

# Climate-Smart Agriculture in Seychelles

## Climate-smart agriculture (CSA) considerations

**A** Agriculture was the main economic activity in Seychelles in the 1970s. However, the country's development agenda took a turn to reliance on tourism and fisheries as the main pillars after the development of the airport. The agricultural sector remains vulnerable to climate change and variability and suffers many challenges such as bush fires, soil erosion, soil fertility loss, insufficient financial investments etc.

**A** While CSA practices exist in Seychelles, most of the practices are not widely adopted. At present, drip irrigation, inter cropping and conservation agriculture techniques seem to be the most adopted due to their low technology needs, private sector engagement and multiple benefits (food security, income diversification and improved resilience).

**A** With livestock contributing 88.5 percent of total agricultural greenhouse gas (GHG) emissions, there is the need to conduct research on livestock-based CSA practices to support mitigation actions. At present, the livestock-based CSA practices focus largely on adaptation and resilience.

**A** Several policies, strategies, plans and programs are being implemented to fight climate change and promote CSA. Of relevance to CSA are the National Communication on Climate Change (NCCC), National Strategy for Disaster and Risk Management (NSDRM), the National Programme on Climate Change (NPCC), Comprehensive Africa Agricultural Development Plan (2018-2020), the Nationally Determined Contributions, Disaster Management Policy (2008), and the National Food and Nutrition Security Policy (2013).

**I** CSA policies and actions are implemented mainly by the Ministry of Fisheries and Agriculture (MoFAG), the Seychelles Agricultural Agency (SAA), the Seychelles Farmers' Association, Seychelles Fishing Authority (SFA), the Seychelles Agricultural and Horticultural Training Centre (SAHTC) and the Ministry of Environment, Energy and Climate change (MEECC). The Seychelles Meteorological Authority (SMA), plays a key role in monitoring and sharing of climate and weather information services. There is limited involvement of civil society on CSA in the country so far.

**\$** Although the country is eligible for multiple international climate finance instruments, funding for CSA has been based on support of various interventions by the African Development Bank (AfDB), Southern African Development Community (SADC), the Common Market for Eastern and Southern Africa (COMESA), the European Union (EU), the Food and Agriculture Organization (FAO) of the United Nations, the International Fund for Agriculture Development (IFAD), the Global Environmental Facility (GEF)/ United Nations Development Programme (UNDP) and the International Atomic Energy Agency (IAEA).

**\$** Greater effort needs to be placed on accessing international climate finance instruments while at the same time, ensuring availability of local level public and private financing instruments for investments in the agriculture sector.

**A** Adaptation    **M** Mitigation    **P** Productivity  
**I** Institutions    **\$** Finance

The climate-smart agriculture (CSA) concept reflects an ambition to improve the integration of agriculture development and climate responsiveness. It aims to achieve food security and broader development goals under a changing climate and increasing food demand. CSA initiatives sustainably increase productivity, enhance resilience, and reduce/remove greenhouse gases (GHGs), and require planning to address tradeoffs and synergies between these three pillars: productivity, adaptation, and mitigation [1]. The priorities of different countries and stakeholders are reflected to achieve more efficient, effective, and equitable food systems that address challenges in

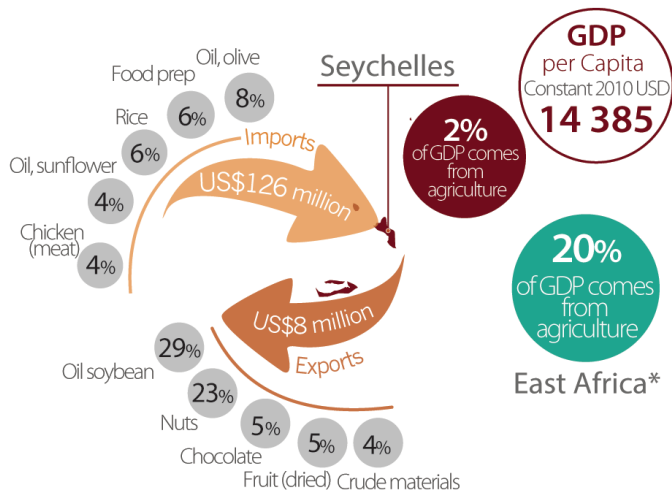
environmental, social, and economic dimensions across productive landscapes. While the concept is new, and still evolving, many of the practices that make up CSA already exist worldwide and are used by farmers to cope with various production risks [2]. Mainstreaming CSA requires critical stocktaking of ongoing and promising practices for the future, and of institutional and financial enablers for CSA adoption. This country profile provides a snapshot of a developing baseline created to initiate discussion, both within countries and globally, about entry points for investing in CSA at scale.

# National context

## Economic relevance of agriculture

Seychelles is a small island state in the western Indian Ocean, which has developed a high-income economy and eliminated extreme poverty. The economic wealth of Seychelles is about USD 14 385.3. It is classified as a high-income economy (currently the only one in sub-Saharan Africa) [3]. Agriculture contributes about 2.07 percent of the gross domestic product (GDP) [4]. Tourism, and the fisheries and seafood industries, are the pillars of the economy, with tourism generating over half of aggregate demand by some estimates, and canned tuna constituting the bulk of goods exports. Total exports of agricultural products is valued at USD 8 millions. The top five agricultural products exported between 2012 and 2016 include: oil, soybean (29.20 percent), nuts, nes (23.00 percent), chocolate products nes (5.40 percent), fruit, dried nes (5.37 percent) and crude materials (3.72 percent). Seychelles, also depend on foreign imports of agricultural products to meet local consumption. Between 2012 and 2016, about USD 126 millions worth of agricultural products were imported to Seychelles. The top five agricultural import products include: oil, olive, virgin (8.05 percent), food prep nes (6.46 percent), rice - total (rice milled equivalent) (6.31 percent), oil, sunflower (4.19 percent), meat, chicken (4.00 percent) [4].

### Economic relevance of agriculture in Seychelles



\*East Africa: Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Maryotte, Mauritius, Mozambique, RÅunion, Rwanda, Seychelles, Somalia, South Sudan, Tanzania, Uganda, Zambia, Zimbabwe

Source: [3, 4]

In 2017, the total human population of Seychelles was estimated at 96 762. Out of the total population, 44 percent are estimated to live in rural areas [4]. Seychelles has achieved a high level of human development, as measured by the United Nations (UN) Human Development Index (HDI) (rank 63rd/188 [5].

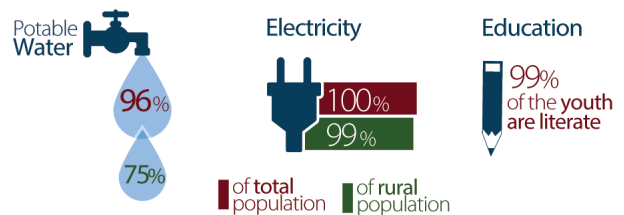
Poverty in Seychelles as defined for international comparison purposes is very low: 2.5 percent percent at the lower middle income line (USD 3.10 per day, at 2013) [3]. Inequality, however, is significant as reflected in a Gini coefficient for gross income of 0.47. The formal unemployment rate is 3.9 percent, indicating a tight labour market consistent with robust recent economic conditions. As at 2013, 1.8 percent (mostly men) of the population were estimated to be actively employed in primary production agriculture. Access to basic needs and youth literacy rate are among the highest in sub-Saharan Africa.

## People, agriculture and livelihoods in Seychelles

### Demographics



### Access to basic needs



### Jobs in agriculture



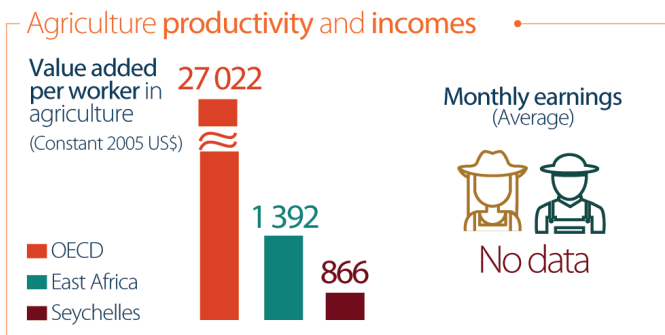
### People living below



### Gender inequality (Index)



Source: [3, 4]

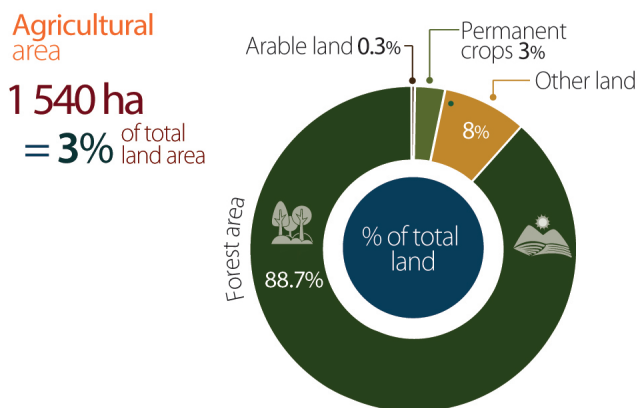


Source: [3]

## Land use

Agricultural land in Seychelles is estimated at 1 540 hectares representing representing 3.4 percent of the total land area of the country. In 2015, arable land constituted about 0.3 percent of the land area while 3 percent of the land area was occupied by permanent crops [4]. Seychelles is covered with 40 600 hectares of forest which represents about 88.7 percent of the total land area. Forested areas include natural forests and plantations established for commercial purposes. About 90 percent of the forests are natural with plantations covering about 4 800 hectares. Although the forest ecosystem is largely secondary with significant levels of invasive species, it still offers a wealth of biological diversity and protects inland water ecosystems and important watersheds. Between the early 1960s and now, the forest cover of Seychelles has remained intact. Forest remain unexploited for timber and wood energy, bush fires and agricultural expansion. Reduced deforestation can be attributed to good environmental management policies in place. In addition, good policy steering and governance, adequate coordination between its forest policy and other sectorial policies, adequate land tenure security and demographic pressure have all contributed to improved biodiversity conservation making Seychelles the first country in the western Indian Ocean region to designate marine protected areas [2].

### Land use in Seychelles



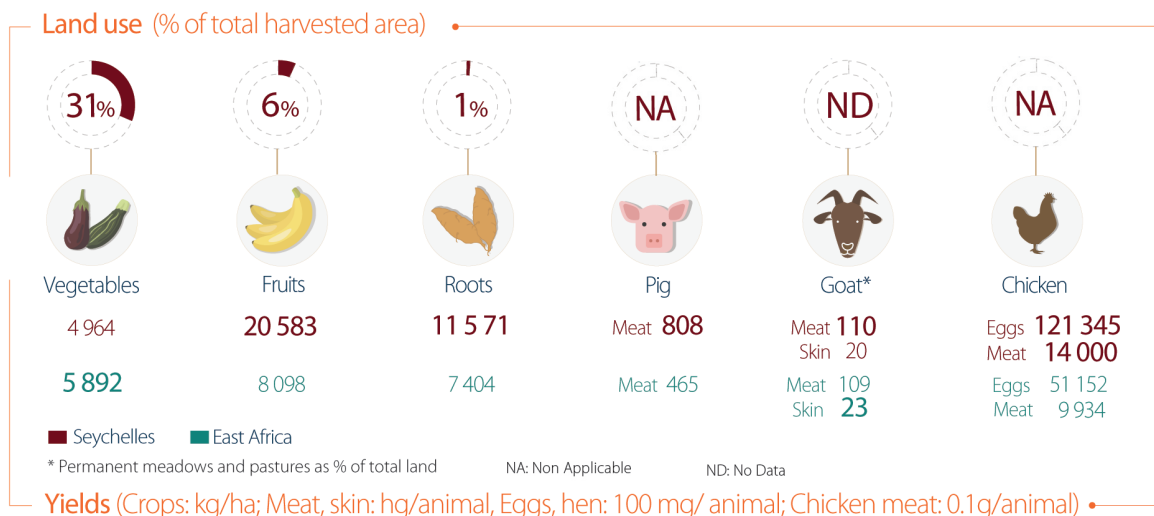
Source: [4]

## Agricultural production systems

Seychelles is divided into two (2) large agro-climatic zones based on biophysical characteristics. The agro-climatic zones include mountainous/forest zone high ground (500-900 m), coastal plateau (2-500 m). In terms of agriculture, two agroecological zones can be distinguished mainly based on soil: upland and sandy soil (annex 1). The main cropping systems include food crop-based systems and perennial crop-based systems. The food crop-based systems include: root and tuber crop (cassava, yam, sweet potato, cocoyam) and vegetables (solanicae, cucurbits, brassicals, capsicum, spices, herbs etc.). Perennial crop-based systems are mainly tropical fruits (bananas, mangoes, orange). Maize has been lately introduced and increasing in production mainly grown in the coastal areas. Livestock produce include goat, pig and chicken.

Most crops produced in the country are under two production systems (rain fed, and irrigated) and contributes 2.2 percent [4] of the country GDP. Primarily consisting of small farms rarely exceeding two hectares, agriculture in the country is largely commercially-based. Backyard farming (involving the production of fruits, vegetables and livestock) is for supplementation of household food or household income. Banana is produced mainly for the domestic market and normally grown in association with other crops in the intercropping system. Cassava is grown on both the coastal plateau and forest area of the higher ground, but it is the forest region which provides most of the production. The principal crops and products are coconuts, cinnamon, vanilla, sweet potatoes, cassava, bananas and tuna. Fresh and frozen fish export gained from by catch of larger fishing vessel are on the rise as new policy are align to increase valued addition. Traditional export crops, such as cinnamon, coconuts, patchouli and vanilla, were used for the oil extracts and have decreased considerably as vegetables and fruits grown for local consumption have increased. The following infographic shows a selection of agriculture production systems key for Seychelles food security. The importance is based on the system's contribution to economic, productivity and nutrition quality indicators. For more information on the methodology for the production system selection, consult annex 2.

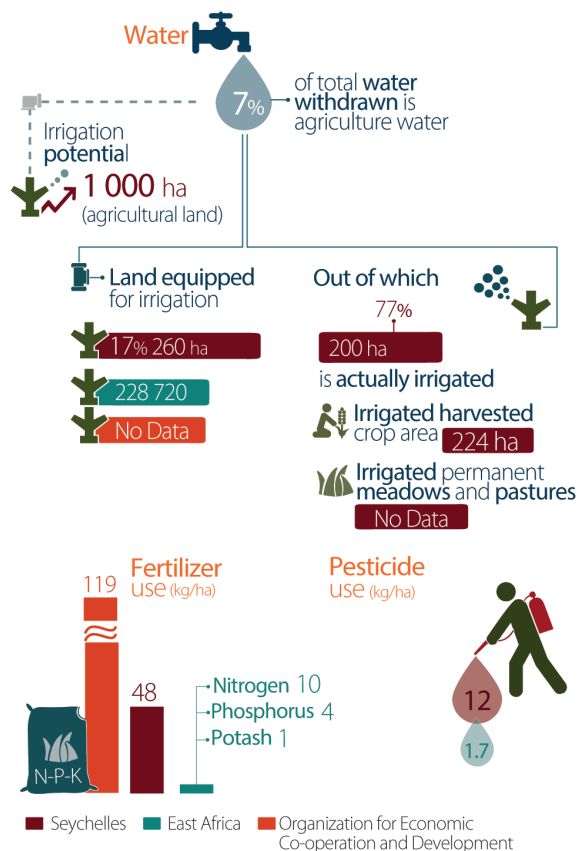
## Production systems key for food security in Seychelles



Source: [4]

Agriculture in Seychelles is mainly rainfed. While the country has an irrigation potential of about 1 000 hectares, about 260 hectares of the agricultural area is irrigated. Majority of agricultural production in Seychelles is low-input with about 12.2 kg of pesticide applied per ha and 48 kg of fertilizer applied per hectare.

### Agriculture input use in Seychelles



Source: [4]

## Food security and nutrition

Seychelles has the highest rate of overweight and obesity in Africa. Some 57 percent of men and 72 percent of women were either overweight or obese in 2013 [6]. Annual school survey show continued increase in the rates of overweight and obesity among school-aged children. In 2016, 20 percent of boys and 24 percent of girls were overweight whilst nearly 8.8 percent of boys and 8.7 percent of girls were obese [7]. The percentage of prevalence of children wasting is only 4.3 percent according to FAO as of 2012. The shift from predominantly unprocessed traditional foods including but not limited to fish, local fruit and vegetables, tubers, roots and breadfruit, to a more westernized dietary intake consisting mainly of refined and processed foods has contributed largely to the increase in obesity and its complications such as non-communicable diseases [8]. All these factors have contributed to altering all nutritional indicators.

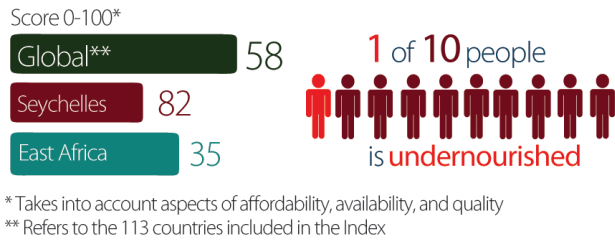
According to the World Bank child mortality rate has remained constant around 14 percent throughout the 2012-2016 period and no alarming trend with potential to decrease with the more vigorous changes of life style and exercise program emphasized by the ministry of health. More detail analysis of household consumption patterns is needed to assess the “wealthier” household shares of their consumption expenditures on food compared with less affluent households, income spent on food and the average number of calories consumed per person. There is an ongoing household consumption survey presently ongoing and results will be available in 2019.

With regards to adolescent fertility rate, a five-year (2012-2016) average is about 59.6 percent. In Seychelles, the HIV and AIDS epidemic is still a concentrated one, with less than 1 percent of prevalence in the general population [8]. However, preliminary results from the respondent-driven survey indicate that the prevalence rates are much higher in key sub-populations, such as men who have sex with men (MSM) and injecting drug users (IDUs).

In the former, the rate of HIV prevalence may be as high as 14 percent whilst in the latter group, the rate is about 4 percent [8].

## Food security, nutrition, and health in Seychelles

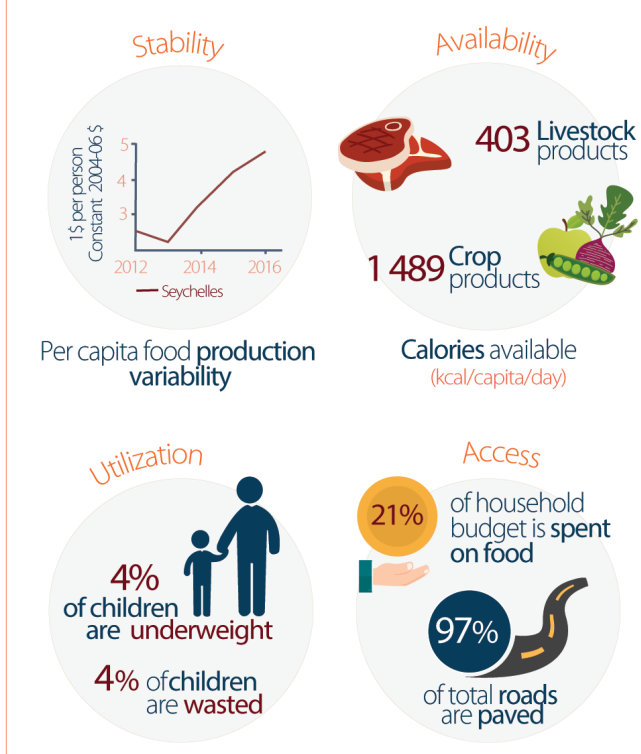
### Food security



### Food aid (2012)



### Food security indicators (selection)



### Health

#### Access to clean energy sources

95% of the population has access to clean energy sources (non-solid fuels) for cooking

#### Child Mortality rate

Under-five mortality rate (per 1,000 live births): 14

#### Adolescent fertility rate

60 births per 1,000 women, ages 15-19

#### Prevalence of HIV infections

1% people infected with HIV

0.03 are women (age 15+)

Source: [3, 4]

## Agricultural greenhouse gas emissions

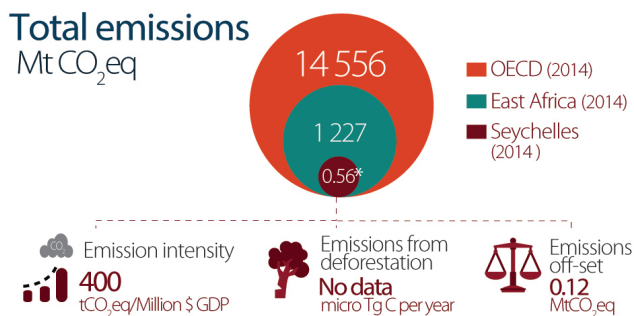
Total annual greenhouse gas emissions (GHGs) in Seychelles are estimated at about 0.56 Mt CO<sub>2</sub> equivalent (CO<sub>2</sub>e) with an emission intensity of 400 tCO<sub>2</sub>e/ million \$ GDP [9]. Most (87.5 percent) GHGs emissions come from the energy sector followed by GHG emissions from waste management (10.9 percent). Agriculture contributes 0.79 percent of total emissions. Regarding emissions from agriculture, the livestock sub-sector contributes 88.5 percent mainly from GHG emissions from manure left on pastures (30.7 percent) and enteric fermentation (20.4 percent) [4].

The UNFCCC Secretariat reported that the Republic of Seychelles was amongst the first group of countries to formally ratified the Paris agreement and submit its (Intended) Nationally Determined Contribution (NDC), which announces its two economy-wide absolute greenhouse gas (GHG) emissions reduction targets: the first, will reduce by 0.1225 MtCO<sub>2</sub>e (21.4 percent) in 2025 and the second estimated 0.188 MtCO<sub>2</sub>e in 2030 (29.0 percent) relative to baseline emissions. This is based on the reduction efforts contained in the strategic sectoral development plans with the support of both technical and financial partners; which is subject to capacity building, technology development and transfer, and financial support that is new, additional and easily accessible.

In the NDC, Seychelles outlines mitigation actions in the forestry, energy and transport, and waste sectors. In agriculture, actions to mitigate climate change include among others: promotion of agricultural practices such as agroforestry; mainstreaming strategies to limit deforestation and increase the sink capacity of forests (837 380 tCO<sub>2</sub>) with an expected loss in sink capacity of 1 percent every 5 years, into Seychelles National Agricultural Investment Plans (SNAIPs).

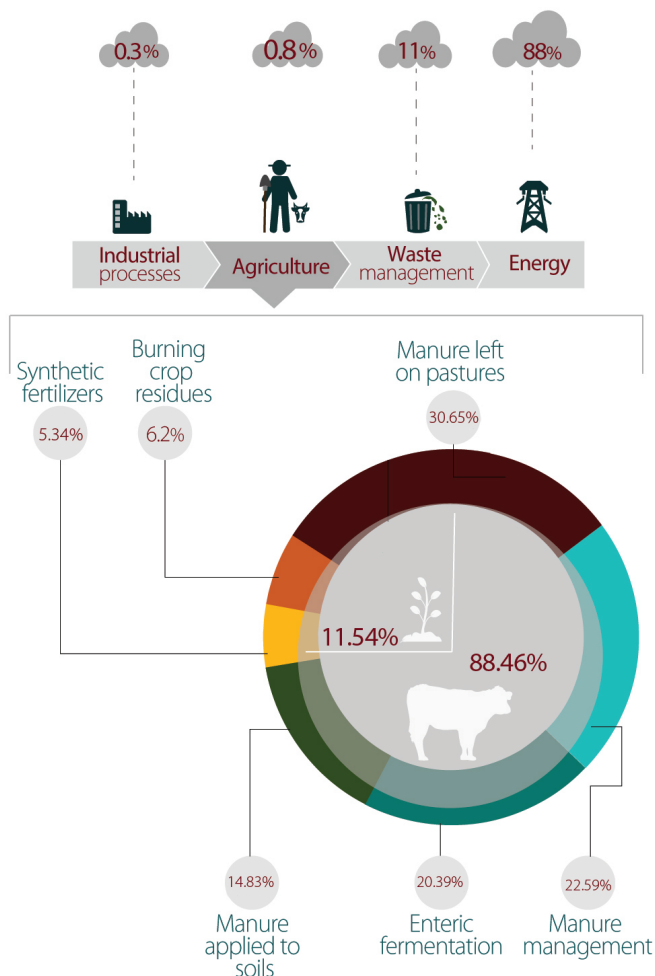
The NDC emphasizes the insignificance of agriculture in emission but highlights the importance of forestry and forestry practices to maintain its ecosystem services. The NDC also identifies food security, energy security, forestry, health, tourism, water resources and coastal zones as priority areas for adaptation support and the needs to mainstream climate change adaptation into planning processes for all new developments, with associated improvements and rigorous enforcement.

## Greenhouse gas emissions in Seychelles



\* Includes emissions from land use change and forestry

## Sectoral emissions (2014)



Source: [4, 9]

## Challenges for the agricultural sector

- Despite the potential of agriculture in Seychelles, the sector remains confronted with several challenges. Intensification of agriculture is far from being achieved and deforestation has worsened. Similarly, the objectives of the intensive diversification of agricultural production, productivity and competitiveness, self-sufficiency and food security could not be achieved in plant or animal production. Imports of food products have maintained an upward trend, which has even strengthened in recent years with rapid trend in population and energy uses. Concerning the human capital, agriculture, for the most part, is driven by an aging agricultural population, the young trained in modern production techniques are few and far between and usual chose different career path after training. Moreover, the low level of conservation and processing of the main agricultural products generally results in relatively high post-harvest losses. The major problems identified in this area are inadequate technology for the processing and conservation of perishable foodstuffs and the high cost of existing technologies and energy uses.
- Uncontrolled urbanization, land clearing for development/infrastructures, bush fires and population pressure are major issues that are face by producers. Funding for agriculture, livestock, fisheries and aquaculture is characterized by a low level of investment, although considerable efforts have been made. The issue of land ownership remains a major concern in Seychelles. Indeed, renewed land resources are scarce and state agricultural land has been on the table for discussion at various occasions, given problems of access to land are still factors that can revive agricultural economic activities in Seychelles. Concerning gender, women who are at the centre of agricultural activities are marginalized in terms of access and control of production assets.
- Seychelles is also highly reliant on food imports with 80 percent of food coming from external markets. Local production is insufficient to supply the whole population due to the high cost of production, limited land for agricultural activities due to competition with other sectors, inappropriate allocation of land, limited resources, climate susceptibilities, amongst other factors [10]. Data access and analysis is a major obstacle that we need to overcome for better prognosis and integral part of bench marking most needed indicators needed for future endeavours.

## Agriculture and climate change

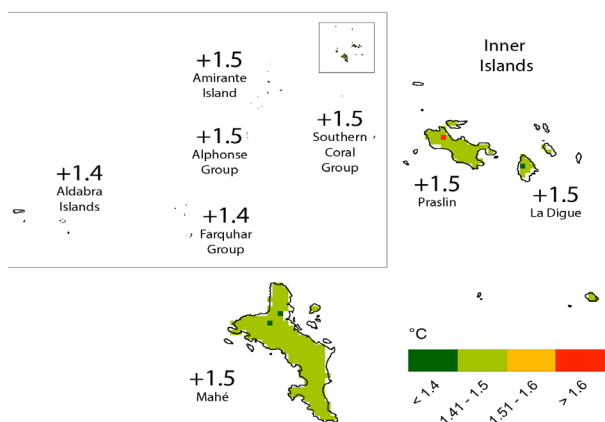
Agriculture in Seychelles is limited by a lack of arable land and extreme rainfall patterns and meteorological events like tropical storms, floods and droughts. A vulnerability/resilience profile exercise undertaken in Seychelles revealed that Seychelles was most vulnerable and least resilient in terms of biodiversity resources and sustainable consumption and production (both with significant implications for climate change adaptation) the tourism industry (the country's crucial economic sector) and food security. Other areas of concern were sea level rise, coastal and marine resources, water security and energy security [10].

Presently, climate change poses serious challenges to Seychelles. Some these include: the uncontrolled economic and social consequences of floods, land degradation, sea-level rise, coastal erosion, declining agricultural yields, health vulnerability, and increased occurrence of drought. Most of all climate change has had a negative impact on the food security and livelihoods of farmers. Therefore adaptation efforts need to take consideration of these temporal differences in rainfall changes. Delays in season onset vary from one to three weeks depending on various factors, Studies shows that the rainy season has been erratic with much influence of the drivers such as El Nino, madden Julian oscillations and Indian Ocean dipole.

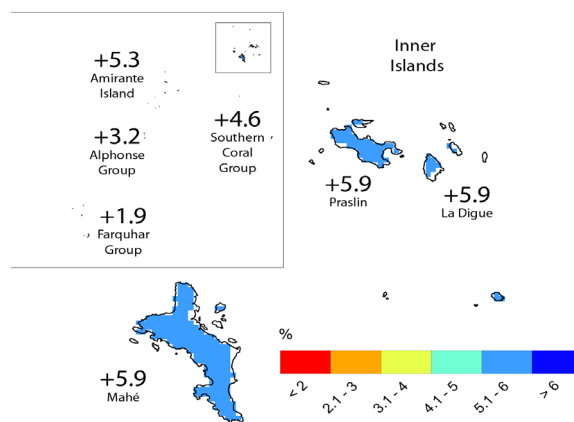
The analysis of the evolution of climate parameters during the last 40 years (1971 to 2013/2015) shows that climate change is already an undeniable reality for Seychelles. It is indicated that temperature increase is alarming during the early hours of the day with greater trend of 0.82 °C compared to 0.33 °C during the daytime. The present sea level rise of  $\approx 6.6$  mm/year if kept constant in this century, could rise by +0.264 m in 2050 and +0.594 m in 2100. This will be consistent with the 5th IPCC Report (+0.4 to +0.6 m for year 2070-2100). Rainfall shows decreasing trend during the wet season whilst the dry season have a positive trend. This may lead to more flooding and increase evaporation during the dry season which will be favourable for crop production. Projections using 15 model outputs and downscaling techniques indicate that temperatures will continue to increase by 2080 under the deferent representative concentration pathways (RCPs), with the greatest increases being in the rainy season of the RCP 4.5 but greater error margin. The RCP 8.5 shows yet another different figure as more increase are expected during the peak of the windy dry season.

### Projected changes in temperature and precipitation in Seychelles by 2050

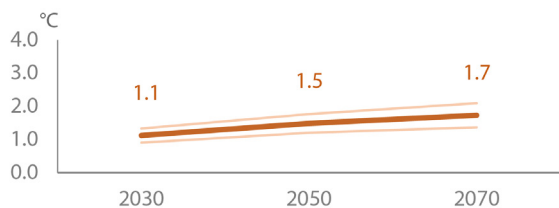
Changes in annual mean temperature (°C)



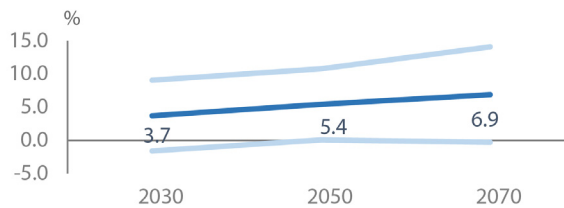
Changes in total precipitation (%)



Average temperature (°C)



Average precipitation (%)



Source: [11, 12, 13]

## CSA technologies and practices

CSA technologies and practices present opportunities for addressing climate change challenges, as well as for economic growth and development of the agriculture sector. For this profile, practices are considered CSA if they enhance food security as well as at least one of the other objectives of CSA (adaptation and/or mitigation). Hundreds of technologies and approaches around the world fall under the heading of CSA. In Seychelles, several CSA practices are adopted covering major part (30-50 percent) of the agricultural area. Some of these include:

- Crop Production under shade houses- crop production under shade houses in Seychelles was initiated some decades ago. The objective of such innovation was to help the farmers to increase production throughout the year. This was important as production fluctuated between the south east Monsoon and north east Monsoon. Crops could be grown all year-round in shaded houses. This is the ideal technology local farmers need to employ to achieve food security. Cultivation under shade house have the advantages of protecting the crop from severe rainfall thus flooding. While, shade houses do not eliminate the spread of pests and diseases they do reduce the incidences. This is a major advantage over traditional farming, which is done in open fields. Traditional farming exposes crops to environmental changes such as extended dry periods, water stress, and pest and diseases. Crops grown under shaded conditions are protected from harsh weather conditions and have minimal exposure to pests and diseases. In fact, shade house cultivation could be farmers' solution to the adverse effects climate change has on the environment.

- Inter cropping – is the cultivation of food, forage or specialty crops between rows of trees. In Seychelles, it is normally practiced at most zones where various crops such as pumpkin, papaya are planted within the rows of leguminous plants. Some of the intercropped plants also serve as natural repellents for insect/pests.

- Use of organic manure and mulch – organic manure use (particularly from poultry/pork and cow) is common with most production systems and plantations across the country.

- Use of weather information – various projects in Seychelles launched by the World Meteorological Organization and the State Agency for Meteorology in 2000, has improved farmers' use of seasonal forecast and climate information for making planting decisions.

- Water control through irrigation - various irrigation techniques are becoming prominent in Seychelles to improve water availability on farmlands particularly during droughts. In the alluvial plains (noted for vegetables, rice, pineapple and banana) sprinkler schemes are commonly used. However the main irrigation technologies implemented in the country are the equipment of inland valley bottoms and drip irrigation for vegetable production. Drip irrigation for farms/gardens is promoted in the country as a means to increase food security, diversify diets, generate incomes and increase resilience to climate change.

- Anti-erosion arrangement – various erosion control measures are practiced in Seychelles. For instance the use of methods such as the planting of vetiver grass at the upper or outer areas of farms areas and drains to control erosion. In addition, terraces, contour ridges and erosion control strips tried out on erosion plots in Seychelles, reduced soil loss and runoff compared to the control plot.

- Wind break and shelter - the association of trees to minimize effect of wind and heavy rains on seedlings, where they benefit from the shade of trees to grow at the early stages of development. The technology has also shown to be productive during periods of long dry spells.

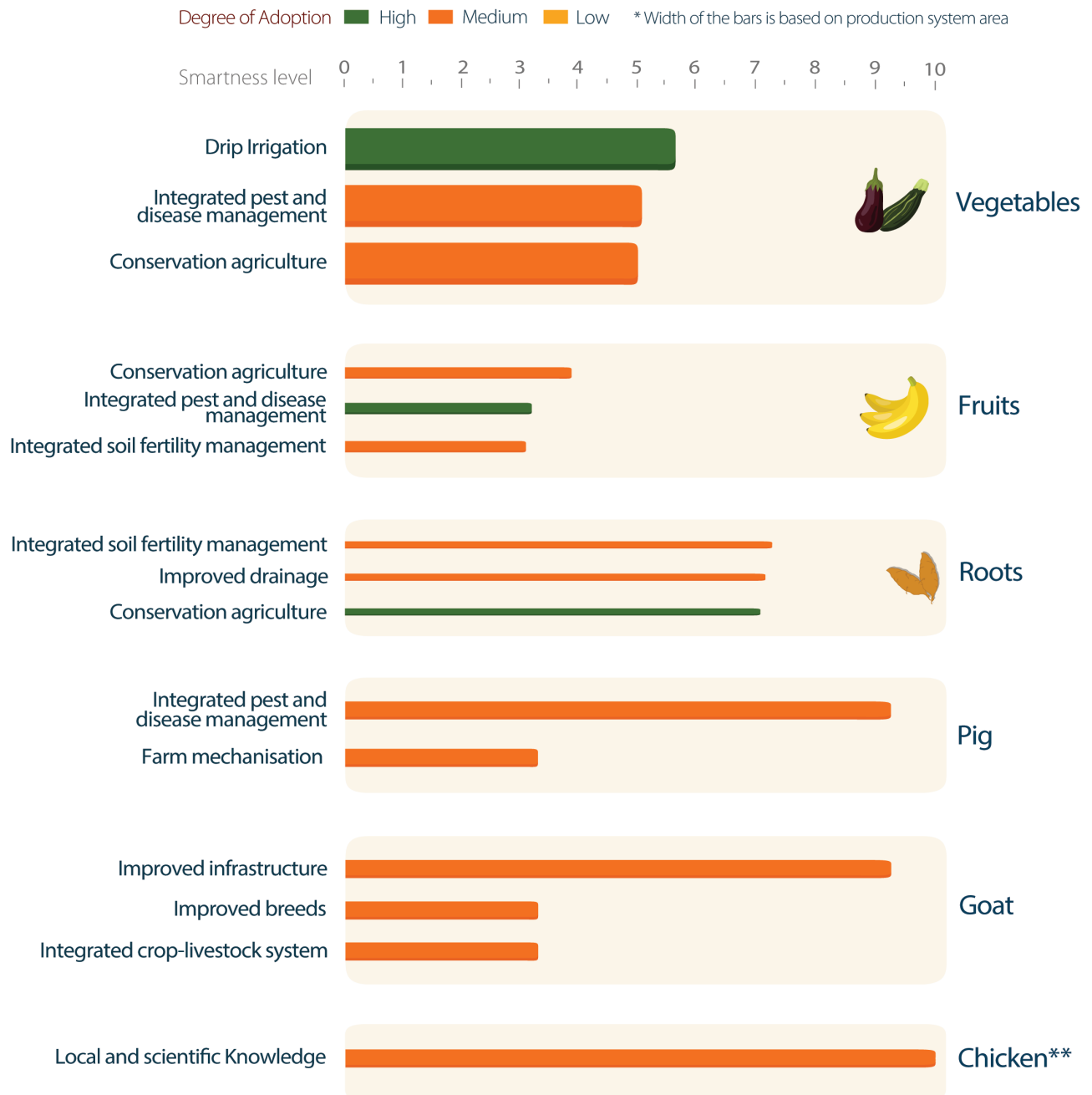
- Use of climate adapted seeds - over the past decades with increased temperatures and higher intensity of rain, many farmers have adopted the use of varieties that are resistant to extreme weather conditions. Some of these are locally saved but many are imported and tested at the crop research station of the Seychelles Agricultural Agency (SAA).

- Integrated pest and disease management (IPM) –this is a strategy that promotes a safer and more sustainable management of pesticides. IPM strategies are evolving because of new emerging pests and climate change. With climate change, the distribution and aggressiveness of some pests and diseases have changed considerably.

The following graphics present a selection of CSA practices with high climate smartness scores according to expert evaluations. The average climate smartness score is calculated based on the practice's individual scores on eight climate smartness dimensions that relate to the CSA pillars: yield (productivity); income, water, soil, risks (adaptation); energy, carbon and nitrogen (mitigation). A practice can have a negative/ positive/ zero impact on a selected CSA indicator, with 10 (+/-) indicating a 100 percent change (positive/ negative) and 0 indicating no change. Practices in the graphics have been selected for each production system key for food security identified in the study. A detailed explanation of the methodology and a more comprehensive list of practices analyzed for Seychelles can be found in annexes 3 and 4, respectively.



## Selected CSA practices and technologies for production systems key for food security in Seychelles



\*\* Unidentified production system area

## Case study: Spurring climate change adaptation in schools through rainwater harvesting in Seychelles

The republic of Seychelles is vulnerable to particular climate change effects and challenges which include sea level rise, increase in sea surface temperatures and changes in rainfall patterns with short periods of heavy rainfall during the rainy season and severe droughts during the dry season being a common occurrence. To address the problem of water scarcity, the country invested heavily in the construction of reservoirs and desalination plants, but this didn't help but instead skyrocketed the use of fossil fuel which only helped to emit more GHGs. Increased school population and the local educational campaign to green school grounds, resulted in increased demand for water resulting in high water bills.

In an effort to address this and at the same time demonstrate adaptation to climate change in Schools, a UNEP/UNDP project (CC DARE: Climate Change and Development – adapting by reducing vulnerability) with financial support from the Danish International Development Agency (DANIDA), assisted Seychelles with a timely-targeted rainwater harvesting project. The project was established in 2010. The objectives were to demonstrate the efficacy of rainwater harvesting for climate change adaptation in schools, and raise awareness and build capacity among

the general public for scaling up. The project was implemented following collaboration with the Seychelles Environmental Education Unit, the Environment Department, the Water Division in Public Utility cooperation, the Sustainability for Seychelles (S4S), Seychelles Islands Foundation (SIF), sea level rise foundation and some NGOs.

The outputs of this project enabled the school for the first time to make a saving of USD 250 monthly on water bills. These savings were invested in improving the school's infrastructure and acquiring learning materials. In addition, water harvested at the school were used for irrigating the school gardens, used in cleaning ups and supplying water to toilet facilities. The success of this project has created opportunities for other climate change adaptation initiatives. For instance, the Department of Environment and the Publicity Utility Cooperation (PUC) of Seychelles are using this project as a means to sensitize and educate the general public on climate change. In addition, the Sustainability for Seychelles (S4S) (a private sector partner) is using the project to promote rain water harvesting at the community level. The schools in the community are being used as models for community demonstrations.





Following national relevance of the demonstration action, the government of Seychelles is encouraging rainwater harvesting as a means to climate change adaptation and mainstreaming it in the environment and sustainable development plans of the country. This is an indication that rainwater harvesting is a sustainable intervention against climate change to the extent that it can be incorporated into the environmental management strategies of a country.

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Source: United Nations Climate Change, 2019 - <https://unfccc.int/climate-action/momentum-for-change/lighthouse-activities/spurring-climate-change-adaptation-in-schools-through-rainwater-harvesting>)



**Table 1.** Detailed smartness assessment for top ongoing CSA practices by production system as implemented in Seychelles

CSA practice	Region and adoption rate (%) <30 30-60 60>	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Impact on CSA Pillars
<b>Vegetables</b> (31 percent of total harvested area)				
Drip Irrigation	60%	S M L		<p><b>Productivity</b> Improves crop yield and overall productivity.</p> <p><b>Adaptation</b> Improves water availability and utilization efficiency for increased resilience to drought.</p> <p><b>Mitigation</b> Some impact on nitrogen emissions by efficient fertilizer application. A reduction in energy required for irrigation can reduce emissions intensity per unit of output).</p>
Integrated pest and disease management	30-60%	S M L		<p><b>Productivity</b> Improves crop production and quality, hence potential increases in income.</p> <p><b>Adaptation</b> Prevents crop losses caused by diseases. Increases the potential to overcome climate shocks.</p> <p><b>Mitigation</b> Disease management and prevention reduces risk of crop failure therefore crop yields and the emission per unit production.</p>
<b>Fruits (bananas, mangoes, orange)</b> (6 percent of total harvested area)				
Conservation agriculture	30-60%	S		<p><b>Productivity</b> Enhances production per unit area. Diversifies income and food sources.</p> <p><b>Adaptation</b> Improves and conserve soil fertility; minimizes erosion; and contributes to reducing the risks of crop failure.</p> <p><b>Mitigation</b> Allows long-term reduction in nitrogen-based fertilizers when leguminous crops are rotated with cereals. Maintains or improves above and below-ground carbon stocks and soil organic matter content.</p>
Integrated pest and disease management	60%	M		<p><b>Productivity</b> Improves crop production and quality, hence potential increases in income.</p> <p><b>Adaptation</b> Prevents crop losses caused by diseases. Increases the potential to overcome climate shocks.</p> <p><b>Mitigation</b> Disease management and prevention reduces risk of crop failure therefore crop yields and the emission per unit production.</p>



CSA practice	Region and adoption rate (%)	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Impact on CSA Pillars
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Roots (1 percent of total harvested area)

Integrated soil fertility management

30-60%



**Productivity**

“Increases productivity as a result of enhanced soil health and fertility”

**Adaptation**

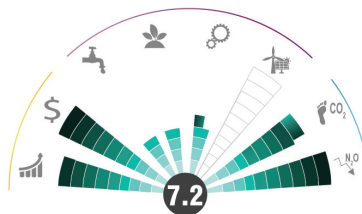
Promotes soil structure conservation. Integrates crop residues and other on-farm waste. Minimizes erosion and enhances insitu moisture conservation.

**Mitigation**

Allows long-term reduction in nitrogen-based fertilizers and related GHG emissions. Maintains or improves soil carbon stocks and organic matter content.

Improved drainage

30-60%



**Productivity**

Improves production per unit area.

**Adaptation**

Minimizes erosion and improves water use efficiency.

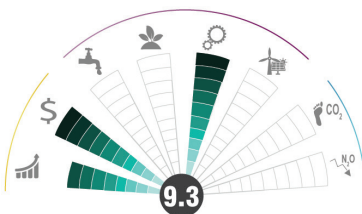
**Mitigation**

Reduces tillage operations for long-term soil organic matter build-up and carbon sequestration.

Pig (NA)

Integrated pest and disease management

30-60%



**Productivity**

Improves crop production and quality, hence potential increases in income.

**Adaptation**

Prevents crop losses caused by diseases. Increases the potential to overcome climate shocks.

**Mitigation**

Disease management and prevention reduces risk of crop failure therefore crop yields and the emission per unit production.

Farm Mechanisation

30-60%



**Productivity**

Enhances production per unit area.

**Adaptation**

Improves timely implementation of farm operations for efficient use of rainfall

**Mitigation**

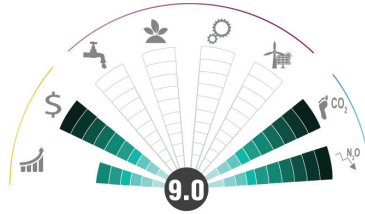
Where solar-powered farm implements are used, they reduce GHG emissions (carbon footprint) by reducing consumption of energy.

CSA practice	Region and adoption rate (%)	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Impact on CSA Pillars
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Goat (No data)

Improved infrastructure

30-60%



**Productivity**

Enhances production per unit area.

**Adaptation**

Minimizes production losses and increases the potential to overcome climate shocks.

**Mitigation**

Reduces GHG emissions (carbon footprint) by reducing consumption of energy, synthetic fertilizers and other agricultural inputs.

Improved breeds

30-60%



**Productivity**

Using improve breeds improve overall productivity and income.

**Adaptation**

Improved breeds are resilient to climate shocks.

**Mitigation**

Improved breeds have improved feed conversion minimizing GHG emissions.

Chicken (NA)

Local and scientific Knowledge

30-60%



**Productivity**

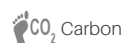
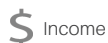
Enhances production per unit area.

**Adaptation**

Minimizes production losses and improve resilience to climate shocks.

**Mitigation**

Improved knowledge on best practices minimizes the use of large quantities of fertilizers and pesticides that significantly emit GHGs.



## Institutions and policies for CSA

Seychelles has several key institutions and policies aimed at supporting and increasing agriculture productivity and advancing CSA practices. These include government ministries and agency structures of ministries, firms operating in the agricultural sector, academic institutions, specialized laboratories, and agricultural research institutes and training centres. The majority of these institutions are national institutions. All these institutions are intervening in several sectors including agriculture, climate change, forestry, environment and natural resources management.

At the government level, the institution responsible for the country's climate change plans and policies is the Ministry of Environment, Energy and Climate Change (MEECC), which also serves as the country's UNFCCC focal point and nationally designated Authority (NDA) to the Green Climate Fund (GCF). The MEECC has recently restructured and created the new Climate Change Division which will serve as the national focal point for climate change adaptation planning and implementation of projects. The University of Seychelles has recently established the Blue Economy Research Institute which should be strengthened and fully funded and function as a hub for climate change related research. Other government ministries, agencies and civil society organizations will continue to contribute to adaptation efforts guided by their own sectoral plans but in collaboration with the ministry.

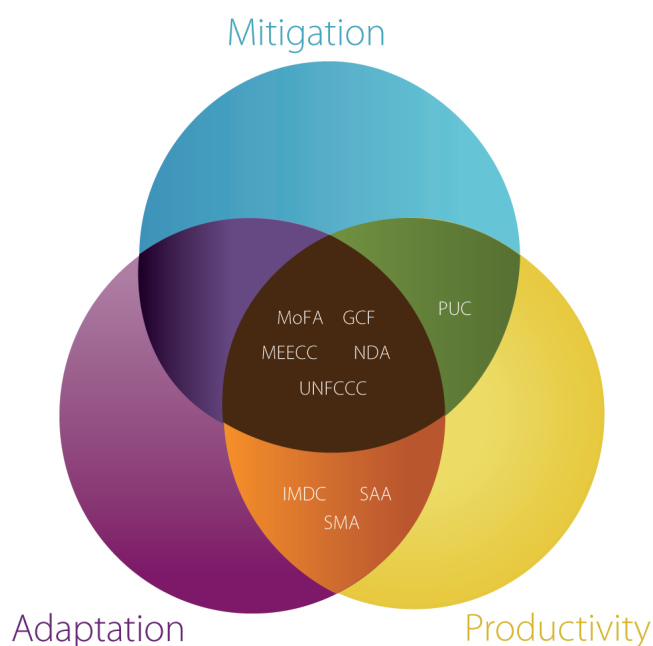
On the agriculture front, the Ministry of Agriculture and Fisheries (MAF) is the key government institution for partnerships for climate-smart agriculture work in the communities as well as for policy and investment related issues through the national Agricultural Investment Plan [14]. With assistance from COMESA, the SNAIP was vetted for its climate smart approach and accepted as a strategy that is "climate proofed". Other key CSA-related government institutions include: public utility corporation (PUC), the Seychelles Agricultural Agency (SAA). While the Institution for Meteorological Development and Climate data capture and analysis lies with the Seychelles Meteorological Authority, plays a key role in monitoring and sharing climate and weather information that is crucial to support farmer adaptation activities.

In terms of research, various institutions on the international stages has linkages and partnering for more focus types of CSA-related agricultural research including research on improved practices in crops and animal production (livestock and fisheries), forestry research, in-field production systems, and post-harvest research (food conservation and processing), while building the adaptation capacity of populations to climate change. The support for the improvement and intensification of agricultural production through water management, the implementation of the innovation transfer into agriculture-adaptation to climate change project which is rolling out many agricultural innovations such as ICT use for climate information, early warning and alerts mainstreamed into national projects.

Most of the organisations identified are conducting work focused on agricultural productivity, although adaptation has become increasingly important in recent decades. Mitigation is often an unintended consequence of their work, hence mitigation efforts still need to be enhanced, possibly through awareness raising and capacity building of all CSA-related stakeholders and use of technology to reduce energy and electricity uses on the farms.

The following graphic highlights key institutions whose main activities relate to one, two or three CSA pillars (adaptation, productivity and mitigation). More information on the methodology and results from interviews, surveys and expert consultations is available in annex 5.

### Institutions for CSA in Seychelles



GCF Green Climate Fund IMDC Institution for Meteorological Development and Climate MEECC Ministry of Environment, Energy and Climate Change MoFA Ministry of Fisheries and Agriculture NDA Nationally Designated Authority PUC Public Utility Corporation SAA Seychelles Agricultural Agency SMA Seychelles Meteorological Authority UNFCCC United Nations Framework Convention on Climate Change

The Republic of Seychelles acceded to the United Nations Framework Convention on Climate Change (UNFCCC) on the 22nd September 1992, being the second country to do so. Likewise, the Seychelles was one of the earliest countries to sign the Kyoto Protocol on the 20th March 1998, and submitted its (I)NDC in 2015. These reaffirmed the country's commitment to both climate change adaptation and mitigation. The (I)NDC, identifies agriculture and forestry as key areas for both adaptation and mitigation, especially in terms of reducing deforestation and land degradation. With the support of FAO and other partners we have been involved in the Regional Programme for Food Security and Nutrition (PRESAN). The National Agricultural Investment Plan (SNAIP) is the overall guiding investment plan for agriculture and aims to support agricultural growth for food security in the country. Although it includes issues such as forest rehabilitation, sustainable fisheries management and the need to improve agricultural productivity and competitiveness; the government has indicated the need to integrate CSA into the plan based largely on the issues raised on importation of commodities that can be substantially grown locally. In response to a request from the Indian Ocean Commission (IOC) and following a resolution of the Conference of Ministers of the IOC held in Antananarivo in May 2015, FAO is committed to provide technical support to the Regional Programme for Food Security and Nutrition (PRESAN) for the development and improvement of food and nutrition security in the Indian Ocean states.

Other CSA-related policies and strategies developed include the following:

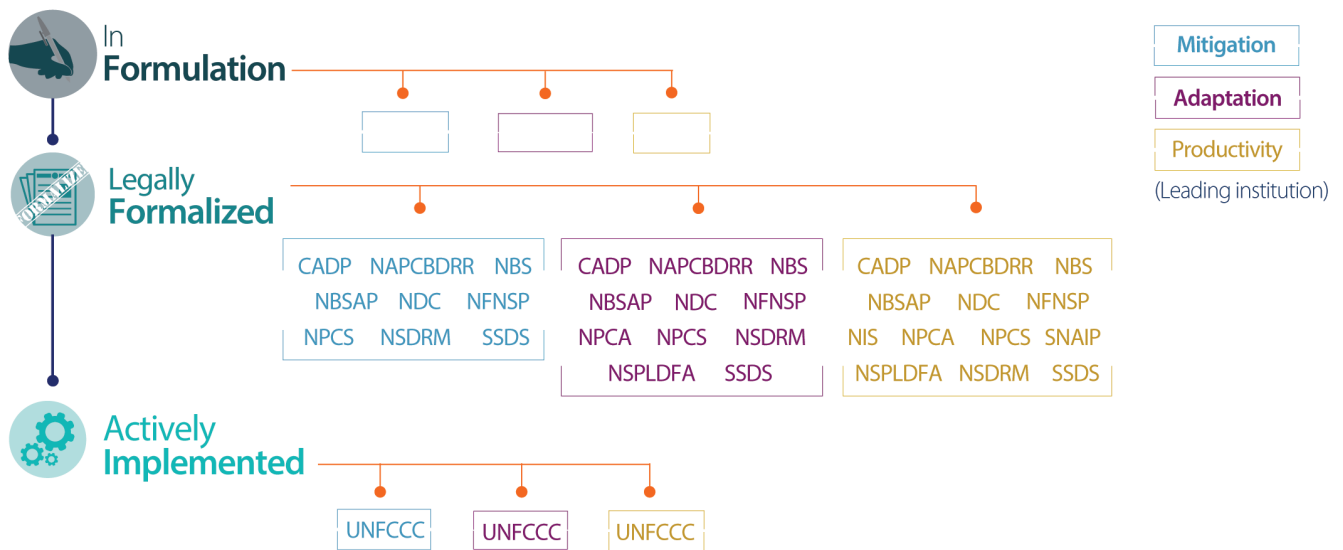
- National Programme on Climate Change strategy (2009) – aims to put in place a national development strategy that integrates both climate change adaptation and mitigation, including in the agriculture sector to address food security alongside the national food and nutrition security policy [15] and the Sustainable Development Strategy of Seychelles [16].
- National Strategy for Disaster Risk Management [17] – focuses on reducing and managing risks and impacts from disasters, including floods and droughts. The strategy also has a National Action Plan for Capacity Building on Disaster Risk Reduction.
- More recently, climate change adaptation has been mainstreamed in the Seychelles Strategic Plan (2015) which is the definitive document intended to guide land-use management during the next 25 years (to 2040). The plan has been developed with reference to sectoral plans by various ministries and is intended to provide an integrated framework for the development of new plans, particularly regarding land use.
- National Biodiversity Strategy and Action Plan (2015) - aims to mainstream climate change in to biodiversity and conservation implementation plan, to address, maintain, and increase the protected areas and forestry as pristine with sustainable development.

A national park and conservancy act was first developed in the late 1960s, alongside the environmental and plant protection act and forest policy, has been effective in keeping Seychelles as a unique destination of green island surrounded by turquoise blue seas. However the country has now taken steps to develop a National Strategy and Investment Plan to support its agriculture goals. The National Strategic Plan for Livestock Development, Fisheries and Aquaculture are also important for CSA in the country; detailing the plans for improving the productivity and resilience in the sub-sectors but not adequately capturing the mitigation issues.

The above policies are implemented mainly by the Ministry of Agriculture and Fisheries, Ministry of environment energy and Climate Change and the Seychelles Agriculture Agency with other line ministries and agencies.

The graphic shows a selection of policies, strategies and programs that relate to agriculture and climate change topics and are considered key enablers of CSA in the country. The policy cycle classification aims to show gaps and opportunities in policy-making, referring to the three main stages: policy formulation (referring to a policy that is in an initial formulation stage/consultation process), policy formalization (to indicate the presence of mechanisms for the policy to process at national level) and policy in active implementation (to indicate visible progress/outcomes toward achieving larger policy goals, through concrete strategies and action plans). For more information on the methodology and results from interviews, surveys and expert consultations, see annex 6.

## Policies for CSA in Seychelles



**CADP** Comprehensive Agricultural Development Plan (2018) (Ministry of Fisheries and Agriculture) **NAPCBDRR** National Action Plan for Capacity Building on Disaster Risk Reduction (2011) (Ministry of Environment, Energy and Climate Change) **NBS** National Biosecurity Strategy (2018) (Ministry of Environment, Energy and Climate Change) **NBSAP** National Biodiversity Strategy and Action Plan (2012) (Ministry of Environment, Energy and Climate Change) **NDC** Nationally Determined Contributions (2015) (Ministry of Environment, Energy and Climate Change) **NFNSP** National Food and Nutrition Security Policy (2013) (Ministry of Fisheries and Agriculture) **NIS** National Investment Strategy (2010) (Government of Republic of Seychelles) **NPCA** National Park and Conservancy Act (2011) (Ministry of Environment, Energy and Climate Change) **NPCS** National Programme on Climate Change strategy (2009) (Ministry of Environment, Energy and Climate Change) **NSDRM** National Strategy for Disaster Risk Management (2010) (Department of Risk and Disaster Management) **NSPLDFA** National Strategic Plan for Livestock Development, Fisheries and Aquaculture (2015) (Ministry of Fisheries and Agriculture) **SNAIP** Seychelles National Agricultural Investment Plan (2015) (Ministry of Fisheries and Agriculture) **SSDS** Sustainable Development Strategy of Seychelles (2012) (Ministry of Environment, Energy and Climate Change) **UNFCCC** United Nations Framework Convention on Climate Change

## Financing CSA

A number of projects that foster the development of knowledge and evidence on the effectiveness of climate-smart agriculture in improving food security, mitigating climate change and improving the adaptive capacities of production systems and populations in Seychelles have received support from various donors and financing schemes. For instance, GEF, ADF, UNDP, UNEP, EUI and REDCROSS through the environmental and Climate Change Adaptation umbrella for program to funded ecosystem base approach to managing water/soil in the context of climate change in Seychelles. Like most countries in sub-Saharan Africa, farmers in Seychelles have benefited from the insurance schemes that help reduce climate-related risks.

In addition AfDB, COMESA, FAO, EUI IFAD etc. have invested hugely in several aspects of the Climate/Agricultural sector of Seychelles which also includes the development and promotion of CSA innovations. For instance UNDP/GEF provided USD 6.45 million for the implementation of a project on ecosystem based adaptation to climate change in Seychelles (UNDP Adaptation Fund).

The project included a component on watershed management which delivered on CSA goals - improved food security for 30 000 households by increasing smallholder farmers' access to services, technologies on flood plains while strengthening the resilience of their production systems to climate change. In terms of access to UNFCCC funding mechanisms, the country has accessed approximately USD 37 million worth of funding from the Global Environment Fund (GEF) for several national projects focused on areas such as biodiversity, environmental and forest management; sustainable production; and coastal areas management among others. The country has also been a part of regional or global projects. Nationally, there are very few institutions financing CSA in Seychelles. National opportunities for funding agriculture include the support from the government (through the National Development Program and the National Investment Plan) and the private sector. By the end of the Maputo declaration (2013), Seychelles recorded a decline of 0.4 percent of the initial value which suggest more efforts are needed in the financial aspect of agricultural development to reach the Maputo target of allocating 10 percent of the national budget towards agriculture.



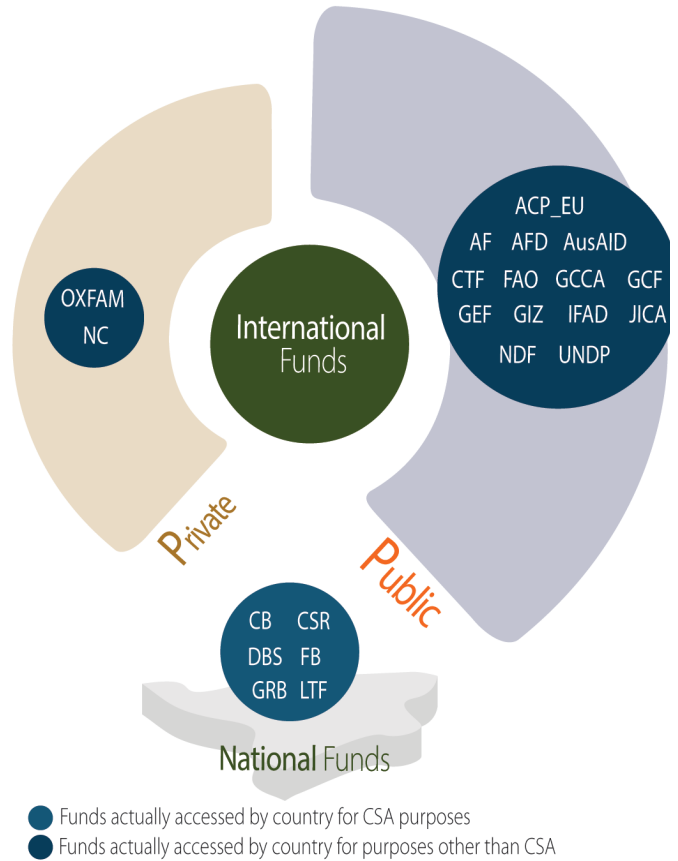
Meanwhile, the government of Seychelles through an act of parliament created in November 2015, the Seychelles Conservation and Climate Adaptation Trust (SeyCCAT) to support the long-term management and expansion of the Seychelles system of protected areas and other activities which contribute substantially to the conservation, protection and maintenance of biodiversity and the adaptation to climate change [18].

## Potential finance

From the various sources of climate finance available internationally, Seychelles is currently eligible for only a limited number of these and has not wholly accessed major funding instruments such as the Green Climate Fund (GCF) and the Adaptation Fund (AF). There are however various international agencies funding agriculture related work in the country and continued partnership with these organisations could be a catalyst for access to larger CSA financing streams. These include the United Nations Environment Program (UNEP), United Nations Development Program (UNDP), and the Food and Agriculture Organization of the United Nations (FAO). There are also international cooperation funds such as the German Development Cooperation Agency (GIZ), COMESA, European Union, International Fund for Agricultural Development (IFAD) and the French Development Agency (AFD) who support agriculture related efforts in the country. Support of the country's access to climate finance, to enhance the ability of the country to attract climate finance is needed within our economic conditions. Efforts to develop and implement high quality GCF projects could be a priority for the short term. The newly approved Agriculture Comprehensive Plan 2018 - 2020 has made provision for the construction of 100 green houses at a total budget of SR 37.0 million (USD 2.6 million). In addition, enhancing private sector financing to climate-smart agriculture is needed. This could be done through capacity building and sensitization of SME's, microfinance institutes and multinational companies on the incentives/benefits of investing in climate-smart practices.

The graphic highlights existing and potential financing opportunities for CSA in Seychelles. The methodology and a more detailed list of funds can be found in annex 7.

## Financing opportunities for CSA in Seychelles



AF Adaptation Fund ACP-EU African, Caribbean and Pacific-European Union Energy Facility AFD French Development Agency AusAID Australian Agency for International Development FAO Food and Agriculture Organization of the United Nations CB Commercial Banks CTF Clean Technology Fund CSR Corporate Social Responsibility - potential DBS Development Bank of Seychelles FB Forestry Budget GCCA Global Climate Change Alliance GCF Green Climate Fund GEF Global Environment Facility GIZ German Society for International Cooperation GRB Government Recurrent Budget IFAD International Fund for Agricultural Development JICA Japan International Cooperation Agency LTF Livestock Trust Fund NC The Nature Conservancy NDF Nordic Development Fund UNDP United Nations Development Programme

## Outlook

Seychelles is a small island nation whose prospects rely heavily on external demand, especially tourism. This poses major challenges for diversification and resilience. Both the small pool of local, skilled labour, and high external transport and energy costs need to be overcome to generate wealth sustainably.

Seychelles' commitment to CSA is relatively new, the institutions involved are still limited, and the sources of funding are essentially from regional and international organisations such as IFAD, FAO, COMESA, SADC etc. Although there are a wide range of organisations conducting CSA-related work, most have focused largely on productivity, environmental management and adaptation, although, reduction of deforestation and sustainable energy are increasingly becoming important and could be integrated into the country's climate-smart agriculture efforts. Some CSA practices are quite widespread and their proliferation has been facilitated by ease of adoption, private sector engagement in their implementation and multiple benefits such as food, income diversification and improved resilience of the impacts of climate variability and change.

However, other CSA practices such as anti-erosion structures, intercropping with legumes, direct seeding, manure management and water harvesting and irrigation are common and cover a very small proportion of the agricultural area and farmers. To enhance the adoption of these CSA practices there is need for:

- Increasing public awareness on agricultural climate change adaptation and mitigation, and the CSA concept.
- Mobilizing private funds at the local and international levels to finance activities related to CSA.
- Encouraging participatory research and development to develop locally appropriate CSA practices for farmers.
- Mainstreaming climate change into country agriculture and economic development policies and programmes.
- Encouraging a multi-stakeholder approach to identifying and prioritizing the most applicable CSA practices for large scale promotion.

In terms of CSA finance, the mainstreaming of climate-smart agriculture into the Seychelles National Agricultural Investment Plan (SNAIP) as well as into other sector plans and policies could represent an important step in ensuring national budget allocation for CSA practices. Such developments could also play a key role in catalysing international and private finance for the larger scale implementation of key CSA initiatives. Lastly, CSA stakeholders in Seychelles will require technical capacity building, technology transfer and financial resources to be able to design, implement, monitor and evaluate CSA-related projects and programmes in line with its NDC and other climate related national strategies and policies. Effort must be made to ensure that the country receives this support in a well-coordinated manner, within the framework of existing CSA-related plans and policies.

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For further information and online versions of the annexes

**Annex 1:** Seychelles' agro-ecological zones

**Annex 2:** Selection of agriculture production systems key for food security in Seychelles (methodology and results)

**Annex 3:** Methodology for assessing climate smartness of ongoing practices

**Annex 4:** Long list of CSA practices adopted in Seychelles

**Annex 5:** Institutions for CSA in Seychelles (methodology and results)

**Annex 6:** Policies for CSA in Seychelles (methodology and results)

**Annex 7:** Assessing CSA finances

This publication is a product of the collaborative effort between the International Center for Tropical Agriculture (CIAT) – lead Center of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and The Food and Agriculture Organization of the United Nations (FAO) to identify country-specific baselines on CSA in the Africa Small Island Developing States (Cabo Verde, Guinea-Bissau and Seychelles). The publication is based on data collected by FAO in collaboration with CSA stakeholders and partners in Seychelles and on previous work commissioned and led by the World Bank Group to identify country-specific baselines and entry points for scaling out CSA, through data analysis and series of dialogues with national stakeholders. The work complements the CSA Profiles series developed since 2014 by the World Bank, CIAT and CCAFS for countries in Latin America, Asia, Eastern and Central Europe, and Africa (<https://ccafs.cgiar.org/publications/csa-country-profiles>).

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