecosystems management improved	
	Output 2.3 Strengthen local institutions and communities to support natural resource and risk management	
	Output 2.4 Biodiversity mainstreamed into agricultural systems	

Appendix 3. ATGS Performance and Results Management Matrix (continued)

Outcomes	Outputs	Indicators
<p>Outcome 3 Resilient agri-food systems</p>	<p>Output 3.1 Climate change resilience and emergency response measures strengthened</p>	<ul style="list-style-type: none"> • Number of early warning systems developed and operationalized • Number of farmers and fishers accessing and making decisions based early warning information per parish • Number and type of climate smart and productivity-enhancing practices rolled out per parish by product type (i.e. crop, livestock, fisheries and aquaculture) • Number of farmers practising climate smart and productivity-enhancing crop and livestock production practices per parish by sex and age • Yield per crop (kg)/ per animal (lambing or kidding or weight gained) per sex and age • Number of policy measures introduced to support food production diversification • Production of nutritious and healthy food by type, weight (kg) by parish and sex of farmer • Number of new warehouses built for emergency reserves per island
	<p>Output 3.2 Climate smart agricultural, fisheries and aquaculture practices scaled out</p>	
	<p>Output 3.3 Agricultural health and human health through food systems enhanced</p>	
	<p>Output 3.4 Genetic innovations promoted</p>	

Appendix 3. ATGS Performance and Results Management Matrix (continued)

Outcomes	Outputs	Indicators
<p>Outcome 4 Prosperous livelihoods and value chains based on agri-food systems</p>	<p>Output 4.1 Access to improved production inputs, post-harvest equipment and services expanded</p>	<ul style="list-style-type: none"> • Number of new credit and insurance products introduced • Number of farmers and fishers accessing new credit and insurance products by sex, age and parish • Amount invested to improve market assessment and linkages • No of integrated agro-food parks established • Number of newly registered agro-processors by sex, age and parish • Number of newly established light manufacturing (food and beverages) firms • Amount invested in upgrading equipment, laboratories and research farms in MAFMR • Amount invested in recruiting and building the capacity of personnel in the quality assurance system in MAFMR and Bureau of Standards.
	<p>Output 4.2 Market assessment and market linkages improved</p>	
	<p>Output 4.3 Risk-informed value chains developed</p>	
	<p>Output 4.4 Quality assurance and regulation improved</p>	

Appendix 4. Ten year budget for the implementation of ATGS

ATGS Budget 2022-2031 (US\$) - Outcome 1			2022-2025	2026-2028	2029-2031	Total
Outcomes	Outputs	Activities	US\$	US\$	US\$	US\$
	1.1 - Risk-informed policies	1.1.1 Improve regulatory, business, trade & investment environ.	100,000			100,000
	to promote investment,	1.1.2 Policies to de-risk agriculture, value chains, & livelihoods	250,000	250,000		500,000
	innovation & competition	1.1.3 Policies to promote and invest in social protection progs.	250,000	250,000		500,000
		1.1.4 Improve coordination & harmonization of policies	10,000	10,000	10,000	30,000
	Subtotal		610,000	510,000	10,000	1,130,000
	1.2 Land tenure water & fishing	1.2.1 Modernise land tenure and property rights legislation	200,000	100,000		300,000
	legislation reviewed	1.2.2 Support integrated water management for agric & invest	250,000	300,000	250,000	800,000
Outcome 1		1.2.3 Development programs to implement FAMRA 2016	100,000	200,000	100,000	400,000
Legal, policy & institutional reforms	Subtotal		550,000	600,000	350,000	1,500,000
	1.3 Policy & institutional	1.3.1 Inst. innovations to support AR4D, extension & capdev	750,000	750,000	750,000	2,250,000
	innovations to support AFST	1.3.2 Policy & L framework to support & promote invest in Dig.oA	250,000	300,000	300,000	850,000
		1.3.3 Strengthen data collection, analysis and management	100,000	200,000	200,000	500,000
		1.3.4 Devcap for farmer and fisher's coops	50,000	50,000		100,000
		1.3.5 Inst. Innovations to promote teaching of AFST in schools	100,000	100,000		200,000
		1.3.6 Inst. Innovations to promote healthy diets	50,000	100,000	100,000	250,000
	Subtotal		1,300,000	1,500,000	1,350,000	4,150,000
	Grand total - Outcome 1		2,460,000	2,610,000	1,710,000	6,780,000

ATGS Budget 2022-2031 (US\$) - Outcome 2			2022-2025	2026-2028	2029-2031	Total
Outcomes	Outputs	Activities	US\$	US\$	US\$	US\$
	2.1 - Integrated land, soil, water, coastal zone & ecosystems manag.	2.1.1 Implement landscape approach	200,000	250,000	250,000	700,000
		2.1.2 Improve soil health	250,000	350,000	250,000	850,000
Outcome 2		2.1.3 Promote integrated coastal & watershed management	350,000	350,000	200,000	900,000
Effective environmental health & management	Subtotal		800,000	950,000	700000	2,450,000
	2.2 Coastal marine & aquatic ecosystems management improved	2.2.1 Improve coastal marine fisheries data collection	100,000	200,000	100,000	400,000
		2.2.2 Measures to control marine pollution and litter	100,000	100,000	100,000	300,000
		2.2.3 Develop capacity to monitor aquaculture enviro footprint	50,000	200,000	100,000	350,000
	Subtotal		250,000	500,000	300,000	1,050,000
	1.4 Strengthen local institutions & communities to support NR & RM	1.4.1 Formation of committees for NR & risk management	100,000			100,000
		1.4.2 Build cap of committees to develop risk-informed plans	50,000	50,000		100,000
		1.4.3 Promote & reward joint action on NR & R management	50,000	100,000	100,000	250,000
	Subtotal		200,000	150000	100000	450,000
	2.4 Biodiversity mainstreamed into agricultural system	2.3.1 Promote integrated food & feed systems	75,000	150,000	100,000	325,000
		2.3.2 Enhance biodiversity functions of gene banks	100,000	250,000	250,000	600,000
		2.3.3 Strengthen area-based co-management of coastal areas	75,000	200,000	200,000	475,000
	Subtotal		250,000	600,000	550,000	1,400,000
	Grand total for Outcome 2		1,300,000	2,050,000	1,550,000	5,350,000

ATGS Budget 2022-2031 (US\$) - Outcome 3			2022-2025	2026-2028	2029-2031	Total
Outcomes	Outputs	Activities	US\$	US\$	US\$	US\$
Outcome 3 Resilient agri-food systems	3.1 - Climate change resilience & emergency response measures strengthened	3.1.1 Shock-specific early warning systems & climate services	250,000	250,000		500,000
		3.1.2 Increase investment in disaster risk preparedness	500,000	250,000		750,000
		3.1.3 Establish emergency reserves and distribution systems	75,000	200,000		275,000
		Subtotal	825,000	700,000	0	1,525,000
	3.2 Climate smart agricultural, fisheries & aquaculture practices	3.2.1 Implement climate-smart & productivity enhanc. crop	250,000	250,000	200,000	700,000
		3.2.2 Implement climate-smart & productivity enhanc. livestock	200,000	300,000	300,000	800,000
		3.2.3 Support climate adaptive coastal fisheries management	250,000	250,000	200,000	700,000
		3.2.4 Promote risk-informed resilient & sustainable aquacult.	150,000	100,000		250,000
	Subtotal	850,000	900,000	700,000	2,450,000	
	3.3 Agricultural health & human health thru food systems	3.3.1 Risk assessment of pests & diseases of plants, animals & fish	175,000	250,000	150,000	575,000
3.3.2 Cost effective and humane animal treatment		100,000	150,000	100,000	350,000	
3.3.3 Increase production of nutrient-dense source foods		100,000	200,000	150,000	450,000	
3.3.4 Support nutrition monitoring and analysis		75,000	75,000	50,000	200,000	
3.3.5 Improve food storage, processing, quality & safety stds.			200,000	200,000	400,000	
Subtotal	450,000	875,000	650,000	1,975,000		
3.4 Genetic innovations promoted	3.4.1 Improve supply & distribution of adapted seeds & breeds	100,000	75,000	50,000	225,000	
	3.4.2 National breeding program - nutrient-dense crops and foods	100,000	250,000	250,000	600,000	
	3.4.3 Conservation & effective management of genetic materials		300,000	200,000	500,000	
Subtotal	200,000	625,000	500,000	1,325,000		
Grand total for Outcome 3			2,325,000	3,100,000	1,850,000	7,275,000

ATGS Budget 2022-2031 (US\$) - Outcome 4			2022-2025	2026-2028	2029-2031	Total
Outcomes	Outputs	Activities	US\$	US\$	US\$	US\$
	4.1 - Access to improved inputs	4.1.1 Promote SMEs to supply inputs, equipment etc	100,000	250,000	250,000	600,000
	post-harvest equipment & services expanded	4.1.2 Improve access to finance & insurance	250,000	500,000		750,000
		4.1.3 Strengthen ext. to promote GAP, record keepings & bus skills	100,000	100,000	100,000	300,000
	Subtotal		450,000	850,000	350,000	1,650,000
	4.2 Market assessment & farmer/fisher market linkages improved	4.2.1 Implement measures to improve competitiveness	100,000	300,000		400,000
		4.2.2 Develop market assessment capability	100,000	350,000		450,000
		4.2.3 Increase investment in hard & soft infrastructure	100,000	350,000	150,000	600,000
Outcome 4 Prosperous livelihoods & value chains based on agri-food systems	Subtotal		300,000	1,000,000	150,000	1,450,000
	4.3 Risk-informed value chains developed	4.3.1 Develop capacity for risk assessment and management		150,000	75,000	225,000
		4.3.2 Improve commodity aggregation & distribution	100,000	100,000		200,000
		4.3.3 Interventions to support new product development & VCs	200,000	600,000	200,000	1,000,000
		4.3.4 Implement capdev for agro-processors & manufacturers	100,000	100,000	50,000	250,000
	Subtotal		400,000	950,000	325,000	1,675,000
	4.4 Quality assurance & regulation improved	4.4.1 Strengthen national biosafety & quality system	250,000	500,000	250,000	1,000,000
		4.4.2 Strengthen cap for compliance with SPS and trade stds	75,000	150,000	150,000	375,000
	Subtotal		325,000	650,000	400,000	1,375,000
	Grand total for Outcome 4		1,475,000	3,450,000	1,225,000	6,150,000

Appendix 5. List of Key Informants Interviewed

Name	Position	Organization
Dr Tracey Challenger	Director of Agriculture - SK	MAFMR
Randy Elliott	Director of Agriculture - Nevis	MAFMR
Lemuel Pemberton	Deputy Director of Marine Resources - Nevis	MAFMR
Ian Chapman	Crops Programme Leader, SK	MAFMR
Kistian Flemming	Climate Change Specialist	CARDI
Jeanelle Kelly	Quarantine Officer, SK	MAFMR
Aisha Howell	Snr. Project Officer, SK	MAFMR
Melvin James	Agriculture Development Advisor, SK	MAFMR
Sharon Jones	Technical Specialist	IICA
Quincy Bart	Quarantine Officer, Nevis	MAFMR
Dr. Lesroy Henry	Chief Vet Officer, SK	MAFMR
Miguel Flemming	Agricultural Officer - Livestock Production, SK	MAFMR
Ambrose James	Chief Vet/Livestock Head - Nevis	MAFMR
Steve Reid	Extension Officer, Nevis	MAFMR
Sean Lawrence	Director of Research	Min. of Trade, SK
Mrs. Mentrice Arthurton	Director	Min. of Trade, Nevis
Solomon Morton	President	Coop: St Kitts Farmers Cooperative
Ras Sankofa Maccabee	President	Coop: Gideon Force (Farmer Group)
Natasha Leader	President	Coop: Fahies Agriculture Women's Group
Mackie Tross	President	Nevis Green House Farmers
Stephen Moore	President	Coop: Indian Castle Fisherfolk Association
Emanuel Richards	President	Nevis Fisher Coop
Craig Tuckett	President	Coop: Newtown Fisher Cooperative Society
Kevin Hope	Executive Director	Chamber of Industry & Commerce
Markysa O'Loughlin	Business Development Officer	First Federal Credit Union, Nevis
Ms. Kenisha Davis	Manager, Business Support Unit	Development Bank, SKN
Mrs. Kimmoy O'loughlin-Burroughs	Manager, Credit Risk Department	Development Bank, SKN
Stuart LaPlace	Director	Bureau of Standards
Richard Paris	Owner, Paris Leafy Greens	SK
Edward Claxton	Manager	TDC, Trading & Development Company Ltd. SKN

List of Key Informants Interviewed (continued)

Name	Position	Organization
Dr Jerome Thomas	Retired, Director of Agriculture, SK	MAFMR
Dr Kerry Dore	Researcher, Invasive Alien Species Programme	
Graeme Browne	Resource Management Officer	Department of Physical Planning
Glenville Leader	Senior Environmental Health Officer	Ministry of Health
Cromwell Williams	Director	Water Services Department, SK
Khalilah Peters	Government Relations Officer	Ross Univ. of Vet Medicine
Dr Samson Mukaratirwa	Associate Dean (Research & Post Graduate Studies)	Ross Univ. of Vet Medicine
Dr Aspinas Chapwanya	Associate Professor of Animal Reproduction/Perinatology	Ross Univ. of Vet Medicine
Randolph Franklin	Agriculture Instructor	Clarence Fitroy Bryant College
Andrew Abraham	Dean, Technical Vocational Education & Management	Clarence Fitroy Bryant College
Kevin Arthurton	Trade Policy Officer	Ministry of Trade
Carlene Henry-Morton	Permanent Secretary	Ministry of Tourism
Carlton Phipps	Director	Department of Statistics
Roger Hennis	Senior Manager -Consulting & Advisory Services	Deloitte
Phillip Browne	Director, Small Business Development Centre	Ministry of Trade

Additional Interviews

Category	Position	Contact Name
Political Parties	CCM	Hon Mark Brantley
	NRP	Hon Janice Daniel
	PLP - Chairman	Mr. Warrem Thompson
	PAM - Asst. Gen Secretary	Mr. Azad Gumbs
	SKNLP	Dr. Terrance Drew
Religious Organizations	Christian Council	Pastor Leroy Matthew
	Evangelical Association	Canon Dwayne Cassius
	Muslim Community	
Sports Clubs	Netball Associations	Mr. Dion French
	Football Associations	Mr. Atiba Harris
	Basketball Associations	Mr. James Hanley
Other	Backyard Garden Association	Sam Franks

List of Farmers/Fishers Who Participated in the Stakeholder Focus Group Discussion

Name	Business/Affiliation	Designation
Stephen Moore	Coop: Indian Castle Fisherfolk Association	President
Telca Wallace	Coop: LACOS (Liamuiga Agriculture Cooperative Society)	President
Craig Tuckett	Coop: Newtown Fisher Cooperative Society	President
Solomon Morton	Coop: St Kitts Farmers Cooperative	President
Anatasia Elliot	Farmer	Crop Farmer
Denise Gillard	Farmer	Crop Farmer
Monroe Tweed	Farmer	Crop Farmer (Youth)
Pedro Wilson	Farmer	Crop Farmer
Stephen Moore	Nevis Coop - Indian Castle Fisherfolk Association	President
Cathy Drew	Fisher	
Nikita Browne	Fisher	
Dwight Watters	Farmer	
Raymond Brantley	Farmer	
Evan Nisbett	Farmer	Crop Farmer

List of Private Sector Participants in the Stakeholder Focus Group Discussion

Name	Business/Affiliation	Designation
Angelo Gordon	Agro-Processor	Owner
Annette Stapleton	Agro-Processor	Owner
Berthilio Nelson	Agro-Processor	Owner
Catherine Pemberton	Agro-Processor	Owner
Curtney Webbe	Agro-Processor	Owner
Kenesha Warner	Agro-Processor	Owner
Kiname Adams	Agro-Processor	Owner
Anastasia Elliot	Agro-Processor	Owner - SugarTown Organics
Kevin Hope	Chamber of Industry and Commerce	Executive Director
Andrew Satney	Chamber of Industry and Commerce	Past, Executive Director
Sydney Newton	Nevis Cooperative Credit Union	General Manager
Winston Tyrell	SL Horsford	Manager, Home Depot
Keesha Jones	St. Kitts Nevis Anguilla National Bank	Nevis Branch Manager
Markysa O'Louhlin	First Federal Credit Union	Business Development Officer
Edward Claxton	TDC	Manager

List of Government Officials & Representatives of Regional Organizations Who Participated in the Stakeholder Focus Group Discussion

Jermine Mike	Bureau of Standards/ St. Kitts	Chemist/Standards Officer
Kistian Flemming	CARDI Representative	Climate Change Development Specialist
Andrea Morton	Dept of Agriculture	Manager- Agroprocessing Unit
Ian Chapman	Dept of Agriculture	Crops Programme Leader
Jeanelle Kelly	Dept of Agriculture	Quarantine Officer
Kevin Jeffers	Dept of Agriculture	Marketing Unit
Lesroy Henry	Dept of Agriculture	Chief Veterinary Officer (Ag.)
Miguel Flemming	Dept of Agriculture	Livestock Production Unit
Quincy Bart	Dept of Agriculture	Quarantine Officer (Nevis)
Tracey Challenger	Dept of Agriculture	Director of Agriculture
June Hughes	Dept of Environment	Director
Marc Williams	Dept of Marine Resources	Director
Sharon Jones	IICA Representative	Technical Specialist
Aisha Howell	Dept of Agriculture	Snr Project Officer/Focal Point
Kyle Flanders	Dept of Agriculture	Assistant Secretary
Tonisha Weekes	Dept of Agriculture	Institutional Liaison
Eric Browne	Min of Environment and Cooperatives	Snr Forestry Officer
Glenville Leader	Min of Health	Snr Environmental Health Officer
Latoya Matthew-Duncan	Min of Health	Nutrition Surveillance Coordinator
Sean Lawrence	Min of International Trade	Director of Trade (Research)
Mr. Randy Elliot	Nevis - Department of Agriculture	Director
Dr. Ambrose James	Nevis - Dept. of Agriculture	Chief Vet/Livestock Head
Lemuel Pemberton	Nevis - Fisheries	Deputy Director of Marine Resources
Huey Sargeant	Nevis - Ministry of Agriculture	Permanent Secretary