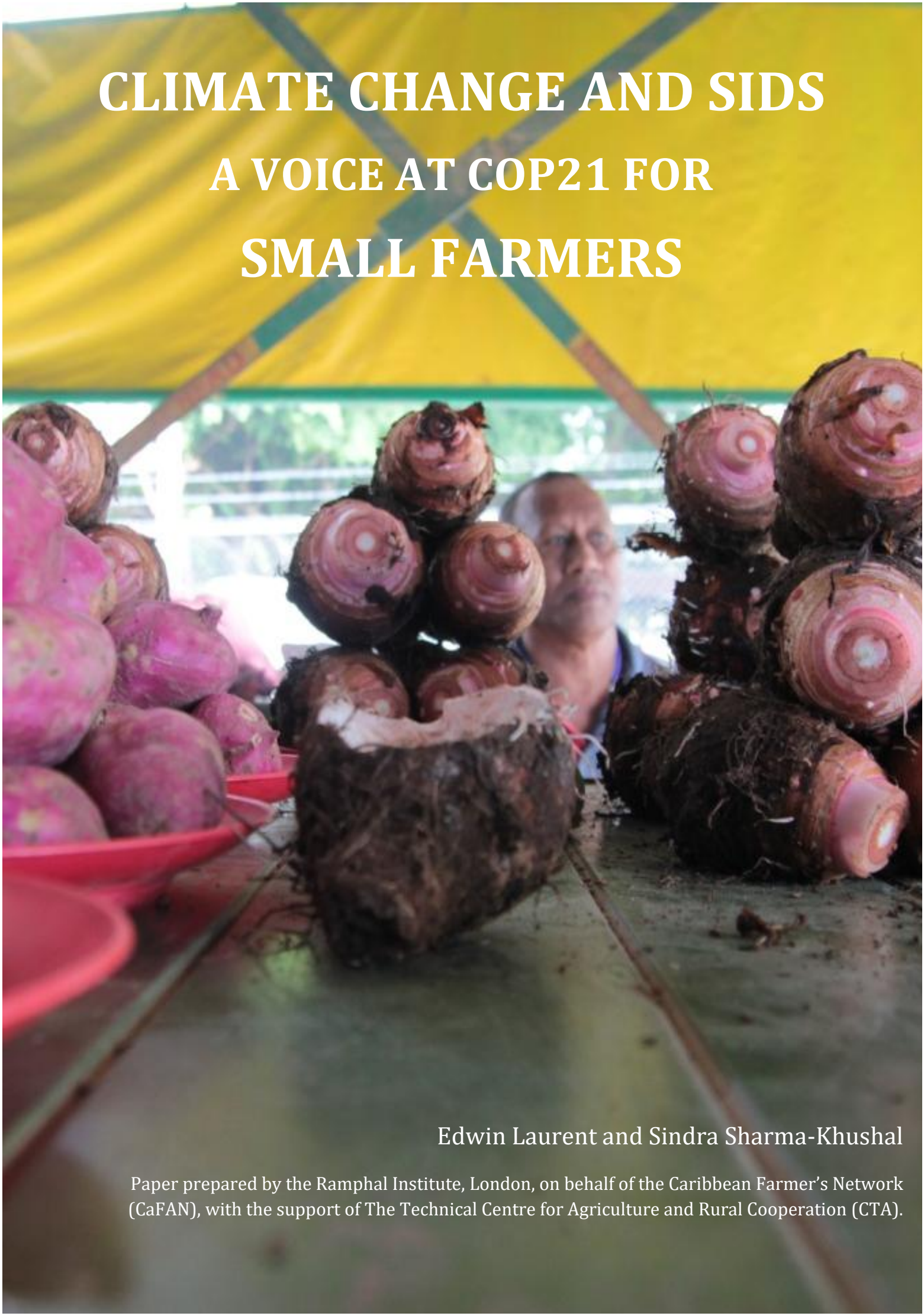
CLIMATE CHANGE AND SIDS

A VOICE AT COP21 FOR

SMALL FARMERS



Edwin Laurent and Sindra Sharma-Khushal

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Abbreviations

ASAP	Adaptation for Smallholder Agriculture Programme
BPoA	Barbados Programme of Action
CaFAN	Caribbean Farmers Network
CANARI	Caribbean Natural Resources Institute
COP21	The 21st session of the Conference of the Parties to the UNFCC
CSA	Climate Smart Agriculture
CTA	The Technical Centre for Agricultural and Rural Cooperation
DRR	Disaster Risk Reduction
FAO	Food and Agriculture Organisation
GHG	Green House Gases
IFAD	International Fund for Agriculture Development
INDCs	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
MSI	Mauritius Strategy of Implementation
REDD+	Reducing Emissions from Deforestation and Degradation
Samoa Pathway	the Small Island States Accelerated Modalities of Action
SIDS	Small Island Developing States
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

1 Introduction

The world's climate has been undergoing dramatic change over the last fifty years, with temperatures increasing sharply. During the first decade of this new century, the global average was the highest since 1880. Global temperatures are set to increase by a further two to four degrees Celsius by the end of the century.

Since 1950 global productive activity has expanded tenfold, greatly increasing concentrations of greenhouse gases such as carbon dioxide into the atmosphere and upsetting its delicate chemical balance. This has resulted, among other things, in increasing global temperatures that in turn are having serious negative consequences, one of which is to cause a rise in sea levels. Projecting to the year 2080, in the worst case scenario, sea levels are set to rise somewhere between 16 and 69 cm. This threatens low lying island states like Kiribati and Tuvalu and elsewhere coastal plains, which could disappear underwater.

Yet it is not only the existential threat from sea level rise that so many SIDS face, but a range of new other challenges including increasingly frequent and severe droughts, hurricanes and cyclones and other extreme weather events as well as changes in rainfall patterns and the emergence of new pests and diseases.

Small farmers in Small Island Developing States (SIDS) have been increasingly concerned by negative direct and indirect consequences and impacts of the climatic changes that actually impact or can potentially impact negatively on farm productivity, costs, competiveness and hence the livelihoods of small farmers in SIDS.

This paper sets out the context of the global changes to the climate and how it is impacting both directly and indirectly on the small farmers in SIDS of the Caribbean, Pacific and Indian Ocean regions. It seeks wider understanding of their predicament and articulates their concerns. It also seeks concrete and meaningful support for their efforts to adapt and build resilience to Climate Change from COP21 and in subsequent international negotiations.

Whilst international negotiations have been going on for many years to reduce greenhouse gas emissions (GHGs) and tackle climate change and its negative impacts, the unique concerns of small farmers in SIDS and their need for support to adapt and build resilience needs more urgent attention than it has been receiving.

These farmers are among the most immediately affected but are also the most powerless victims of climate change. Nonetheless their voices are not sufficiently heard and their concerns not adequately understood or taken into account in international climate change negotiations and global environmental and economic debates. Given the importance of relative power and size in such international negotiations, the talks tend to be dominated by the conflicts among the major global players.

This brief is intended to help inform SIDS delegates and other delegates at COP21 of the direct and indirect impact of Climate Change on small farmers and their operations in SIDS;

their special case and predicament; and make concrete proposals regarding support needed for their adaptation and resilience building.

Small farmers in SIDS are among the most powerless victims of climate change and the most immediately affected, but their voices and concerns are not adequately understood and supported in international negotiations.

1.1 Methodology

The Ramphal Institute sought from the outset to fully engage and consult with farmers, and their representatives on their actual experience. The hope was to assess the actual evidence of the impact and consequences of climate change. The writers also engaged with international technical experts.

The approach to conducting the study entailed an on-line survey and consultative workshop with a mix of experts, SIDS representatives and small farmer representatives. That workshop reviewed and identified key elements favouring small farmers to be advanced at COP21. Participants included small farmers from the Caribbean and representatives of CaFAN, CANARI, UNEP, the Commonwealth Secretariat and the Ramphal Institute. Among the questions addressed in the consultation were:

1. How does climate change manifest itself in SIDS and what are its direct and indirect impacts.
2. What are the implications for the costs of production, competitiveness and livelihoods of small farmers in SIDS?
3. How can small farmers adapt and build resilience and what support do they need?
4. What proposals can delegates at COP21 and in Climate Change negotiations present that would help secure:

- better understanding of the unique predicament of small farmers in SIDS
- concrete support to help them adapt and build resilience.

The survey targeted small farmers: principally to get their actual experience of the extent and the impact of recent changes that that might be attributed to climate change, and to ascertain what support the farmers would require to deal with the new challenges.

The analysis was also informed by both published and unpublished research. Though the material on the specific impact of climate change on the small farmers in SIDS is still limited, there is useful and helpful data that explores the overall physical impact of climate change on SIDS as well as the impact of climate change on farming.

1.2 Structure of the paper

The paper places the concerns and challenges of the small famers and the climate change negotiations in their broader historical and development context starting from the Brundtland Commission that laid the groundwork for the 1992 Earth Summit and the adoption of Agenda

21, the Rio Declaration. It assesses the particular characteristics of SIDS to understand why and how their circumstances diverge from those of other countries. This is essential since for remedies to be effective, they need to be properly structured and targeted; but this is only possible if they are based on sufficient appreciation of the problem/s that they are intended to correct or whose impact they are to ameliorate.

Following on from this overall assessment of the predicament facing SIDS, the impact of climate change on small farmers in SIDS is assessed, as are the subsequent implications for their costs of production, competitiveness and livelihoods. Whilst the paper recognises that many of their challenges are also faced by small farmers in other developing countries, it concludes that some are unique to them or are exacerbated because of the peculiar geographic and economic challenges and difficulties facing SIDS.

The next task of the paper is to explore various methods that the small farmers can resort to in order to adapt to the changes, such as switching to more appropriate product varieties, insurance, improved marketing. It is important to recognise however that even with the targets for maximum average global temperature rise of 1.5°C being sought by SIDS and even more so the 2°C being advanced by several other countries, climate change will accelerate even further and have serious adverse impacts on these small farmers. Therefore the paper assesses how these adverse consequences can be contained and hopefully minimised. Devices such as increased investment in research, infrastructure development, irrigation and drainage systems etc. are explored. Measures such as coastal zone protection, improving farming and horticultural practices also help in building resilience.

However, the small farmers cannot do this all on their own; they need external help. Both the State and the international community must help them if they are to be able to successfully undertake the adaptation, mitigation and resilience building measures required. The paper concludes with proposals that small Farmers would wish to be advanced by their country delegates at COP21 and in ongoing Climate Change negotiations.

A brief on behalf of the small farmers to SIDS delegates at COP21 is provided separately.

The Issue

High vulnerability

- Inherently exposed to factors outside of their control

Low Adaptive Capacity

- Limited financial resources
- Weak technical, human and institutional capacity.
- Limited data

Meeting Commitments

- Implementing the SAMOA Pathway
- Challeneges in implementation of the Barbados Programme of Action and the Mauritius Strategy of Implemenation

2 Why are SIDS and their Agriculture unique?

Whilst SIDS are all developing countries, several of their features and constraints differ in unique ways from the characteristics of other countries at similar levels of development and in the same geographic zone. This means that climate change can impact them differently, and also the generic policy prescriptions aimed at adaptation and resilience building might not always be applicable.

Some of the handicaps that SIDS face are: their small land mass, populations, and economic size; many are geographically remote and dispersed, vulnerability to natural disasters, limited access to markets, limited volume and range of natural resources, limited technological capacity and development and weak and poorly resourced institutional structures. Many of them are remote from major international markets and lack adequate and competitive air and sea freight connections. These problems are compounded by the negative impact and consequences of climate change.

2.1 Economic Characteristics

- **Lack of diversification**: A major consequence of smallness is that the limited range and volume of resources can preclude the range of goods/services in which production can achieve economies of scale and consequently minimum levels required for economic viability. SIDS tend to be heavily dependent on a single or very narrow range of economic activity for their livelihood; their economies are not sufficiently diversified. Their income often comes from one particular agricultural commodity such as sugar or bananas or a service like tourism. Some SIDS are developing offshore tax havens and shipping registries, however these do not offer significant employment and income opportunities, particularly in rural areas.
- **Poor macro-economic performers**: Many economic sectors in SIDS, including most of the Caribbean islands, suffered significant contraction, since the international financial crisis at the end of the last decade leading *inter alia*, to growing unemployment. Not all of the islands have yet recovered.
- **Extreme openness:** SIDS are often heavily reliant on imported products, including for consumption, capital goods and energy, often from petroleum products. In addition, they often export the bulk of goods and services that they produce.
- **Competitiveness**: Because of limited volumes for export, their frequent remoteness, and for many their wage structures, the unit costs of production in SIDS can be very high as can the cost of getting goods to overseas markets, thus making it difficult for them to compete on the basis of low cost.

2.2 Environmental fragility

- SIDS are formed of delicate and fragile ecosystems that in many cases are reliant on the protection provided by forest cover, coral atolls and mangrove swamps. Their biodiversity and profile can come under pressure from a variety of climate related threats and invasive species.

Institutional capacity:

- Managing a modern State needs a certain minimum of staffing and other resources for undertaking government activities and delivering essential services. However, given small populations, the size of the pool of qualified staff is invariably limited. These demands can be exacerbated by the archipelagic character of several SIDS which can require duplication of certain facilities such as schools and medical units in scattered and outlying islands. In essence the per-capita cost of management is higher in SIDS than in large countries.
- The lack of institutional capacity also extends to the private sector where limited human and other resources also constrain the producer organisations and such bodies.

2.3 Agriculture Sector

- **Importance:** Agriculture has always played an important role in the economies of most SIDS, while subsistence agricultural production remains vital to their nutritional status, and social well-being. In some SIDS, agriculture accounts for approximately 50% of GDP and 75% of employment whilst in others, it accounts for less than 10% of GDP, employing 20% of the workforce[1].
- **Structure of the Sector:** In many SIDS agriculture is dominated by small farms that produce either for the local or export market or some combination of the two. Historically for SIDS, their production has been within rigid and narrow production structures and protected trade agreements with the main export being an agricultural commodity. The export sector has been dominated by large plantations alongside which small farmers are often relegated to the marginal lands. There are exceptions though such as in St Lucia where with the demise of the sugar industry in the middle of the last century, some large plantations were divided into a number of small holdings. In general though small holders tend to be on more marginal and less productive land.
- **Low farm capitalisation**: Given the high levels of rural poverty in many SIDS; the level of capitalisation relative to labour (often family) is low[2]. This has a range of implications including the inability to finance activities and acquire assets that might be high cost. For instance, the installation of irrigation or the provision of credit demanded by purchasers of produce, such as hotels, supermarkets and foreign buyers might not be affordable. Significant capital investment is required to enable diversification of farm systems and adopt best practice.
- **Lack access to credit**: Small farmers in SIDS often operate outside of the formal financial sector. They lack collateral for loans from the banks and often the sole assets are the farm and home, which farmers might be unwilling to risk and they sometimes do not have clear title anyway. This means that the small farmers have very limited scope to undertake investment even in basic activities like soil preparation; purchase of planting material; and installing water managment systems, especially those like trickle irrigation that can be quite expensive. The combination of low capitalisation and unavailability of credit leaves the farmer in a

[1]FAO (1999*). Trade Issues Facing Small Island Developing States*. Retrieved from: http://www.fao.org
[2] Thapa, Ganesh and Raghav Gaiha (2011). *Smallholder Farming in Asia and the Pacific: Challenges and Opportunities.* Paper presented at the IFAD conference on New Directions for Smallholder Agriculture, 24-25 January, 2011, International Fund for Agricultural Development, Rome, Italy

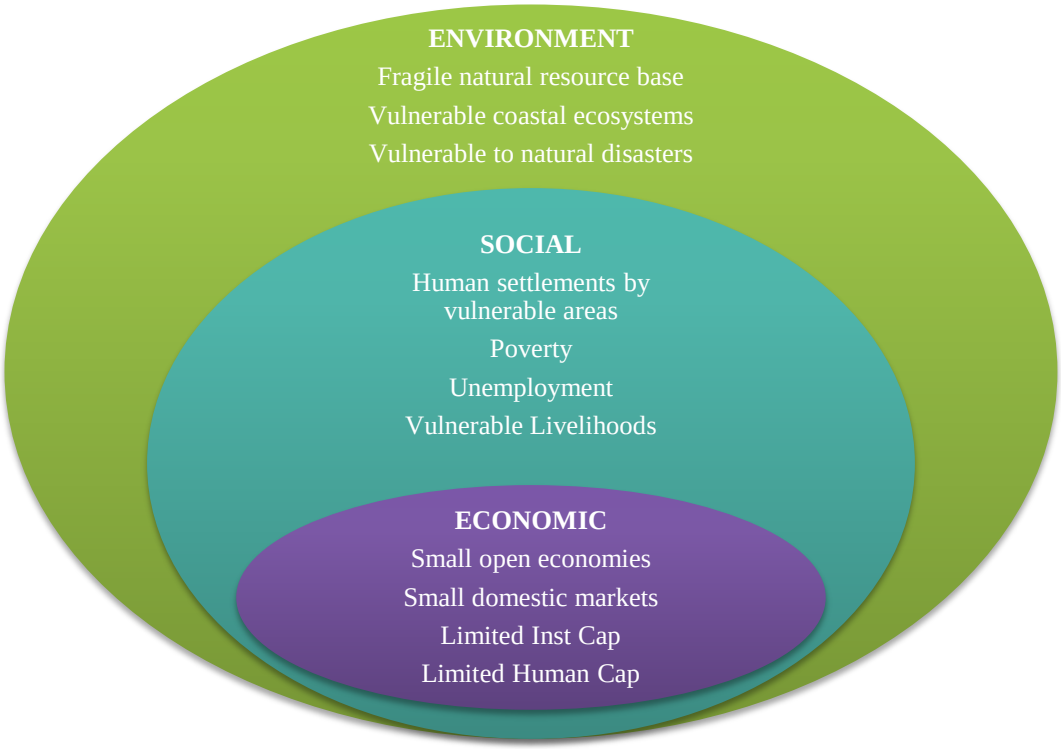
precarious financial position and exposed to bankruptcy should a crisis occur. Not surprisingly small farmers in SIDS are often considered to be risk averse.

- **Export orientation**: The absorptive capacity of their very small domestic markets are limited and easily flooded with disastrous financial consequences for farmers. This means that any major expansion of farm production must find an outlet overseas; i.e. be exported. SIDS are therefore obliged to export much of what they produce whilst they import much of what they consume.
- **Inadequate water management:** There is minimal artificial irrigation on small farms in SIDS; hence they generally rely exclusively on rainfall. Given the increasing vagaries in rainfall patterns as climate change takes hold, productivity levels can be affected. There is a clear correlation between the adequacy of the volume of water that plants receive at the correct time and crop yields.
- **Overseas Marketing**: This is a challenge. Historically traditional exports of products like sugar and bananas have been collected locally, paid for and exported on behalf of the farmer. However in respect of other produce, the farmer has no such support and has to undertake market investigations; find and arrange with buyers; arrange packaging, freight and insurance, delivery and collect payment. Small farmers are generally not in a position to successfully undertake all of these tasks on their own.
- **Regulatory challenges**: As small island states seek to diversify exports away from traditional export commodities where the value of traditional trade preferences have been severely eroded (e.g. bananas and sugar), a key regulatory obstacle that they face is in the operation of the SPS in the countries to which they export. The systems can have the consequence of their produce having to meet higher SPS fees than competitors from larger and more established competitors. (See Case study at Annex 2.11).
- **Complying with Private Standards**: A related challenge facing small farmers is keeping abreast of and complying with such standards including those set by GLOBAL G.A.P. and others set by supermarkets, which are continuously becoming more onerous and demanding.

3 The Concerns in Context: The Two Degrees Centigrade of Warming and Understanding the Impact of the Climate Change on SIDS

Small island states represent areas with the highest vulnerability and lowest adaptive capacity to climate change. These nations, built on fragile ecosystems, account for just a fraction (1%) of global Greenhouse Gas (GHG) emissions but are amongst the first nations to feel the consequences elicited by anthropogenic climate change. As early as 1992, there was recognition of SIDS' special status regarding environment and development. Agenda 21 states: 'Small island developing states and islands supporting small communities are a special case both for environment and development. They are ecologically fragile and vulnerable. Their small size, limited resources, geographic dispersion and isolation from markets, place them at a disadvantage and prevent economies of scale."

Figure 1: The Vulnerability of SIDS



Whilst small and often isolated, these island ecosystems are of global significance. An array of SIDS rest within the most threatened of the World's 34 biodiversity hotspots[3]. Oceanic island ecosystems contribute disproportionately to biodiversity compared to their land mass, with one in six of the earth's known plant species occurring on such ecosystems. The high degree of endemism makes SIDS rich stores of evolutionary data which is of global value. In

[3] Brooks, T. M., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A., Rylands, A. B., Konstant, W. R., ... & Hilton-Taylor, C. (2002). Habitat loss and extinction in the hotspots of biodiversity. *Conservation biology*, *16*(4), 909-923.

addition they provide atmospheric gas (including CO2) regulating services and climate regulation services whose beneficiaries are global[4].

3.1 Two Degrees Centigrade of Warming

There is overwhelming scientific evidence that we are now living on a planet where global temperatures are warmer than they have been for most of the last 11,000 years. The Intergovernmental Panel on Climate Change (IPCC) has identified the amount of carbon dioxide which can be emitted before the accumulation of GHGs in our atmosphere reaches a point of no return. This tipping point is expected to result in an increase of two degrees centigrade (2°C) of global average mean surface temperatures above pre-industrial levels.

In order to limit the rise in global temperatures to 2°C of warming, the carbon quota estimated by the scientific community is one trillion tonnes of carbon (1,000 PgC). 52% of this target had already been utilised by 2011, and it is anticipated that if emissions continue unabated then we would have burned through the quota by 2045. Indeed 2015 marks an important phase of warming, as we are set to breach the 1°C of warming threshold[5]. With this 1°C of warming, the impact on natural earth systems will exacerbate the accumulation of GHGs. For instance thawing tundra will release methane and other GHGs, and as ice caps melt the amount of solar radiation reflected back into space will also decrease.

What needs to be done to meet this target? Emissions will have to be curbed by an estimated 36 billion tonnes a year. Also existing commitments will have to be honoured whilst also pursuing new actions. Greater reductions are needed to will ensure that emissions peak by 2020 and thereafter steadily decline. In addition the stocks of fossil fuels which are in reserve (estimated at 1,053 PgC) would have to stay in the ground if the carbon quota is to be met.

The 2°C target has been adopted by countries within the United Nations Framework Convention on Climate Change (UNFCCC), with most countries submitting their Intended Nationally Determined Contributions (INDCs) to the UNFCCC ahead of COP21. The intended national contributions as it stands will not be consistent with meeting the 2°C target with accumulated emissions from the INDCs amounting to between 55-56bn tonnes a year by 2030[6].

For SIDS, even under the 2°C warming scenario, the challenges will remain significant – just taking the example of rainfall – for Caribbean SIDS the IPCC projects that they will experience more drought conditions, whilst some Pacific SIDS will be wetter. Essentially under the 2°C scenario all the aforementioned impacts will be intensified: the rate of climate change will become too rapid for some species to adapt; the risk of mass coral bleaching will

[4] United Nations Environment Programme (UNEP), (2014). *Guidance manual on valuation and accounting of ecosystem services for small island developing states*. Ecosystem Services Economics Unit, Division of Environmental Policy Implementation: UNEP

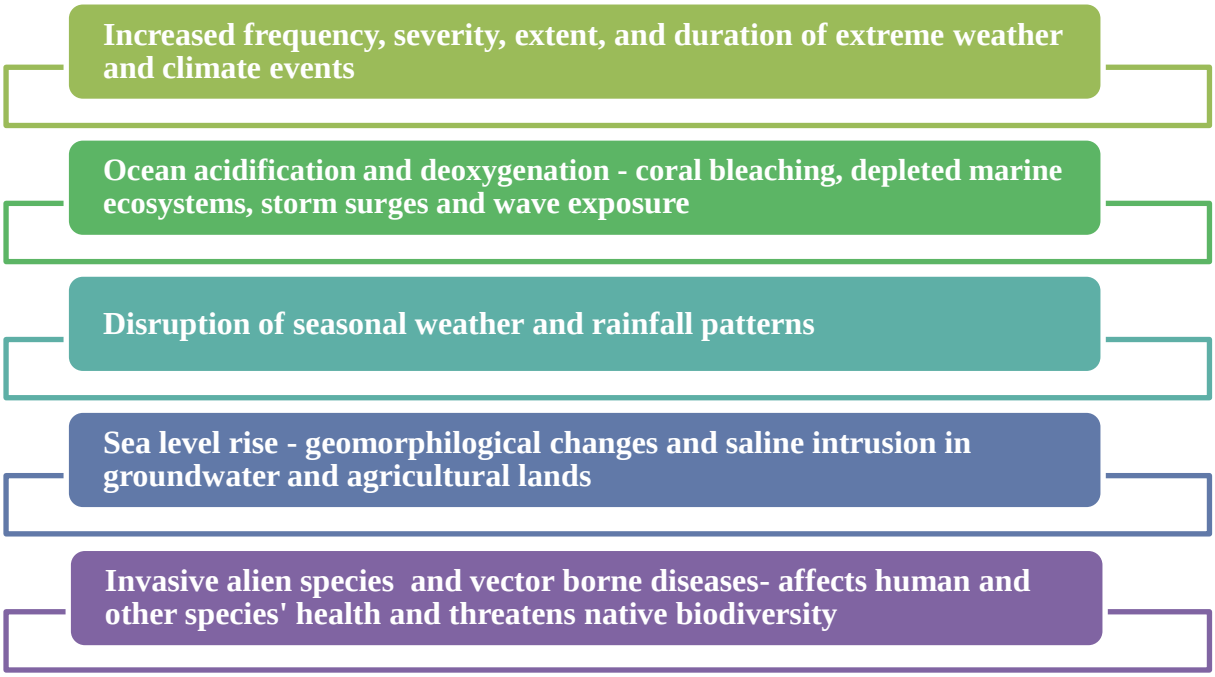
[5] World Meteorological Organisation (WMO). (2015, November). *Greenhouse Gas Concentrations Hit Yet Another Record*. Press Release 11. WMO. Retrieved from: https://www.wmo.int

[6] Boyd, R., Turner, J. C., & Ward, B. (2015). *Tracking intended nationally determined contributions: what are the implications for greenhouse gas emissions in 2030?* Grantham Research Institute on Climate Change & the Environment and Centre for Climate Change Economics and Policy. August 2015.

become very high, affecting over half of all reefs; sea level could rise above one meter; crop production would be at high risk; and more extreme and severe weather events will prevail[7].

The cost of climate change will further place a strain on already limited resources – the overall cost of climate change for Pacific SIDS under the 2°C scenario would reach between 2-3% of GDP per annum by 2100, affecting SIDS development trajectory. Adaptation costs under the 2°C scenario are estimated to be around 0.5% of GDP per annum[8]. Climate change effects on agriculture production, fisheries, human health, tourism and well-being will have the consequences of decreasing national income while increasing key social and infrastructure costs. SIDS will need support to meet these costs.

Figure 2: A Summary of Climate Change Impacts on SIDS



3.2 More frequent and severe weather and climate events

Within the last two decades hurricanes and cyclones in the Atlantic, Pacific and Indian Oceans have been becoming more powerful and consequently destructive. A well-publicised and particularly devastating impact of climate change for SIDS is *more frequent and severe weather and climate events* – Recent examples include Hurricanes Ivan, Tomas, Katrina and Cyclone Pam and Typhoon Haiyan which caused considerable damage to infrastructure and affected livelihoods.

Even when they are not as devastating these weather events cause considerable loss and destruction. Tropical storm Erika caused an estimated US$41 million in damages and losses to the agricultural sector in Dominica. These were associated with infrastructure damages,

[7] Schleussner, C-F., & Hare, B. (2015). *Briefing note on the Report on the Structured Expert Dialogue on the 2013-2015 Review*. Climate Analytics. Retrieved from: http://climateanalytics.org
[8] ADB (2013). *The Economics of Climate Change in the Paicific*. Mandaluyong City, Philippines: Asian Development Bank

loss of land and livestock. Agricultural losses reflected the ability to realise a harvest in accordance with projected production for 2015, in addition to the inability to harvest at the appropriate time and increased expenditures for land preparation and re-treatment. The principal cause of loss and damage was lowland flooding, erosion and landslide. Apart from crop loss and damage, this also blocked farm to market roads and also destroyed some important agricultural operations. Two rum distilleries were destroyed with partial damages to a third. In addition the bay oil distillery and the bay leaf crop in Petite Savanne were completely destroyed. In total Erika cost US$482.84 million in loss and damages across the productive sectors, infrastructure, and social sectors[9].

In the Pacific region, Small Island States have collectively experienced losses from natural disasters of approximately US$1 billion per decade, increasing to US$4 billion in the 1980s and 1990s[10]. In 2014 tropical cyclone Ita caused severe flooding which cost the Solomon Islands US$107 million in damages and losses. In 2014 tropical cyclone Ian cost Tonga US$49.3 million in damages and losses. Fiji and Samoa suffered US$108.4 million and US$203.9 million in damages and losses respectively from tropical cyclone Evan in 2012[11].

In the Pacific region, the cost to cash crops, infrastructure and buildings at risk of climate change related natural disasters is estimated at US$112 billion[12]. Such events are detrimental to biodiversity, they damage and degrade infrastructure, wipe out crops and livelihoods, displace populations, strain social cohesion and derail the economic development trajectory of SIDS.

In the Smallholder Survey, small farmers reported more extreme natural events such as prolonged droughts and hurricanes. In the latter case excess rainfall can pose a significant challenge for smallholders wiping out 100% of livelihoods in some instances.

3.3 Changing weather patterns; notably rainfall and drought

In addition to the spectacular and devastating extreme weather events that are already becoming more frequent, climate change is also predicted to affect rainfall patterns. In the Caribbean, with decreased rainfall and increased rainfall in the Indian and Pacific Ocean SIDS[13].

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[9] Government of Dominica (2015). Rapid Damage and Impact Assessment Tropical Storm Erika – August 27, 2015. A Report by the Government of the Commonwealth of Dominica. Retrieved from: http://www.dominica.gov.dm/

[10] The World Bank (2012, April). *Pacific Islands: Disaster Risk Reduction and Financing in the Pacific*. The World Bank. Retrieved from: http://www.worldbank.org

[11] Pacific Catastrophe Risk Assessment & Financing Initiative. (2015). *Advancing Disaster Risk Financing & Insurance in the Pacific – Regional Summary Note and Options for Consideration*. Washington, DC: The World Bank.

[12] Bettencourt, S., Pryce, R.S., Gitay, H. (2006). *Adapting to Natural Hazards in the Pacific Islands Region: A Policy Note*. Washington DC: The World Bank

[13] Nurse, L.A., R.F. McLean, J. Agard, L.P. Briguglio, V... & A.Webb, 2014: Small islands. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi,... and L.L.White (eds.)]. Cambridge, UK, NY, USA: Cambridge University Press

As rainfall patterns change Caribbean SIDS will experience greater drought events as evidenced in the extended 2015 drought. The amount of water that is able to be harvested reduces, whilst the rate of recharge for freshwater lenses and the flow of rivers also decreases leading to prolonged droughts. This negatively impacts agricultural productivity in countries where rain fed agriculture is the norm. This has been damaging agricultural productivity. In the Caribbean prolonged seasonal dry periods, and increasing frequency of drought, are expected to increase demand for water throughout the region.

These findings were borne out in the Smallholder Survey Results, since small farmers are noting changes in seasonal weather patterns with extremely hot and prolonged dry periods, with occasional incidents of excess rainfall.

The rise in average temperatures can also impact on agricultural output. It is estimated that a one percentage increase in temperature would result in a 5.1% decrease in growth of banana exports. Under the IPCC climate projections, by 2050, banana exports are therefore projected to be minimal with the cumulative yield loss estimated to be EC$165 million.

3.4 Sea-level rise

There is a disproportionate impact of sea-level rise on SIDS. For example, the global mean of sea-level rise is 3.2mm per year, however in some SIDS regions, such as the western Pacific sea-levels had risen by 12mm per year between 1993 and 2009[14]. The result of sea-level rise in SIDS is an increase in:

- Coastal erosion
- Coastal inundation
- Encroachment of tidal water into estuaries and coastal river systems
- Saline intrusion of groundwater acquifers
- Increased salinity in soil
- Increased landward reach of storm surges and sea waves

Saline intrusion to aquifers, in addition to shifts in seasonality and rainfall, will impact access to potable water and limit harvestable volumes of water. Storm surges and sea waves could also further degrade freshwater lenses. Coastal erosion and inundation will place stressors on coastal livelihoods, impacting coastal farm systems, and displacing communities. In addition it also poses an existential threat, whilst an increase in salinity from salt water intrusion will impact crop yield.

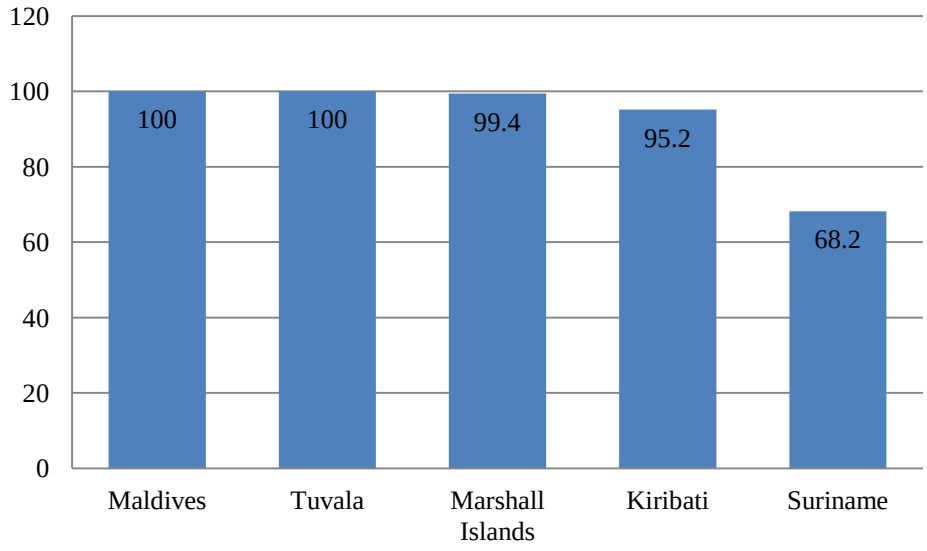
We are aware that sea-level rise constitutes a major threat to SIDS resource base, and in particular to agriculture. On average 26% SIDS have their land area five meters or less above sea-level, with some Small Islands having a significantly greater proportion of their population living below 5m (refer to Figure 3). The United Nations Environment Programme (UNEP)[15] predicts that the rate of sea level rise is up to four times the global average in the

[14] United Nations Environment Programme (UNEP). (2014). *Emerging issues for Small Island Developing States*. Results of the UNEP Foresight Process. Nairobi, Kenya: UNEP

[15] UNEP(2014). *Emerging issues for Small Island Developing States*. Results of the UNEP Foresight Process. UNEP: Nairobi, Kenya.

tropical western SIDS. For example between 1993 and 2009, sea level rose by 12mm a year, about four times more than the global average of around 2.8mm. The Carterert Island in Papua New Guinea was arguably the first official island to have to relocate 2600 citizens because of sea-level rise.

Figure 3: Top 5 SIDS with highest percentage of population living 5m or less above Sea-Level[16]



The encroaching sea could deplete agricultural lands, impacting livelihoods and food security. Coastal small holders may be forced to abandon their farms. This could result in internal migration[17], to cities or to other rural lands, or external migration[18] with small farmers opting out of agriculture all together, reducing the agricultural labour force and putting greater strain on food security.

With livelihoods threatened by rising seas, ocean acidification and deoxygenation, coral bleaching, shifts in rainfall patterns, invasive species, disease and sustained, frequent and more extreme weather events – without resilient smallholder agriculture, SIDS may have to increase their import dependence for food and water. This in turn can impact their vulnerability to price spikes and pre-existing pressures to migrate for economic reasons.

3.5 Ocean Acidification and deoxygenation

Ocean Acidification and deoxygenation is negatively impacting SIDS' vast exclusive economic zones. Seawater chemistry is changing due to the subsequent uptake of emissions by the oceans. Whilst some marine organisms are tolerant to acidification, some of the species that form the base of the marine food web, such as phytoplankton, zooplankton, and other shell making marine species (essential to coral reefs) are negatively reacting to

[16] UN-OHRLLS (2013). Small Island Developing States (Statistics). UN-OHRLLS retrieved from: (http://unohrlls.org/

[17] Increased rural to urban migration in developing countries has seen an increase in squatter settlements. These settlements in turn increase vulnerability to climate change risks.

[18] With external labour migration, small countries like Kiribati and Tuvalu, whose citizens may migrate to Australia or New Zealand, may find it hard to compete in especially with larger Asian countries.

acidification. The result is: changes in marine assemblages, food webs and marine ecosystems; biodiversity loss; changes in biogas production by oceans and feedback into the atmosphere[19]. Deoxygenation is the loss of oxygen in the oceans from climate change and similarly impacts ocean productivity, nutrient cycling, carbon cycling, and marine habitats[20].

Fisheries play an important role in the economy, livelihoods, food security and the culture of SIDS. In some SIDS it accounts for 12% of GDP[21]. As marine health continues to deteriorate fisheries, aquaculture, food security, tourism, climate regulation, carbon storage, and coastal protection will be compromised in SIDS.

3.6 Vulnerability to invasion by invasive species

Climate change also increases SIDS' *vulnerability to invasion by alien species*. Natural ecosystems cannot adapt as quickly to a changing environment, which can allow alien species to become established and even to dominate. Whilst this impacts biodiversity, it also impacts smallholders, agriculture and fisheries in general. Some regions, with wetter and warmer climates, will also experience an increase in some vector and non-vector borne diseases such as dengue and malaria which will impact human health and consequently carry indirect economic costs.

Because of data gaps, precision of the likely impacts of increased risk of crop pests and diseases due to climate change in smallholder systems in SIDS is not clearly defined. However in recent years there has been a loss of wildlife, property, food and livelihood security in the Pacific Islands caused by ants, fruit flies, termites, and plant pathogens. This has cost millions in in terms of cash and subsistence incomes, pest control, and human health[22].

The Taro Leaf Blight (TLB) is one example of a disease that is impacted by climate change. Temperature and rainfall are important in the spread of the disease. For those regions where taro is cultivated, and where climate change will result in warmer and wetter conditions, the spread of TLB may be accelerated[23].

Small farmers reported in the Smallholder Survey that crop yields were being impacted by a greater incidence of pests and disease. They also found that the productivity of agricultural lands was decreasing. They were concerned that incomes were being further and negatively affected as a result of having to meet the additional cost of pesticides to deal with biological threats. This was also compounding the already existing income pressures (not climate related) from various factors including lower international prices and increasing freight chargers and praedial larceny.

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[19] Turley, C., & Gattuso, J. P. (2012). Future biological and ecosystem impacts of ocean acidification and their socioeconomic-policy implications. *Current Opinion in Environmental Sustainability*, *4*(3), 278-286.
[20] Keeling, R. F., Körtzinger, A., & Gruber, N. (2010). Ocean deoxygenation in a warming world. *Annual review of marine science*, *2*, 199-229.
[21] UNEP (nd). *Media Fact Sheet – The International Year of for Small Island Developing States*. Retrieved from: http://www.unep.org/wed/
[22] Thaman, R. (2014). Agrodeforestation and the loss of agrobiodiversity in the Pacific Islands: a call for conservation. *Pacific Conservation Biology*, *20*(2), 180-192.
[23] FAO(2010). *Building Resilience to Climate Change – Root Crop and Fishery Production*. Pacific Food Security Toolkit. Rome: FAO

3.7 Displacement in Small Island States

According to the Internal Displacement Monitoring Centre, in 2014, 17.5 million people were displaced by weather-related hazards, with 1.7 million being displaced by geophysical hazards, and an average of 22.5 million people being displaced each year by climate or weather-related disasters in the last seven years. These numbers are only expected to grow as climate change effects take hold in the coming decades. One estimate is that 200 million people will be displaced by 2050 as a result of climate change related disruptions such as changes in rainfall patterns[24]. The significance for small farmers of such displacement is that it reduces the availability of labour and disrupts rural communities.

Population movements are influenced by interconnected and dynamic processes which can make it difficult to estimate future displacements from a single source. To illustrate the complexities of migration, we can look at the case of Fiji. There, trade liberalisation through the end of the Lomé Convention and the trade component of the Cotonou Agreement, coupled with the expiration of land leases[25], increased severity of natural disasters, and governance failures has resulted in reduced production, unemployment and deeper impoverishment of sugarcane smallholders. Consequently, many of these smallholders are moving from rural areas to urban squatter settlements[26]. Such settlements tend to be in highly exposed locations that lack basic amenities, leaving inhabitants highly vulnerable to climate risks. In addition the loss of vital social networks leads to a heightened social vulnerability to climate change. This is something which is shared amongst island states and particularly in smallholder communities. Traditional values, social cohesion and collective identities are a major component in the resilience of local communities in Pacific islands.[27]

[24] Myers, N. (2005). *Environmental Refugees: An Emergent Security Issue* . 13th Meeting of the OSCE Economic Forum, Session III. Organization for Security and Co-operation in Europe: Prague

[25] Greater than 80% of land in the Pacific Islands is under customary ownership and managed by indigenous groups. Such indigenous ownership steeps the land with social and spiritual beliefs and collective and individual identity is tied to the land.

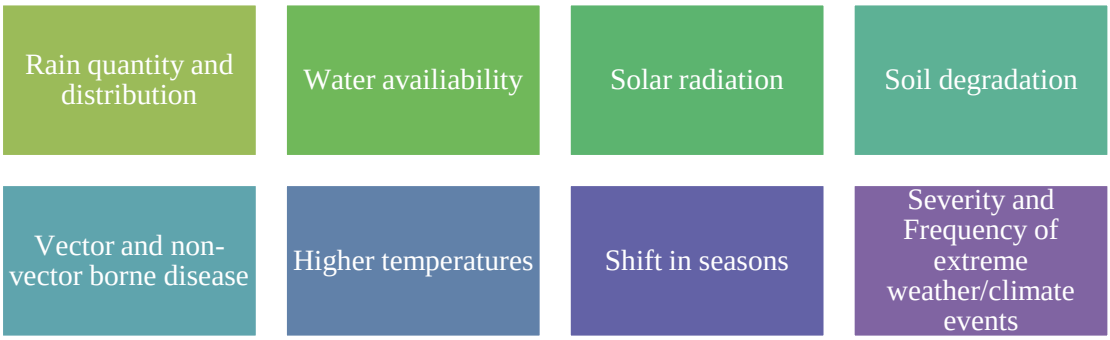
[26] The European Commission. (2006). The Republic of the Fiji Islands European Commission Joint Annual Report. Retrieved from: https://ec.europa.eu/europeaid/

[27] Mimura, N., L. Nurse, R.F. McLean, J. Agard, L. Briguglio, P. Lefale, R. Payet and G. Sem. (2007). *Small islands. Climate Change: Impacts, Adaptation and Vulnerability.* Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press: Cambridge

4 Consequences for Small Farmers in SIDS

Some of the handicaps that agricultural production in SIDS face are: smallness, remoteness, geographical dispersion, vulnerability to natural disasters, limited access to markets, lack of human and technological capacity, price volatility, growing populations, weak governance structures and land tenure security. These problems are compounded by the negative impact and consequences of climate change.

Figure 4: Climate Change Impacts of Smallholder Agriculture



The dependency of SIDS on agriculture and their competitiveness in markets differs. In some SIDS, agriculture accounts for approximately 50% of GDP and 75% of employment whilst in others, it accounts for less than 10% of GDP, employing 20% of the workforce[28]. The agricultural capacity of SIDS differs, and whilst data limitations make it difficult to understand the true number and distribution of smallholders globally, let alone in SIDS, we are aware that Smallholders constitute a large majority of agricultural producers in SIDS. These small farmers on average operate 1 hectare of cropland. The World Bank's Rural Strategy defines smallholders as those with a low asset base, operating less than 2 hectares of cropland[29]. The definition of smallholders differs between countries and between agro-ecological zones[30], with definitions by scale being relative to national contexts[31]. The following table gives an indication of farm size for a sample of SIDS for which data was available. As can be seen, the majority of holdings are less than 1 hectare.

[28]FAO (1999). *Trade Issues Facing Small Island Developing States*. Retrieved from: http://www.fao.org
[29] Dixon, J., Tanyeri-Abur, A., & Wattenbach, H. (nd). Framework for Analysing Impacts of Globalisation on Smallholders. FAO. Retrieved from http://www.fao.org/
[30]IFPRI (International Food Policy Research Institute). (2005). *The Future of Small Farms*. Proceedings of a research workshop, Wye, UK, June 26-29, 2005. Washington, DC.
[31] Morton, J. F. (2007). The impact of climate change on smallholder and subsistence agriculture. *Proceedings of the national academy of sciences,104*(50), 19680-19685.

Table 1: Smallholder Holdings by Size in Selected SIDS

	Census Year	<1ha	1-2ha	2-5ha	5-10ha	10-20ha	20-50ha	50-100ha	100-200ha	200-500ha	Total
American Samoa	2003	4064	1867	926	189	40	8				7094
Cook Islands	2000	1403	236	82							1721
Fiji	1991	41320	11211	18703	12703	6332	3173	1407	551		95400
Samoa	1999	1108	5954	13408	11970	9553	11389				52382
Dominica	1995	800	1922	1654	443	89	69	30	14	5	9026
Grenada	1995	15534	1372	978	243	74	76				18277
Jamaica	1996	130247	28548	3886	1351	795	263	164	205		187791
Saint Lucia	1996	5375	1102	712	121	42	28				7380
	Total	199851	52212	40349	27020	16925	15006	1601	770	5	379071

Source: Lowder, Skoet & Singh (2014)[32]

Despite the differences that may exist between smallholders in SIDS, agriculture has always played an important role in their economic history and subsistence agricultural production remains universally vital to their economies, nutritional status, and social well-being, as does the production of cash crops for export. Because of their geophysical and geospatial characteristics which restricts agricultural production – reflected in low diversity of crops and food products – and their great distance from markets, export led development is often undermined in SIDS, with high import dependence challenging food security and green growth. Whilst their smallness does provide barriers, it can also be seen as a great opportunity for smallholder agriculture. The reason being that smallholders are generally characterised by smaller applications of capital and higher use of family labour and other family-owned inputs[33], as such modestly financed projects in SIDS can have a significant impact and bring substantial socio-economic benefits[34].

4.1 Varying Impacts on Smallholders

With different population dynamics, policies and agricultural practices in place, the specific issues faced by each small island state in its agricultural sector means that the compounding impacts of climate change will be different across SIDS. In addition, the complexity of

[32] Lowder, S.K., Skoet, J. & Singh, S. (2014). *What do we really know about the number and distribution of farms and family farms worldwide?* ESA Working Paper No. 14-02. Rome: FAO.
[33] Thapa, Ganesh and Raghav Gaiha (2011). *Smallholder Farming in Asia and the Pacific: Challenges and Opportunities.* Paper presented at the IFAD conference on New Directions for Smallholder Agriculture, 24-25 January, 2011, International Fund for Agricultural Development, Rome, Italy
[34] IFAD (2014) IFAD's approach in Small Island Developing States A global response to island voices for food security. Rome: IFAD

impacts will vary according to socio-political circumstances. Haiti for instance ranks 153 on the Human Development Index, the development issues are many, including food insecurity which is intensified by natural disasters. Following the earthquake in 2010 that caused widespread devastation, a cholera outbreak spread through the country. This outbreak remains the largest in recent world history. Population pressures, corruption, poor governance and a lack of infrastructure compound efforts for smallholders in Haiti to become resilient. Compare this to the Bahamas which ranks 42 on the HDI, it shares the common vulnerabilities of SIDS but because of its development status and stronger governance, small farmers may have greater risk resilience.

Climate change impacts on SIDS smallholders will vary according to the farm system and its location and the interaction between weather, topography, soil types, water availability, crop diversity, livestock, and the type of trees used in agro-ecosystems[35]. There is however, strong consensus[36] that climate change will impact smallholder agriculture in SIDS via rain quantity and distribution, water availability, reduced solar radiation, soil degradation (salinization, erosion, and humus depletion), vector and non-vector borne diseases, higher temperatures, shifting seasons and of course the increased severity, and frequency of extreme events such as tropical cyclones, hurricanes, floods, and droughts.

Furthermore, these impacts can influence important ecosystem services such as pollination and soil biodiversity. In addition, the rate of climate change may exceed the rate of adaptation for natural systems, including crops. Crops that were once strong and viable in one region may no longer be suitable, whilst another region may gain the advantage.

For example, one projection shows that an extended dry season (by 45days) will decrease maize yields by 30-50%, sugarcane yields by 10-53%, and taro yields by 35-75% in the islands of the Pacific. Whilst a greater than 50% increase in rainfall during the wet season on the windward side of some larger islands would cause taro yields to increase by 5-15%, it would also reduce rice yields by approximately 10-20% and maize yields by 30-100%[37]. As we see in Figure 5, decrease in sugarcane yields will prove costly to many SIDS.

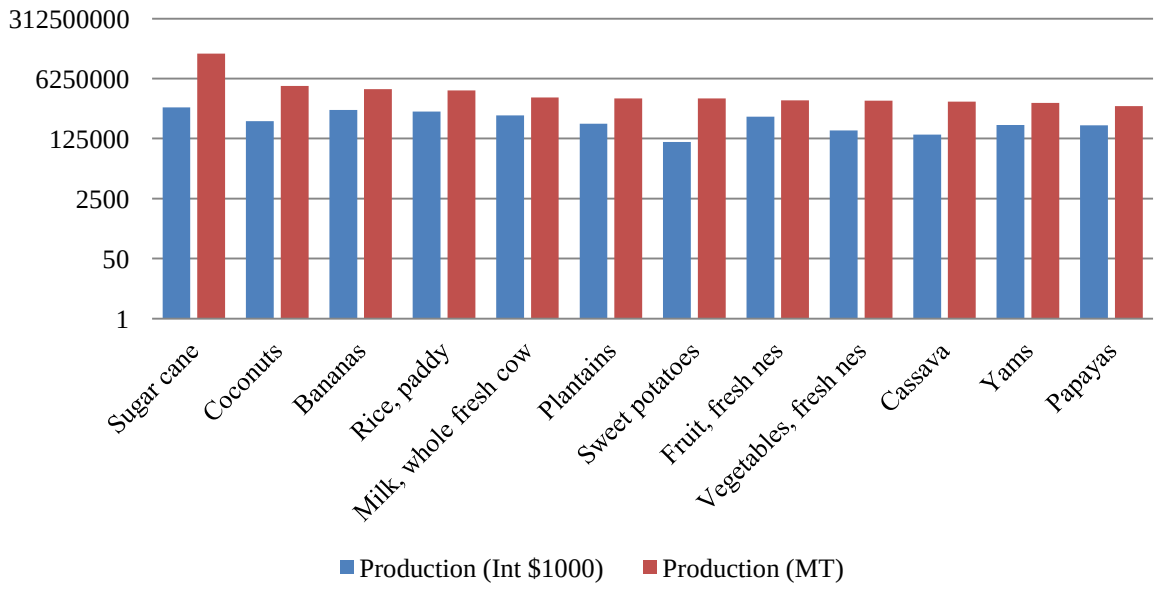
These conclusions were validated by the smallholders' survey in which farmers reported that they were now experiencing changes in seasonal patterns with extremely hot and prolonged dry periods, and more extreme natural events such as hurricanes and droughts, with one institution commenting that excess rainfall was a significant challenge for smallholders wiping out 100% of livelihoods in some instances.

[35] Ortiz, R. (2012). La adopción de la biotecnología moderna y su compatibilidad con una agricultura sustentable. *Idesia (Arica), 30*(3), 3-10.

[36] Nurse, L.A., et al. (2014) *Small islands. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects.* Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Barros, V.R., et al(eds.). Cambridge University Press, Cambridge: UK & NY

[37] Singh, U. (1994). *Potential climate change impacts on the agricultural systems of the small island nations of the Pacific*. Draft paper, IFDC-IRRI: Los Banos, Philippines.

Figure 5: Top Production in SIDS – 2012 (where international commodity prices are used to calculate the total value of each commodity)



Source: FAOSTAT – Production (2015)

In summary climate change will be costly to SIDS even under the 2°C of warming target. The cost to SIDS could reach between 2-5% of the GDP per annum. Smallholder agriculture in SIDS is particularly vulnerable to climate change. Climate change poses a threat to smallholder production which is exacerbated by the challenges that SIDS already face, namely: Smallness, remoteness, geographical dispersion, vulnerability to natural disasters, limited access to markets, lack of human and technological capacity, price volatility, growing populations, weak governance structures and land tenure security. The consequences for small farmers are increased volatility in yields, prices, and competitiveness, with negative impacts on livelihoods, subsistence, and food security.

5 International Commitments – The SAMOA Pathway

With the support of their governments and through collaboration with others, both within their regions and internationally, small farmers can take collective action to adapt and build the required resilience to climate change. However they will still lack the resources to undertake this entirely on their own. They can turn to the International Community, which in September 2014 undertook to strengthen support to SIDS for promoting strong, inclusive and sustainable economic growth and decent work. This undertaking is enshrined in the declaration adopted at the Third United Nations International Summit Conference on Small Island Developing States, the 'SIDS Accelerated Modalities of Action (SAMOA) Pathway. The SAMOA Pathway reaffirms earlier commitments to SIDS and mapped out a plan for implementation whilst focusing global attention on the sustainable development of SIDS.

The SAMOA Pathway is well-meaning and provides direction, measurement tools and milestones towards sustainable development. It also aims to help in building climate change adaptive capacity, develop partnerships, and gain access to funding and other resources. However without concrete implementation measures these and the earlier commitments to provide support are of little value.

This danger was well recognised by SIDS delegates even at the UN SIDS Summit. St Lucia's Minister of Sustainable Development Dr Fletcher reflected the mood saying; "*despite all the declarations, affirmations and reaffirmations, overall progress in surmounting the numerous challenges facing our community of island nations, has, over the last two decades been modest at best. Indeed in some areas there has been noticeable regression*".

That concern has been accepted and since that Summit, the UN has developed a SIDS Action Platform to chart progress and in addition it has facilitated the discussion of the position of SIDS in the post-2015 development agenda.

The onus is first on SIDS themselves to use the SAMOA Pathway to:

- provide direction, measurement tools and milestones towards their sustainable development of which their small farming sectors are critical to most;
- secure help in building their capacity to adapt to climate change and build their resilience;
- develop beneficial partnerships; and
- as a platform for advancing inter island solidarity that would enable them to have a more coherent and strengthened voice in the international debate on sustainable development.

There is certainly growing global awareness of the special case that SIDS present for sustainable development. Similarly, their multilateral and bilateral partners have made several previous commitments to the sustainable development of SIDS (Box 1). World leaders renewed these commitments at the SIDS conference and made new pledges amounting to approximately US$1.9 billion for implementing the Pathway. In Paragraph 63 of the Pathway they made specific commitments relating to food security and nutrition:

"63. *... we are committed to working together to support the efforts of small island developing States:*

a) *To promote the further use of sustainable practices relating to agriculture, crops, livestock, forestry, fisheries and aquaculture to improve food and nutrition security while ensuring the sustainable management of the required water resources;*
b) *To promote open and efficient international and domestic markets to support economic development and optimize food security and nutrition*
c) *To enhance international cooperation to maintain access to global food markets, particularly during periods of higher volatility in commodity markets;*
d) *To increase rural income and jobs, with a focus on the empowerment of smallholders and small-scale food producers, especially women;*
e) *To end malnutrition in all its forms, including by securing year-round access to sufficient, safe, affordable, diverse and nutritious food;*
f) *To enhance the resilience of agriculture and fisheries to the adverse impacts of climate change, ocean acidification and natural disasters;*
g) *To maintain natural ecological processes that support sustainable food production systems through international technical cooperation*."

This urgent need to develop food security and nutrition in SIDS was reiterated in the 'Milan Declaration on Enhancing Food Security and Climate Adaptation in Small Island Developing States, in the framework of the SAMOA Pathway'.

The Milan Declaration stated that the multilateral trading system must play a critical role in addressing food security. In particular it highlighted the need for the designations of "small, vulnerable economies", and "the net food-importing developing countries", to continue beyond the Doha round. In addition it stated that trade policies should not have a negative impact on local food production, considering the vulnerability and resilience of SIDS. It also noted that sustainable food systems are essential in promoting healthy living in SIDS. And reiterated means of implementation through developing partnerships, the technology facilitation mechanism and financing.

5.1 Mauritius and Beyond, Queries around Progress

Small farmers in SIDS are critical to the domestic production of food which is central to helping these often remote and low income countries meet their long term food security needs. This issue had been addressed since 2005 in the Mauritius Strategy of Implementation which came during a period of declining investment in agriculture[38]. Five years after the MSI, MSI+5 called upon the international community to prioritise food security and continue enhancing efforts of SIDS to foster agricultural production, productivity and sustainability.

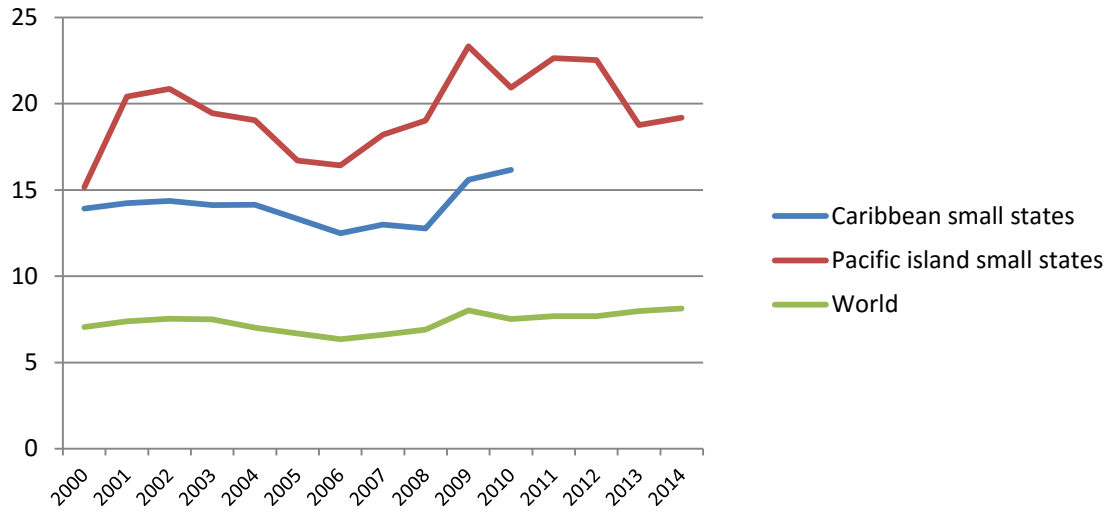
There is a lack of data on successful implementation on the agreements and on tracking the progress of smallholders in building their resilience. However, with external factors like

[38]FAO (2005). International Meeting to Review the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. Statement of the FAO Director-General. Retrieved from: ftp://ftp.fao.org

increasing food prices, continued high import dependency (Figure 5), and occurrence of extreme events (Figure 6) we can see that this will be an ongoing process.

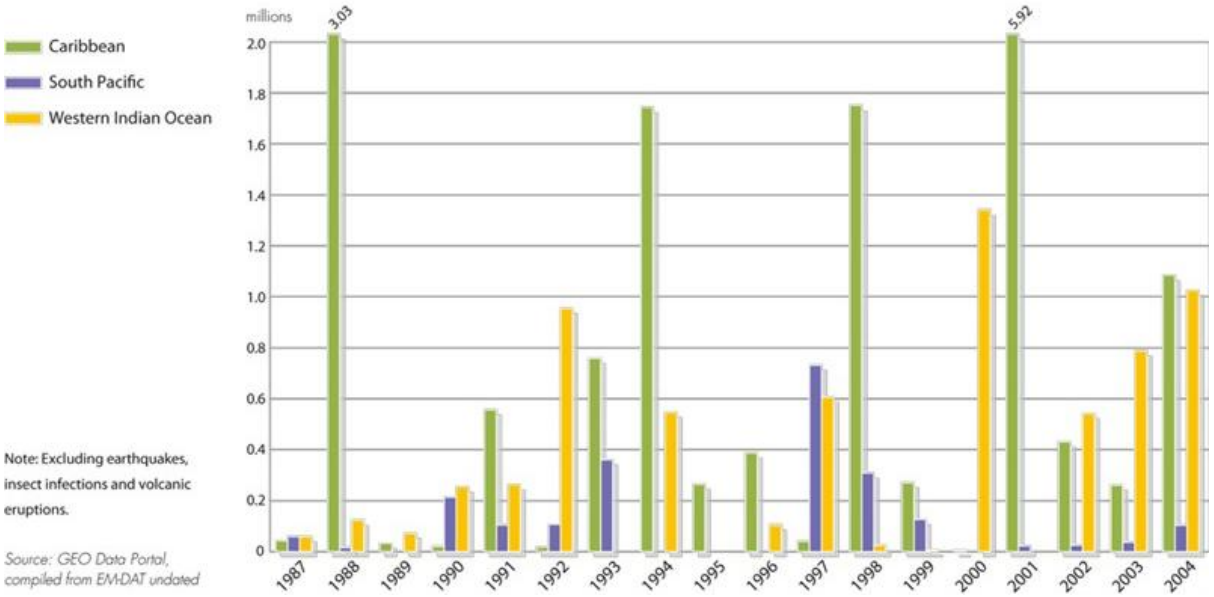
In Samoa, it was realised that implementation of commitments has been slow. A more integrated approach to the sustainable development was called for, with greater support needed from the international community and all stakeholders. Partnership agreements across a diverse range of actors, including public-private partnerships were secured at Samoa.

Figure 6: Food imports (% of merchandise imports)



Source: World Bank Data – Indicators (2015)

Figure 7: Number of People Affected by Natural Disasters in SIDS



Source: Global Environment Outlook – GEO4[39], 2007

Box 1: Previous Commitments on Sustainable Development

- Rio Declaration on Environment and Development, Agenda 21
- Programme for the Further Implementation of Agenda 21
- Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Plan of Implementation), including chapter VII, on the sustainable development of small island developing States, and the Johannesburg Declaration on Sustainable Development,
- Programme of Action for the Sustainable Development of Small Island Developing States (Barbados Programme of Action)
- Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States (MSI), and MSI+5
- The outcome document of the United Nations Conference on Sustainable Development, entitled "The future we want".

In summary the SAMOA Pathway and subsequent Milan Declaration highlighted the urgent need to develop food security in SIDS, with multi-lateral trading systems and trade policies playing a critical role. Implementation would be achieved through developing partnerships, the technology facilitation mechanism and financing. These offer SIDS an important basis for seeking support for the support required by small farmers to adapt and build residence to climate change.

[39] UNEP (2007). Global Environment Outlook, GEO 4, Environment for Development. Retrieved from: http://www.grida.no/

The Solutions

Mitigate

- Capturing mitigation finance
- Low emissions agriculutre, climate-smart agriculutre

Adapt

- Capture co-benifits of adaptation and mitigation
- Climate-smart agricultre

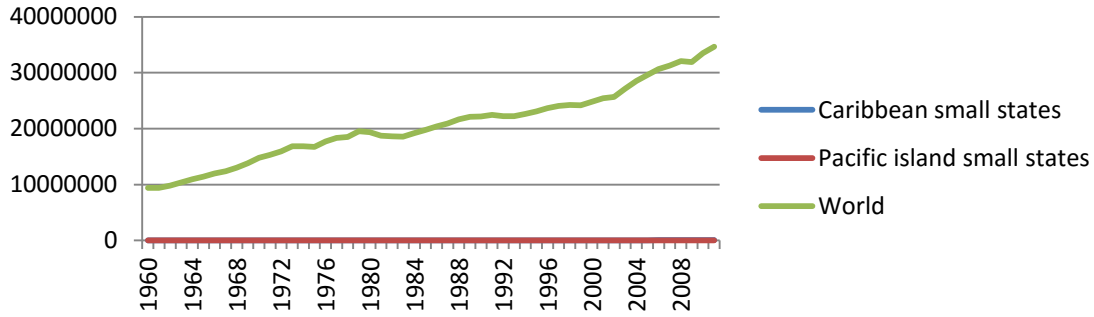
A Global Deal

- Partnerships
- Finance
- Resources

6 Mitigation of Climate Change

We already know that SIDS are low carbon emitters (Figure 8). The meagre emissions that are attributable to them is for the most part due to their dependence on fossil fuel imports. That SIDS are willing to mitigate and have indicated so in their Nationally Appropriate Mitigation Actions and in their Intended Nationally Determined Contributions, shows their commitment and determination to reducing the effects of climate change globally. Despite their smallness and fragility and that realistically, they are not "part of the problem" they have chosen to act to protect the global commons.

Figure 8: CO2 emissions (kt)



Source: World Bank Data – Indicators (2015)

In addition, for SIDS in order to transition to sustainable development and green growth it is necessary to reduce their dependence on fossil fuels. Their high dependence of SIDS on imported fossil fuels is a major source of economic volatility. SIDS generally have rich renewable energy sources but structural problems and limited resources hinders their ability to convert these to a tangible product.

The development of long-term green growth strategies across SIDS will enable them to create new opportunities, enhance competitive advantages and importantly capture mitigation finance. Whilst agricultural emissions in some SIDS are quite low (Table 2), capturing mitigation finance still provides a useful opportunity for SIDS in developing more resilient and sustainable agricultural sectors and ultimately advancing their green economy potential.

Table 2: Agriculture's Contribution to Total Emissions in SIDS[40]

Country	Agriculture's contribution to total emissions (%)
Sao Tome and Principe	16
Antigua and Barbuda	12
Cook Islands	11
Palau	9

[40] Data retrieved from: Richards MB, Wollenberg E, Buglione-Gluck S. (2015). *Agriculture contributions to national emissions*. CCAFS Info Note. Copenhagen, Denmark: CGIAR

St Lucia	7
Seychelles	5
Mauritius	4
Barbados	2
Tuvalu	2
Trinidad and Tobago	0
Belize	0
Niue	0

6.1 Low Emissions Agriculture

Low emissions agriculture is still a relatively new field and the development of appropriate policy, financing and incentive measures are still being investigated. However research has shown that the largest decrease in emissions from agriculture can be realised through restoration of degraded lands (particularly through tropical peatlands and forest conservation), improved cropland and grazing land management, and cultivated organic soils. Further mitigation potential has also been found in water and rice management, set-aside land, land use change and agroforestry, livestock management and manure management.[41]

For some SIDS smallholders mechanisms like Reducing Emissions from Deforestation and Degradation (REDD+) have been explored (for instance in Fiji and Papua New Guinea). REDD+ is a financial mechanism to create value around the carbon stored in forests. It offers developing countries an incentive to reduce emissions from deforestation and degradation. For smallholders climate smart agricultural practices such as agroforestry and other activities to decrease forest degradation and enhance carbon stocks, (such as mangrove restoration) can capture the benefits of REDD+. However the realisation of and implementation of REDD+ benefits would require strong institutions, and support from a wide range of stakeholder groups including producer and supply chain companies, financiers, non-governmental and civil society organisations, governments, as well as smallholders and their representatives, which are often found to be underdeveloped in the SIDS context.

A recent project which could show promise is that of the Guyana Low Carbon Development Strategy (LCDS), developed in partnership with the Government of Norway. Guyana and Norway signed a memorandum of understanding wherein it was agreed that Norway would provide US$250 million to Guyana by the end of 2015 for avoided deforestation which are measured against indicators of enabling activities and of REDD+ Performance. The Guyana REDD+ Investment fund (for which the World Bank acts as trustee) is the financial mechanism through which financial support is channelled. A reported US$190 million

[41] Smith, P., Martino, D., Cai, Z., Gwary, D., Janzen, H., Kumar, P., & Smith, J. (2008). Greenhouse gas mitigation in agriculture. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *363*(1492), 789-813.

performance based REDD+ payments have been made to Guyana. The lessons learnt from the LCDS could provide an example of best practice for SIDS.

In summary mitigation is an important consideration for green growth and sustainable development in SIDS. Reducing energy import dependence and harnessing a sustainable energy future will protect the economy of SIDS and smallholders from external energy shocks. In addition mitigation will enable smallholders to create new opportunities and capture mitigation finance.

7 Building Resilience and Adaptation

Adaptation is defined as: the actions that people take in response to, or in anticipation of, projected or actual changes in climate, to reduce adverse impacts or take advantage of the opportunities posed by climate change. Whilst mitigation refers to actions taken to prevent, reduce or slow climate change, through slowing or stopping the build-up of greenhouse gases in the atmosphere.[42]

In the smallholder survey, farmers recognised the necessity to adapt and build resilience. They identified the need to access appropriate climate change adaptation techniques, information and technology, switch to drought resistant crops, employ better irrigation systems, green house technology and shade management. They considered that there was a need to network with other farmers and the government as they pursued these techniques. They considered that improving their precarious financial position would enhance their ability to adapt and make them more resilient. They called for measures that would help reduce losses such as patrols to limit theft and proposed initiatives that would help with infrastructure, finance, marketing, microenterprise development, eco-tourism development and market linkages, like joint lobbying to secure reduction in air freight fees and help in procuring packaging material and crates.

Building resilience at the smallholder level must target both the physical and direct consequences of climate change but also the commercial consequences. This would involve safeguarding against the increased frequency of extreme weather events that include hurricanes, cyclones, floods and drought. Bearing in mind that these destructive events are now inevitable regardless of what action is taken at COP21; reducing exposure to risks is therefore paramount.

Agro-technologies such as such as greenhouses and other protected agriculture structures can be beneficial to SIDS, enabling smallholders to help insulate themselves from some of the impacts climate change. Such systems can allow for increased insect and disease control, improved quality and consistency of crops and improved resistance to adverse weather conditions.

Building resilience to climate change in small holder agriculture combines mitigation and adaptation to realise the goal of sustainable development and to create communities that are able to withstand shocks.

A number of measures may be taken to ensure that when disasters strike, their destructive impact is lessened and well as ensuring that production can thrive under the changing weather and conditions associated with climate change. These measures include

1. Ensuring and, as necessary, switching to those crops that are suited to changing climatic conditions and weather patterns of the islands is essential. This can entail diversification and

[42] Tompkins, E. L., & Adger, W. N. (2003). Building resilience to climate change through adaptive management of natural resources. *Tyndall Centre for Climate Change Research Working Paper*, *27*.

the replacement of existing crops with those that are more appropriate. It would be vital to include in the search traditional agro-forestry products that might be ideally suited to the geographic habitat but had not been previously commercialised. It is important to appreciate that diversification requires considerable investment in research, product development, and marketing and can be risky for the small farmer whose financial circumstances are precarious. Financial support including, credit and assistance with research, freighting, packaging and marketing can be very helpful. An instance of such support came from the EU which funded the Development of Sustainable Agriculture in the Pacific - DSAP[43] which undertook the identification and promotion of promising technologies including: improved crop varieties, pest and disease management, land conservation and agroforestry technologies.

2. Being able to make available to growing plants the right quantities of water at the required times will be vital for successful crop production. Most small farms in SIDS are rain fed and as is expected that rainfall patterns will become more erratic, yields can suffer. Irrigation is therefore an important adaptation and resilience measure since it will permit continued cultivation even if rainfall is greatly reduced in future. To be environmentally sustainable and beneficial irrigation needs to be promoted wisely. Rainwater harvesting should be used first where possible in integrated systems that might include, harvesting, conservation and hydration via drip-irrigation for instance. This form of irrigation can be the most appropriate and least wasteful, but the investment can be substantial and beyond the means of many small farmers.
3. At the farm level steps may be taken to reduce storm damage in open fields through such measures as planting trees that create wind-breaks.
4. Loss of top soil and of soil nutrients, particularly on hillside farms, during storms and heavy rains can be lessened by such practices as terracing and planting vetiver hedges as well as the strategic planting of trees.
5. The damage due to flooding can be lessened by adequate drainage.
6. Various forms of diversification including inter-cropping, and crop-rotation as well as livestock integration can be helpful in various ways to spread and reduce the risk of total loss of income in the event that one crop is wiped out; e.g. bananas might be destroyed in a storm but mango trees might survive whilst coconut or castor oil trees are less affected by drought.
7. Given that some losses due to the weather and climatic shocks will occur, crop insurance is vital if farmers' livelihoods are not to be jeopardised each time they suffer a disaster. (Under the ACP-EU Lomé Convention, a system entitled the Stabilisation of Export Earnings, STABEX existed which provided compensatory financial support when earnings dropped suddenly often as a result of destruction and loss caused by hurricanes or prolonged drought. There is no equivalent facility available to small farmers in the Economic Partnership agreement (EPA) or in other arrangements).

   Resilience can also be built up via less direct measures such as: substituting where possible energy derived from fossil fuel, by renewable sources such as solar, energy, biomass, etc.

[43] http://www.adaptationlearning.net/project/development-sustainable-agriculture-pacific-dsap

As temperatures rise countries in more temperate zones that previously could not produce certain tropical and semi-tropical products might now be able do so competitively. The small farmers in SIDS might find that they are being forced out of their traditional markets. In order to survive they will need to adapt and find alternative markets, switch to new crops or become more competitive.

7.1 Adaptation

Given the inexorable advance of climate change it is vital that smallholders in SIDS adapt if they are to secure resilient futures. Smallholders are a critical contributor to development, food security and poverty reduction in SIDS. With exogenous pressures of food prices and climate events, more people in SIDS are at risk of being driven into poverty. By helping smallholders and working towards developing a competitive and sustainable agricultural sector, SIDS can anticipate far reaching benefits, an important one of which will be enhanced food and nutrition security.

Adaptation projects are widespread in SIDS with measures to increase resilience at the regional and national levels at various stages of implementation. Ground-level projects looking at structural aspects of agriculture are in operation as are projects that involve strengthening institutions, policy, and regulations. These projects are being implemented by a wide array of actors which include the EU and UN agencies which also serve as Global Environment Facility (GEF) implementing agencies (activities include projects sponsored by GEF and non-GEF funded projects), multilateral financial institutions, bilateral development assistance agencies, private and civil society partnerships.

Through National Adaptation Programmes of Action (NAPAs), Least Developed SIDS have been able to identify their most urgent adaptation needs. Introduced by the UNFCCC, NAPAs are meant to be action oriented, country-driven, and flexible and based on national circumstances. However there is some concern that agriculture is underrepresented in some NAPAs[44].

The way that food is grown, processed, distributed and consumed has a profound impact on the environment, societies, and economies. Smallholder adaptation and mitigation is not solely a process to create resilience against climate change but an opportunity to realign practices for people, planet, and prosperity.

Smallholder adaptation would have to look at governance, technical, cognitive and cultural aspects, paying particular attention to identified barriers to adoption. Some of the barriers to adoption of adaptation interventions in SIDS have been identified as:

- A lack of focus on the adaptive capacity needs of Local Government or Island Councils and communities.
- Inadequate and inflexible support from international adaptation funding modalities for system transformations or to address root causes of vulnerability.

[44] Huq, N., & Hugé, J. (2010, March). *National Adaptation Programme of Action (NAPA)–An Assessment of Workers' Rights*. Workshop on Climate Change, its Impacts and on Employment and Labour Markets, Brussels, Belgium.

- Failure to recognise the significance of cultural knowledge and practices in shaping adaptive choices of communities in SIDS[45].
- Inadequate financial support and political will to facilitate focused targeted and market-driven research for development.

7.2 Climate Smart Agriculture

A climate smart agriculture approach can help support and focus adaptation and resilience building. Climate smart agriculture (CSA) was developed by the United Nations Food and Agricultural Organisation (FAO). They have defined CSA as "integrat[ing] the three dimensions of sustainable development (economic, social and environmental) by jointly addressing food security and climate challenges. It is composed of three main pillars:

1. Sustainably increasing agricultural productivity and incomes;

2. Adapting and building resilience to climate change;

3. Reducing and/or removing greenhouse gases emissions, where possible.

CSA is an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change"[46]

The method of CSA is holistic and site specific, with planning being highly farm, commodity and context specific. It attempts to understand, through a participatory process, the trade-offs and choices that farmers must make to become resilient to climate change.

The CSA approach is achieved through ecosystem-based adaptation, which is defined variously as:

- The use of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change – CBD
- The use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people and communities adapt to the negative effects of climate change at local, national, regional and global levels – UNEP
- The use of the biodiversity as part of the overall adaptation strategy to help people adapt to adverse impacts of climate change – GEF & IUCN

There are several key components to this approach.

1. It is context specific. It does not attempt to seek a global unifying solution as none exists.
2. It aims for inter-sectoral and consistent policies, identifying interactions between sectors and stakeholders, preferably with management at the cabinet level.
3. It seeks financial support for smallholders to transition, linking finance opportunities from the public and private sectors,
4. It does not try to reinvent the wheel and respects traditional ecological knowledge, scaling up exiting successful practices where appropriate

[45] Kuruppu, N., & Willie, R. (2015). Barriers to reducing climate enhanced disaster risks in Least Developed Country-Small Islands through anticipatory adaptation. *Weather and Climate Extremes*, *7*, 72-83.
[46] FAO(2013). *Climate-Smart Agriculture Sourcebook*. Natural Resource Management and Environment Department, FAO: Rome

5. It understands that reform cannot be achieved by ignoring farmer's needs. Thus it prioritises strengthening livelihoods by improving access to services, knowledge, resources (genetic and otherwise), financial products and markets
6. It identifies barriers to adoption at all levels starting with the smallholder
7. Disaster Risk Reduction is a key priority. Strengthening institutions, building resilience and better preparedness across levels and sectors and accessing financing are vital to the CSA formula
8. It considers climate change mitigation as a co-benefit especially in low-income agricultural-based populations.

Broadly, there are four major types of actions which can lay the foundation for effective CSA across agricultural systems, landscapes and food systems. These are:

- Expansion of evidence base and assessment tools enabling the identification of sustainable and adaptive agricultural growth strategies for food security which could also have mitigation potential.
- Building policy frameworks and consensus for implementation at scale
- Enabling farmer management of climate risks and the adoption of suitable agricultural practices, technologies, and systems through strengthening national and local institutions
- Developing financing options to support implementation, linking climate and agricultural finance[47]

The CSA approach has attracted its fair amount of criticisms. A few of which are: inadequate understanding of CSA at the local smallholder level (where emissions reductions is perhaps less of a concern); lack of monitoring and accountability[48]; a need for clearer political agendas and agricultural sector transformation pathways to abate confusion around the purpose of CSA[49]; it risks diluting or taking away from the agro-ecology movement; it is dominated by corporate/vested interests; it lacks a clear definition with standards and exclusions; it fails to address some key issues around land rights and seed systems; and underrepresented costliness of instigating CSA practices[50]. However the CSA approach remains promising and can essentially be seen as an umbrella term which groups the various agricultural adaptation, conservation, and mitigation practices together. So across the value chain, from smallholders to consumer, stakeholders can have access to a large toolkit of methods to build resilience against climate change.

Techniques in the CSA toolkit include and are not limited to:

[47] CCAFS and UNFAO. (2014). *Questions & Answers: Knowledge on Climate-Smart Agriculture*. Rome: FAO.
[48] Nambiza, W. (2014). *Understandings of climate change, climate-smart small scale agriculture and practices of climate-smart small scale agriculture as climate change adaptation in two Tanzanian districts: a case study of Kilosa and Chamwino districts.* Proceedings of the International Conference on Reducing Climate Change Challenges through Forestry and Other Land Use Practices. Retrieved from: http://www.taccire.suanet.ac.tz
[49] Caron, P., & Treyer, S. (2016). Climate-Smart Agriculture and International Climate Change Negotiation Forums. In *Climate Change and Agriculture Worldwide*. Netherlands: Springer
[50] McCarthy, N., Lipper, L., & Branca, G. (2011). *Climate-smart agriculture: smallholder adoption and implications for climate change adaptation and mitigation*. Mitigation of Climate Change in Agriculture Working Paper, 3

- Ecosystem-based approaches
- Conservation agriculture
- Integrated nutrient and soil management
- Mulch cropping
- Cover cropping
- Alterations in cropping patterns and rotations
- Crop diversification
- Using high quality seeds and planting materials of adapted varieties
- Integrated pest management
- Integrated weed management
- Grasslands management
- Water and irrigation management
- Landscape-level pollination management
- Organic agriculture
- Land fragmentation (riparian areas, forest land within the agricultural landscape)
- Reintroducing Endemic and traditional crops
- Linking value chains
- Microfinance development and access

The CSA approach identifies adoption of adaptation measures as an important consideration. In doing so it realises that adaptation does not occur in a controlled space. Whilst creating measures is one challenge, ensuring the correct adoption of those measures is at times the bigger challenge. This is a subject that behavioural economists and psychologists have been grappling with for decades. Financing needs to consider the dissemination of adaptive solutions, implementation and adoption by stakeholders.

7.3 Disaster Risk Reduction

Climate change adaptation and Disaster Risk Reduction (DRR) should be pursued in concert in order to mitigate the negative effects of climate change and to reduce the risks and vulnerabilities that it presents. Indeed the two are interrelated with the methods used in one, being appropriate to the other. Despite this policy integration is still weak, with an unproductive distinction existing between these two related concepts in the Pacific SIDS at least. These distinctions however are not as apparent at the community level, where initiatives to minimise risk and create resilience through adaptation often operate within a policy vacuum [51]. Indeed if we examine some of the methods to reduce risk from environmental and climate change impacts we will see that there really need not be a distinction between the two. These include: Diversification; the adoption of climate resilient crop varieties; sharing losses through insurance and other capital market mechanisms such as private reinsurance and collateralized markets; early warning systems and its communication to end-users.

[51] UNISDR, UNDP (2012). *Disaster Risk Reduction and Climate Change Adaptation in the Pacific: An Institutional and Policy Analysis.* Suva, Fiji: UNISDR, UNDP

The integration of DRR into agricultural policy and its application across the agricultural value chain can facilitate the identification of barriers to production and detect private sector and market orientated approaches to reduce risks and create resilience.

7.4 Participatory value-chains

The FAO define a sustainable and inclusive value-chain as "the full range of farms and firms and their successive coordinated value-adding activities that transform raw agricultural materials into food products that are sold to final consumers and disposed after use, in a manner that is profitable throughout the chain, has broad-based benefits for society and does not permanently deplete natural resources."[52]

Figure 9: Agricultural Participatory Value-Chain

If the small farmer can get a larger share of the price paid by the final consumer of his product, then he/she is evidently better off and consequently in a less precarious and vulnerable position.

Value-chain analysis takes place at all levels of production, with value being determined in end-markets. If a smallholder is using green technologies, lowering emissions, and conserving local ecosystems, then this is additional value that they are adding to their product, but one that can only be captured when consumers buy the product. Certification bodies such as Fairtrade, Rainforest Alliance, Bird Friendly, Soil Association and the Gold Standard can help smallholders capture this value. For instance, Fairtrade is working on developing the Fairtrade Carbon Credits Standard. This would be an add-on to the Gold Standard – a well-known carbon verification scheme. It will aim to enable producers to actively participate in the production and trade of carbon credits through climate smart agriculture, green energy, and forestry projects, capturing the value of emission reductions in the production process.

Smallholders in SIDS face market integration challenges which can be problematic for food security and rural livelihoods. Poor economic geography, costly marketing infrastructure, and the lack of domestic value adding opportunities means that smallholders find it hard to compete in niche export and domestic markets. There are opportunities for domestic market integration, especially through linkages to the tourism industry. However a paradox that SIDS smallholders face is that often hotels and supermarkets prefer to import produce rather than sourcing from local farmers. Purchasing managers cite erratic supply, quality, quantity, high

[52] FAO. (2014). *Developing Sustainable Food Value Chains – Guiding Principles*. Rome: FAO

transaction costs and unreliable delivery and transport logistics for domestically grown fresh produce[53].

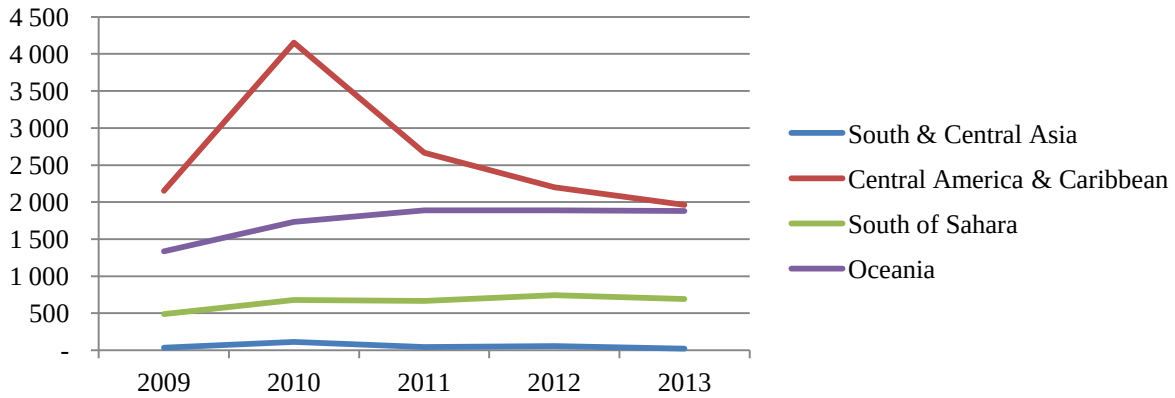
Addressing these barriers by consolidating stakeholder needs, product diversification, more efficient and sustainable processing technologies, sustainable waste minimisation, better infrastructure, and policy integration are integral to the success of climate smart agriculture, and to meet the triple bottom line of sound environmental, social, and economic development.. As CSA practitioners reach critical mass, it will become institutionalised. In order to get to this stage, project implementers would need:

- To ensure the involvement of different stakeholder groups, with increased sector coordination
- Support the professionalisation of farming enterprises
- Shift away from project-based interventions to looking at driving structural change and regulation through programmes and market mechanisms
- Mainstream sustainability until it becomes a licence to operate[54].

7.5 Adaptation Finance

The picture of adaptation finance is encouraging. There has been a large increase in public adaptation related finance in recent years. There was an estimated US$24.6 billion (range US$23-26 billion) in 2012/13, of which 90 per cent was invested in non-OECD countries. However how much of this is channelled to SIDS is unclear. As we can see from the figure below, net Overseas Development Assistance (ODA) to SIDS has remained quite stable since 2009. The sharp increase in 2010 in the Caribbean region is attributable mainly to Haiti.

Figure 10: Net ODA Receipts to SIDS in US$ Millions



Source: OECD DAC (2015)

SIDS will need access to greater financial resources in order to adapt. Financial support for improving smallholder agriculture could come from the traditional sources of development and environment finance as well as performance-based funding. The latter would include the sale of carbon credits (through for instance REDD+ mechanisms) or certified commodities,

[53] Bammann, H. (2007). Participatory value chain analysis for improved farmer incomes, employment opportunities and food security. *Pacific Economic Bulletin*, *22*(3), 113-125.
[54] Molenaar, J.W., Gorter, J., Heilbron, L., Simons, L., Vorley, B., Blackmore, E., Dallinger, J. (2015). *Sustainable Sector Transformation: How to drive sustainability performance in smallholder-dominated agricultural sectors?* White Paper 1. Commissioned by IFC.

payments for ecosystem services, and Nationally Appropriate Mitigation Action budgets, however this would require the development of better data and research infrastructure to measure emissions and carbon stocks, and subsequently capture mitigation finance to its full extent. In developing performance-based mitigation finance, SIDS can realise co-benefits of improvements in livelihoods and food security. Therefore it is important to enable the relevant infrastructure for SIDS to tap into this pool of financing.

The largest global financing source for smallholders is the Adaptation for Smallholder Agriculture Programme (ASAP). This was launched by the International Fund for Agricultural Development (IFAD) and aims to channel climate finance to smallholder farmers so they can access the information tools and technologies that they need in order to build resilience to climate change. IFAD will attempt to mobilize more climate finance at COP21, for SIDS ensuring that they are fairly represented in such programmes is essential.

In summary climate change adaptation is critical in creating resilient smallholders in SIDS. Through processes like CSA small holders can reduce risk from environmental and climate change impacts whilst also developing opportunities for green growth. Adaptation however does not occur in isolation and would require systemic change. This would require expanding research and development of sustainable and adaptive agriculture, building cross sector policy frameworks, strengthening national and local institutions to enable management of climate risks at the smallholder level and developing financing options for widespread adaptation measures.

7.6 Measures for farmers

It is recognised that adaptation and resilience building starts at the small farm level so measures that can be taken are outlined though both national and international support will be required.

The measures include:

1. **Review and upgrading of horticultural practices**. A variety of measures can be appropriate and helpful including terracing of hillslopes and planting hedges (e.g. vetiver) as well as the strategic planting of trees as windbreaks; inter-cropping, and crop-rotation as well as livestock integration; regular clearance and maintenance of drainage canals.
2. **Diversification**. This can be helpful in various ways including:

- Replacing less profitable crops with those that are more profitable and sustainable.
- Having a range of spreads that reduces the risk of total loss of income in the event that one crop is wiped out.
- Having crops that are more suited to the changing weather and climatic patterns, makes for more secure long term income.

  The investment, research, marketing and preparation required to successfully switch to new and more suitable crops can be considerable, but farmers have no option but to take the risk.

3. **Overseas marketing**: For diversification into new products to be successful farmers need to be able to deliver and market their goods effectively and remuneratively. Whilst they have often been able to do so reasonably well on the local market, it generally is too small to be able to absorb the entire output of the small farming community; export is therefore vital. The markets that tend to be most available are the sophisticated and competitive markets of developed countries like those of Western Europe for the Caribbean and Australia and New Zealand for the Pacific. To be able to succeed here, the farmer needs, among other things, funding for investment and credit, market intelligence, capacity to monitor and comply with product standards and requirements both the official and the private, such as GLOBAL. G.A.P.
4. **Water management**: The availability of water is already a serious problem for most small farmers, increasing drought and more erratic rainfall patterns makes the widespread reliance on rain-fed agriculture untenable. Irrigation is therefore vital. At the farm level micro systems might be devised that can include for instance rainwater harvesting, conservation and plant hydration via drip-irrigation or canals. Greater community awareness of the need for water conservation can be very helpful.
    - **Drainage:** As droughts become more frequent so do major precipitation events such as hurricane Tomas in 2010 which, following the St Lucia's worst drought in 40 years deposited 61 cms of rain in just one day. Such occurrences are of course rare and the massive volume of water would overwhelm most drainage systems. However, instances of very heavy rainfall often associated with storms and hurricanes are increasingly frequent. On hillside farms the concern is soil erosion and loss of nutrients. In low lying areas particularly those on flood plains, the longer it takes to disperse the waters the greater the destruction and damage to the farm. Adequate drainage is essential therefore with proper construction and maintenance of storm drains and run-off canals.
5. **Wind breaks:** Open fields with such fragile plants like bananas and sugar-cane can be very vulnerable to high winds associated with storms hurricanes and cyclones. Strategically planted large trees can help protect the crops. These can also provide additional income if the trees themselves produce cash crops like mangoes for instance.
6. **Insurance**: Given the inevitability of weather and climatic shocks that can result in catastrophic losses to the farmer, some form of adequate crop insurance is vital if livelihoods are not to be jeopardised whenever disaster strikes. (Under the ACP-EU Lomé Convention, a system entitled the Stabilisation of Export Earnings, STABEX existed which provided compensatory financial support when earnings dropped suddenly often as a result of destruction and loss caused by hurricanes or prolonged drought. This facility has not been replicated in the Economic Partnership agreement (EPA). The Caribbean has a CCRIF SPC, formerly the Caribbean Catastrophe Risk Insurance Facility that was launched in 2007 as "*a regional catastrophe fund for Caribbean governments to limit the financial impact of devastating hurricanes and earthquakes by quickly providing financial liquidity when a policy is triggered*",[55] but it is Governments that are the policy holders, not farmers or the private sector).

[55] http://www.ccrif.org/

7. **Renewable energy**: The energy use profiles of small farms in SIDS does not diverge substantially from the patterns in the wider society where there is in general heavy dependence on energy derived from fossil fuel. Developing and harnessing renewable supplies from such sources as solar, wind, biomass, biogas etc. can, in addition to reducing the carbon footprint of the farm, actually be more cost-effective in the long term. On certain farms where there are fast running streams, micro plants for generating power might be feasible.

   For smallholders in SIDS the potential of renewable energy on agricultural production is promising. Wind, solar, hydro, geothermal, and biomass resources are often available on farms systems and presents the opportunity to produce 'energy-smart' food. Excess energy generated on site can also be transformed into additional revenue. Small farms can benefit from small turbines, electricity from solar photovoltaic systems, solar water heating (which is widespread in Barbados) and solar heat for crop drying, as in São Tomé and Principe where cocoa beans are fermented and dried through solar cocoa dryers Agricultural by-products for energy generation are also being implemented in SIDS.

   Biomass, in the form of fuelwood and bagasse, from sugarcane production, and coconut oil generators are being utilised in Fiji. The coconut oil generator repurposed diesel generators on the islands of Vanua Balavu and Tavenui. In agriculture, biofuel seems to a popular strategy. Some of the biogas crops (such as sorghum) help reclaim degraded wastelands and provide soil and water friendly options for production in remote and fragile agricultural area, whilst also provide savings in foreign trade exchange by providing a local/national supply of fuel.

7.7 Recommendations

The increasing concentrations of atmospheric GHGs and the consequent steady rise in global temperatures have been resulting in changes to the climate and weather patterns leaving small farmers in SIDS particularly vulnerable, both directly and indirectly to the adverse consequences. The shifting weather and rainfall patterns, increasing frequency and intensity of droughts, storms and hurricanes, and the various impacts climate change increase the physical and commercial risks facing farmers and reduce income and profitability and in extreme cases can destroy their livelihoods altogether.

Recognising however that even with the targets for maximum average temperature rise of 1.5°C being sought by SIDS and even more so the 2°C being advanced by several other countries, climate change will accelerate even further and have serious adverse impact on these small farmers. Given that none of the likely GHG reduction targets will be sufficient to reverse the climate changes that have occurred, and that indeed the situation is likely to further deteriorate, adapting in order to survive in the more hostile environment becomes the priority for small farmers.

This section explores what they can do on their own both individually and collectively to build resilience and to adapt. It also considers what the States themselves can do since

resilience building and adaptation on small farms needs external help. Yet more fundamentally, to be successful the task has to be integrated into a comprehensive and coordinated national strategy.

The States on their own cannot ensure adaptation and resilience building. They lack sufficient resources to fully finance the range of measures that will be required and do not have control over certain critical factors that can facilitate or impede adaptation; these are under international not national control. The essential role for the international community is therefore assessed.

7.8 Measures for States

The State can provide the supportive framework for the individual farmer to adapt and build resilience. This can be achieved by the development and implementation of appropriate policies, strategies, and programmes, including:

1. **Promoting awareness:** Promoting an appreciation within the farming and wider community of the importance of and the necessity for adaptation to climate change, conservation and safeguarding of resources including water and the natural environment.
2. **Incentives:** Providing appropriate incentives that will encourage farmers to adopt the required measures, whilst ensuring that disincentives are eliminated.
3. **Water resource management:** Ensuring an effective national water collection, storage management and distribution system permits regular and adequate water supply to small farmers.
4. **Developing and properly maintaining infrastructure:** In particular feeder roads, bridges, coastal and flood defences. The effort and costs entailed in this are expected to increase with the frequency of storms, hurricanes, cyclones, deluges, landslides and sea-surges which degrade and destroy infrastructure.
5. **Supporting diversification:** By undertaking and disseminating appropriate technical and market research on alternative crops and providing targeted advice to farmers.
6. **Crop insurance:** Helping devise and support a viable and affordable arrangement for providing crop insurance for small farmers.
7. Providing a **post-disaster reconstruction fund**. Catastrophic events like hurricanes and cyclones can result in substantial losses of farm equipment and property as well as to perennials like coconut, nutmeg and cocoa. Even if the farmer were to receive a crop insurance pay-out, he/she is often unable to fund farm reconstruction, replanting and reinvestment. Governments should therefore provide a disaster fund that would contribute to the cost of eventual recovery. Without such facility, the pace of recovery is slowed because of a lack of funds and in some cases farmers can be obliged to abandon the land altogether because they lack the capital to invest.

7.9 International support

The role of the international community, notably the trade, financial and other regulatory institutions, trading partners and donors is vital to the strengthened ability of farmers to adapt and build resilience. This can be done both through measures that support the processes as well as providing financial support to the small farmers and governments.

The following are proposed:

1. **Ensure** that SPS arrangements support and facilitate small farmers' compliance and provisions that discriminate against or disadvantage small farmers from SIDS are removed.
2. **Financial and technical support** is provided for the following:
3. **Upgrading of product quality standards** and ability to comply with Global G.A.P. and supermarket requirements.
4. The **gathering of intelligence** and improved organisation of production, collection, packaging, promotion marketing, and credit.
5. **Support for small farmer collaboration** in: production, transportation and marketing and the development of inter-island small farmer organisations and of intra-SIDS collaboration and the exchange of best practice
6. **Assisting** with the establishment of and contributing to an affordable and sustainable **insurance facility** that will cover crops and farm-property
7. **Assisting** with the establishment of and contributing to a well-financed **post-disaster reconstruction fund**.

It is imperative that small farmers and their organisations are directly consulted and engaged in the conceptualisation, construction and management of the financial and technical support systems. This will ensure the appropriateness of the systems and the commitment and support of the farmers.

8 COP21: 2015 Paris Climate Conference:

The Samoa Pathway and the Milan Declaration on Enhancing Food Security and Climate Adaptation in SIDS recognised that these Small Island States are amongst the most vulnerable to the effects of climate change with the least adaptive capacity. In Samoa and in Milan the need to develop human, technological and resource capacity and access to financing were reinforced, as was the need for partnerships to enable green growth and adaptation in SIDS. From conversations about the development of SIDS in Barbados, to implementation in Mauritius, the Samoa Pathway represented a shift in dialogue to concrete actions. Pledges and promises were made, and partnerships forged.

If concrete action is not produced in Paris, then the global community is put at risk of not meeting the newly agreed upon Sustainable Development Goals (SDGs), and the promises made to SIDS would be shown to be empty. Already, for SIDS 2°C of warming will have a profound impact on their environment, societies and economies. Building resilience into smallholder agriculture in SIDS will have widespread value for these island ecosystems, fortifying them against the impacts of climate change and building food security.

To build resilience, smallholders need:

- A legally binding agreement that curbs future emissions so that the impacts already felt by SIDS are not exacerbated
- Access to variety of financing options, from private sector investment to micro-lending opportunities
- Access to research and technology
- Capacity support to enable concrete actions

8.1 Concrete Proposals to be Advanced at COP21

Small Farmers from SIDS are relying on their national delegations at the COP21 conference not only to advance the case for the reduction in global emissions of GHGs that would keep average global temperature rise to 1.5°C, but more particularly to:

- Sensitise the international community to the serious predicament and challenges facing small farmers as a result of Climate Change that is exacerbating their already tenuous economic positions.

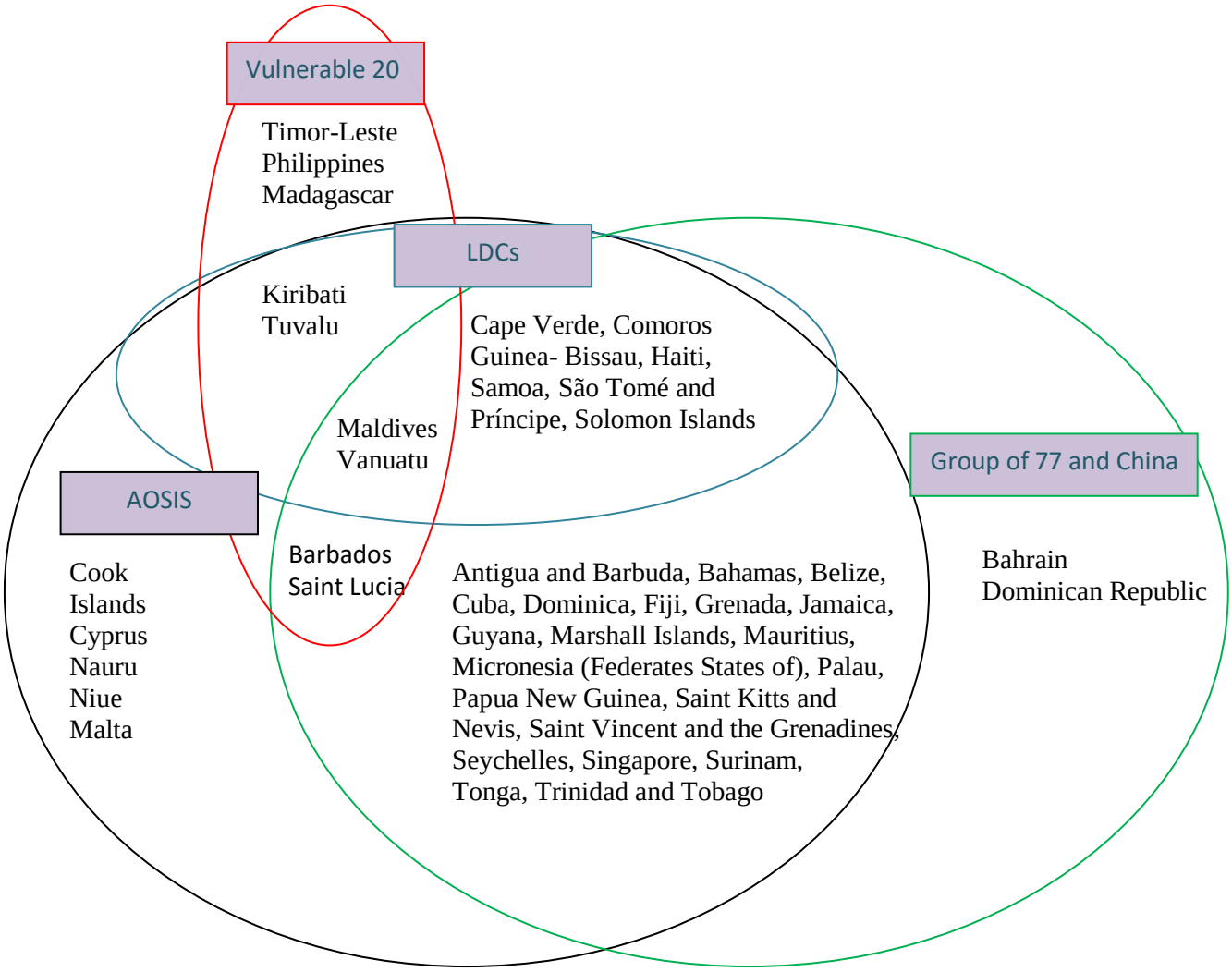
  Remind the international community and donors of their specific commitments under the Samoa Pathway and the Milan Declaration on Enhancing Food Security and Climate Adaptation in SIDS and seek to get firm and concrete commitments that will give effect to these commitments

  Specifically delegates are urged to seek:

1. The provision of adequate financial and technical support that will be used for: product upgrading to meet international quality standards; an affordable and sustainable insurance facility that will cover crops and farm-property; a well-financed post-disaster reconstruction

2. fund; support for small farmer collaboration in: production, transportation and marketing and the development of inter-island small farmer organisations and their collaboration
3. An end to all discrimination against SIDS in the management of national SPS arrangements because of the limited numbers of shipments of consignments.
4. In view of the limited volumes of agricultural products exported by SIDS, which nonetheless are of considerable economic and social importance to the countries and their small farmers, target countries are urged to not to apply and to exempt SIDS agricultural exports from any safeguard measures or quantitative restrictions that they impose.
5. Support for the development of associations of small farmers in SIDS and their collaboration and exchange of best practice within their regions and internationally.

Annex 1: SIDS groups within the negotiating groups of the United Nations Framework Convention on Climate Change



Annex 2: Country Case Studies

2.1 Case Study: Hurricane Ivan in Grenada

In September 2004 Hurricane Ivan reached Grenada as a category three storm, in less than eight hours Ivan had devastated the island's socio-economic infrastructure. 28 people were killed, and the OECS estimated that 90% of housing stock was damaged (equivalent to 38% of GDP), 90% of hotel rooms were damaged (equivalent to 29% of GDP), the agricultural sector sustained major losses equivalent to 10% of GDP with the two main commercial crops of nutmeg and cocoa making no contribution to the economy for six to eight years following the hurricane. The list of damages continued with losses to schools, eco-tourism and cultural heritage sites, telecommunications and electricity installations leading to an estimated financial loss of US$900 million, over twice the country's GDP. Prior to the hurricane, Grenada was projecting a positive economic growth rate of 5.7%, but in the wake of the devastation negative growth of -1.4% was projected[56]. As it moved towards Jamaica, Ivan was classified as a category 5 storm, devastating communities there also.

This is the power of natural disasters. In the span of a few hours the devastation to communities can be massive, setting development back years if not decades. With projections of increased frequency and severity of extreme weather and climate events, the challenge for SIDS to survive is great. As magnitude and severity increase SIDS with their smaller resource base and limited development options, have a limited capacity to cope. The impact of sequential severe events on island ecosystems could mean that systems are unable to recover to their last best state. Agricultural reduction could decline as soils never recover from erosion, salination, or biological degradation through biodiversity loss.

In Grenada, regenerating nutmeg and cocoa production post hurricane proved slow with the population characteristic of farmers being a hindering factor as older farmers lacked the incentive to replant crops with a long-term income profile. In addition the loss of mature shade trees for cocoa production and the time intensive task of saving old and standing nutmeg trees meant recovery would take longer than expected[57].

[56] Organization of Eastern Caribbean States (OECS). (2004). *Grenada: Macro Socio-economic Assessment of the Damages Caused by Hurricane Ivan* . Retrieved from: http://www.gov.gd

[57] The World Bank (2005). Grenada: A Nation Rebuilding. An Assessment of Reconstruction and Economic Recovery One Year after Hurricane Ivan. Washington, DC: The World Bank.

Box 2: Impact of Hurricane Ivan on Agriculture in Grenada[58]

- Destruction of 70 percent of the 555,000 nutmeg trees. With a predicted reduction in production for five years following the hurricane and associated reductions in foreign exchange earnings of approximately 8%.
- Considerable damages to the physical infrastructure supporting the nutmeg and cocoa industries
- 100% destruction of the 350 acres of bananas estimated at EC$1,440,134.
- Destruction of 15.4% of the 120 acres of citrus estimated at EC$ 2,610,623.
- Total destruction of 114.5 acres of vegetables valued at EC$2,792,000.
- Destruction of minor fruits estimated at EC$2,792,000.
- Around 20% of the 282 acres of roots and tubers valued at EC$837,125.
- 91% of forest lands and watershed were stripped of vegetation.
- The livestock industry incurred estimated damages of EC$ 9,338,117.00 due to the loss of housing infrastructure and stock.
- Damage to 150 miles of farm roads were incurred, with an estimated reconstruction value of EC$28.67 million.

This case study illustrates the urgent need for investing in disaster risk reduction, resilience building, and climate change adaptation in SIDS.

2.2 Case Study: Banana Production in the Windwards

The Windwards banana producers are Dominica, St Lucia, St Vincent and the Grenadines, with approximately 4000 farms, the majority of which are Fairtrade certified. St Lucia has the largest number of farmers. The average farm size is generally less than one hectare and 45% of smallholders are women[59].

Banana production in the Windwards is going through a crisis with a loss of more than 20,000 producers since the 1990s. There have been various factors contributing to this decline. These include:

- Increased competition from Latin American banana producers who benefit from lowered import tariffs to the EU
- Increased incidence of natural disasters such as Hurricane Tomas in 2010 and greater prevalence of droughts
- Disease outbreaks and specifically the black sigatoka

With a 1% increase in rainfall, St Lucia's banana exports would be expected to increase by approximately 0.27%, whilst the same percentage increase in temperature is projected to result in a 5.1% decrease in growth of banana exports. Under the IPCC climate projections,

[58] FAO (2008). *Assistance to Improve Local Agricultural Emergency Preparedness in Caribbean Countries Highly Prone to Hurricane Related Disasters.* Good Agricultural Practices for Climate Risk Management in Grenada Summary Report. TCP/ RLA/3101.
[59] Support Caribbean Bananas. (nd). Bananalink. Retrieved from: http://www.bananalink.org.uk

by 2050, banana exports are projected to be minimal with the cumulative yield loss to be an estimated EC$165 million.[60]

The loss of income from banana production will have an overwhelming effect on the livelihoods of smallholders in the Windwards. Significant capital investment by small farmers is required to enable diversification of farm systems and adopt best practice.

2.3 Case Study: Taro Cultivation and Sea Level Rise in the Republic of the Marshall Islands (RMI)

Taro is an important subsistence crop in the RMI where it was traditionally cultivated in taro pits in an agroforestry system (where coconut, breadfruit, and padanus were also grown). Pit cultivation however differs across atolls, with the practice almost extinct in some. Production of Taro and other crops has fallen dramatically as import staples have become more popular. In addition climate change threatens production through changes in rainfall, rising temperatures, climate variability, and sea level rise. Wetter conditions will benefit some crops such as coconut, breadfruit and cassava, whilst declines in rainfall would hurt most crops and especially traditional subsistence crops such as yam and taro in the RMI.

Sea-level rise in a real concern in the RMI and affects traditional agriculture. Sea level has risen 0.3 inches a year since 1993 and under a low emissions scenario is projected to have risen by 3.9–10.6 inches by 2030[61]. Saline intrusion in soil and groundwater aquifers from rising seas are already making cultivation of crops like taro and yam no longer viable in some regions. In addition storm and tidal surges flood taro pits with salt water, compromising the crops. [62]

To reduce its dependency on food imports there is a growing interest in subsistence agriculture and particularly Taro production in the RMI. However the challenges of rising sea-levels and shortage in elite seedlings limit progress.[63]

2.4 Case Study: Smallholder Adaptation to Cocoa Pod Borer in Papua New Guinea

Smallholder livelihoods derived from Cocoa production were negatively impacted by a widespread pest in the East New Britain Province of Papua New Guinea. The cocoa pod borer (*Conopomorpha cramerella*) is a small moth that lays its larvae in the cocoa pod. The larvae then feed on seeds causing them to stick together. The result is undersized seeds of poor quality. The cocoa pod borer decimated harvests in the East New Britain Province of Papua New Guinea leaving many small farmers without income. Total production in the province fell from 22,000 tons in 2008 to under 4,000 in 2012.

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[60] ECLAC. (2011). An Assessment of the Economic Impact of Climate Change on the Agriculture Sector in Saint Lucia. LC/CAR/L.322. Retrieved from: http://www.cepal.org/

[61] Pacific Climate Change Science Programme. (2013). *Current and Future Climate of the Marshall Islands*. Retrieved from: http://www.pacificclimatechangescience.org

[62] Reti, M. J. (2008). *An Assessment of the Impact of Climate Change on Agriculture and Food Security in the Pacific-A Case Study in the Republic of the Marshall Islands*. Apia, Samoa: FAO

[63] Nandwani, D., Cheng, M.C., Joseph, J., Aikne, J., Soson, A., Moh, G. (2003, May). *Taro cultivation in the Marshall Islands: Problems, persistence and prospects*. In L. Guarino., M. Taylor., & T., Osborn (Eds) 3rd Taro Symposium conducted at the Tanoa International Hotel, Nadi, Fiji Islands.

The cocoa pod borer will be impacted by climate change. The Pacific Climate Change Science Programme[64] shows that temperatures have increased at a rate of 0.11 degrees Celsius since the 1950s and rainfall has become more varied in the PNG. Higher humidity and rainfall patterns in cocoa production regions may impact incidence of the moth which favours hot and humid.

A recent study[65] looked at the interconnections between household responses, the local socio-cultural and economic context of smallholder commodity crop production and the wider institutional environment in which household choices and decisions are made to assess why the cocoa pod borer had such a drastic impact on yield in the East New Britain Province. The arrival of the disease presented smallholders with an all or nothing scenario. At the farm level, the decision was to modernise and shift to a high-input and technically advanced cropping system or remain in their traditional foraging production strategy which is a low-input cropping system. Farmers would be required to adopt more market orientated values, new agricultural practices, and make major lifestyle changes, with more family labour time required and greater investment in cocoa plot. The shift to modernity would not be an easy leap, presenting smallholders with a decision that would require a fundamental shift in their value systems and moral frameworks.

Prior to cocoa pod borer, smallholders in the East New Britain Province would practice a low input cocoa cropping system, with harvesting of cocoa being the main source of cash income. The low input cropping system allowed farmers to engage in other activities to diversify livelihoods. Cocoa plots were interplanted with other crops to be sold at local markets. More time was spent on food crops employing the traditional swidden (slash and burn) cultivation technique. Importantly the low input system meant that family members had time to engage in the important socio-cultural activities that are integral to social wellbeing.

The study found that after cocoa pod borer many famers did not return to cocoa production, with limiting factors being a lack of quality training and support services, the high labour demands which limited labour flexibility across a range of activities, and a reluctance to adapt through adoption of modern farming methods. The latter would mean a radical change in lifestyle and the suspension of indigenous economic and social values that underpin labour, production and social relationships. For instance, such adaptation would require farmers to adopt a savings culture to finance farm inputs. However, historically, cocoa farm income is utilised to meet socio-cultural obligations therefore savings would not always be reinvested into cocoa production. It was found that those farmers who did shift to cocoa pod borer farm management techniques did so with the help of credit facilities.

This study adds to the evidence that smallholder adaptation decision-making is not independent of the environmental, political and socio-economic contexts of farming including the cultural values and historical experiences that have long shaped farming practices. Any adaptation strategy must consider this.

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[64] The Pacific Climate Change Science Programme. (2013). *Changes in Papua New Guinea's Climate*. Retrieved from: http://www.pacificclimatechangescience.org/

[65] Curry, G. N., Koczberski, G., Lummani, J., Nailina, R., Peter, E., McNally, G., & Kuaimba, O. (2015). A bridge too far? The influence of socio-cultural values on the adaptation responses of smallholders to a devastating pest outbreak in cocoa. *Global Environmental Change, 35*, 1-11.

2.5 Case Study: Palau Land to Sea Approach to Climate Change Adaptation[66]

With sea level rise and saline intrusion impacting coastal growing areas in Palau, an ongoing Pacific Adaptation to Climate Change project was instigated that would focus on lowland taro cultivation, upland agroforestry, aquaculture and food processing.

Partnering with local farmers and the Secretariat of the Pacific community, taro production is being tested by identifying varieties which are more resistant to salt. The project is making use of indigenous knowledge in the construction of dikes to reduce saline intrusion to taro crops. To date the project has discovered three new salt-tolerant taro varieties to share across the pacific. Upland farming has not traditionally been practiced in Palau, but this method is being trialled to grow diverse crops such as bananas, lemongrass, soursop, pineapples, papaya, tapioca and taro, through ridge farming to conserve water, intercropping, and the use of organic fertilisers and compost to increase soil health.

The aquaculture project was developed to curb the unsustainable harvesting of mangrove crabs which form an important part of the Palauan diet. The project saw the distribution of 20,000 crablets which were distributed to farmers to rear to maturity and develop sustainable hatcheries expertise.
The project promoted growing and eating local food to increase local food production, reduce reliance on imported foods, and address the non-communicable disease crisis, The project has been training youth in local food processing and cooking, developing new recipes to substitute imported produce with locally grown. Though still in its formative stages, the project is also helping to develop local understanding of climate change adaptation.

2.6 Case Study: Organic Cocoa in São Tomé and Principe[67]

In São Tomé & Príncipe, cocoa constitutes 95% of exports, with the country's unique conditions enabling it to be the world's only producer of the Ciollo cocoa bean – the rarest and most expensive type of cocoa on the market.

In the 1990s however, the cocoa plantations were struggling because of drought, mismanagement, and falling global prices leading many producers to abandon cocoa production. Struggling to make a living, farmers begun to encroach into and clear the biodiversity rich forests of the region. An IFAD supported project sought to change this trend through the establishment of public-private partnerships between local smallholders and organic and fair trade operators in São Tomé and Principe.

The project – titled Participatory Smallholder Agriculture and Artisanal Fisheries Development Programme (PAPAFPA) – commenced in 2003 and would last for 13 years, involving 500 farmers in 14 communities which by the end of the project had benefitted 1800 small farmers, with a total of 2400ha under cultivation for cocoa.

The project went into partnership with Kakoa – a French organic chocolate producer – who ran an assessment on the value of the beans, finding value in the unique cocoa of the region.

[66]Ngiraingas,M.T. (2014). Republic of Palau Food Security. Retrieved from: https://www.sprep.org/
[67] IFAD (2014) *IFAD's approach in Small Island Developing States A global response to island voices for food security*. Rome: IFAD

They committed to buying all organic cocoa produced by smallholders in the region whilst also provided technical and commercial advice alongside IFAD. The smallholders learnt to transition from the production of medium-quality to high-quality cocoa beans.

The organic production of cocoa adjusted traditional cropping methods, which restored and used established shade forests in the region which supplied supplementary crops such as bananas, coconuts, mangos, papaya and breadfruit. The beans were fermented and dried through solar cocoa dryers and smallholders also learnt to minimise waste through the use of correct postharvest storage practices.

A local research station endorsed the cocoa's aromatic qualities whilst an international certifier made sure that the beans produced were in fact organic. Participating smallholders have seen their income increase on average from 25% below the poverty line to 8% above it.

São Tomé & Príncipe's use of cocoa production as a climate change adaptation strategy has highlighted:

- The importance of facilitating local and regional market access through public-private partnerships
- That sustainable production systems depends on healthy ecosystems
- The importance of incentives for agro-biodiversity through value-chains[68].

2.7 Case Study: Castor Oil in Haiti

The seeds of the castor oil plant (ricinus communis) produce an oil that has a range of pharmaceutical and other uses and the plant is well suited to the tropical climate of Haiti. It can withstand drought much better than many other currently cultivated crops. A young female entrepreneur Yve-Car Momperousse received a loan of US$100,000 via the crowd funding site Kiva to expand her Kreyol Essence business that uses the castor oil for producing cosmetics. She intends to be able to expand cultivation in three years to 40,000 trees.

The production of castor oil has the potential to restore depleted ecosystems. A major issue in Haiti is that of deforestation driven largely by its dependence on wood and charcoal for fuel. The castor oil tree is few one of few perennials which is able to grow and repair depleted soils with limited rainfall and minimal agricultural inputs. In addition the production of castor oil will not displace usual agricultural practices but can supplement them by allowing farmers to used mixed cropping methods.

2.8 Case Study: Promoting domestic food production: "Eat Jamaican"

Eat Jamaican: This programme now in its 12th year is aimed at increasing local production and encouraging consumers to make healthy choices by eating local produce. Consumer education is a key part of, the campaign seeking to unite Jamaicans behind the theme *'grow what we eat, eat what we grow*'.

[68]Firmian, I. (nd). *Cacao did they do that? (IFAD) Adapting to climate change through organic cocoa production in São Tomé.* The Global Environment Facility. Retrieved from: https://www.thegef.org

According to the President of the Jamaica Agricultural Society (JAS), Senator Norman Grant, "*with the support of the consumers, farmers, and policymakers, the campaign has enhanced brand Jamaica and improved quality and consistency in supply of agricultural produce*."

He hailed the campaign as a game changer in the Jamaican economy, saying that it has saved the country over US$500 million in food imports since its launch in November 2003.

He noted that the emphasis on increasing production and consumption of local food, through the 'Eat Jamaican' drive is in recognition that "*this is the way to reposition the agricultural sector and the economy on a whole, through a process of integrated rural development that will lead to sustainable food security and food independence*."

Other objectives of the campaign are: to re-establish the fact that Jamaica is an agricultural country; lift the morale of farmers and communities; highlight the various aspects of the country's agricultural sector and celebrate Jamaican cuisine.

2.9 Case Study: Risk Insurance[69]

In 2007, the Caribbean Catastrophe Risk Insurance Facility was formed as the first multi-country risk pool in the world. It was designed as a regional catastrophe fund for Caribbean governments to limit the financial impact of excess rainfall, devastating hurricanes and earthquakes with catastrophe coverage and quickly providing financial liquidity when a policy is triggered.

In 2014, the facility was restructured into a segregated portfolio company (SPC) to facilitate expansion into new products and geographic areas and is now named CCRIF SPC. The new structure, in which products are offered through a number of segregated portfolios, allows for total segregation of risk. In April 2015, CCRIF signed an MOU with COSEFIN - the Council of Ministers of Finance of Central America, Panama and the Dominican Republic - to enable Central American countries to formally join the facility.

CCRIF was developed under the technical leadership of the World Bank and with a grant from the Government of Japan. It was capitalised through contributions to a multi-donor Trust Fund by the Government of Canada, the European Union, the World Bank, the governments of the UK and France, the Caribbean Development Bank and the governments of Ireland and Bermuda, and membership fees paid by participating governments. Since the inception of CCRIF in 2007, the facility has made 13 payouts totalling approximately US$38 million to 8 member governments.

CCRIF helps to mitigate the short-term cash flow problems small developing economies suffer after major natural disasters. CCRIF's parametric insurance mechanism allows it to provide rapid payouts to help members finance their initial disaster response and maintain basic government functions after a catastrophic event.

Since the inception of CCRIF in 2007, the facility has made 13 payouts for hurricanes, earthquakes and excess rainfall to 8 member governments totalling approximately US$38 million to eight member governments as shown below.

CCRIF SPC is registered in the Cayman Islands and operates as a virtual organisation, supported by a network of service providers covering the areas of risk management, risk modelling, captive management, reinsurance, reinsurance brokerage, asset management, technical assistance, corporate communications and information technology.

CCRIF offers earthquake, tropical cyclone and excess rainfall policies to Caribbean and Central American governments.

Sixteen Caribbean governments are currently members of the facility: Anguilla, Antigua & Barbuda, Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, St. Kitts & Nevis, Saint Lucia, St. Vincent & the Grenadines, Trinidad & Tobago and Turks & Caicos Islands. Nicaragua is the first Central American government to become a CCRIF member.

Table 3: CCRIF SPF Payouts 2007-2015

Event	**Country Affected**	**Payouts (US$)**
Earthquake, 29 November 2007	Dominica	528,021
Earthquake, 29 November 2007	Saint Lucia	418,976
Tropical Cyclone Ike, September 2008	Turks and Caicos Islands	6,303,913
Earthquake, 12 January 2010	Haiti	7,753,579
Tropical Cyclone Earl, August 2010	Anguilla	4,282,733
Tropical Cyclone Tomas, October 2010	Barbados	8,560,247
Tropical Cyclone Tomas, October 2010	Saint Lucia	3,241,613
Tropical Cyclone Tomas, October 2010	St Vincent & the Grenadines	1,090,388
Tropical Cyclone Gonzalo, October 2014	Anguilla - Excess Rainfall Policy	493,465
Trough System, 7-8 November 2014	Anguilla	559,249
Trough System, 7-8 November 2014	St. Kitts & Nevis	1,055,408
Trough System, 21 November 2014	Barbados	1,284,882
Tropical Storm Erika, 27 August 2015	Dominica - Excess Rainfall policy	2,400,000
Total for the Period 2007 – 2015		**37,972,474**

2.10 Case Study: Climate Risk Adaptation and Insurance[70]

The Climate Risk Adaptation and Insurance in the Caribbean programme seeks to help vulnerable people adapt to extreme weather events. The programme will design and implement products that combine risk reduction and insurance for low-income groups such as small farmers and day labourers in the region. The products target medium-level weather extremes (specifically, excess rainfall and high winds), which are likely to increase in frequency and intensity with climate change. Thus, the programme will protect the livelihoods of small farmers and day labourers who are affected by a hurricane or a flood by offering micro-insurance and other risk transfer solutions linked with disaster risk reduction and risk management.

Supported by the German Federal Ministry of the Environment and Nuclear Safety (BMU) and receiving funds of €2m for a period of three years, the programme is being implemented within the Munich Climate Insurance Initiative (MCII) by a partnership made up of Munich Re, MicroEnsure and CCRIF. In the next three years, up to three different insurance products will be developed and marketed in at least three countries across the region.

The programme is designed to be a model for the international community. It will share lessons learned with policy makers at the regional and international level. This will inform decision makers about designing approaches to loss avoidance and reduction, on expanding the access of vulnerable people to these schemes and on the potential services and value addition of a regional facility. The programme will demonstrate to leaders from Africa, the Pacific and Latin America whether such an approach would be relevant for risk management in their regions. The programme partners will work with delegates to the UNFCCC to determine what role the international community might play in catalysing similar regional approaches to adaptation, reduction of loss and damage, and insurance.

2.11 Case Study: Overcoming the SPS Risk Assessment Constraint[71]

Sanitary and phytosanitary controls (SPS) on imports of food and agricultural products are legitimately and generally applied to imports by countries to protect human and animal health. In the design and implementation of SPS procedures and controls small farmers in SIDS can inadvertently be disadvantaged.

After numerous delays and total investments of US$269 million, St Vincent and the Grenadines ***Argyle International Airport*** is scheduled to open at the end of 2015. It is hoped this will open up the possibility for the development of new non-traditional horticulture and floriculture exports to the EU.

However, under current EU rules it would take a minimum of three years for a track record of exports to be established on which a risk assessment can be based. Even then there may be insufficient flights to hit the 200 consignment threshold required for a risk assessment to take place.

[70] The Caribbean Catastrophe Risk Insurance Facility (nd). Climate Risk Adaptation and Insurance in the Caribbean, Project Brochure No. 2. Retrieved from: http://www.ccrif.org

[71] This is an extract from unpublished research by Dr Paul Goodison into the impact of the St Vincent and the Grenadines Argyle International Airport

The risk assessment is important since farmers would, in its absence, face SPS inspection charges up to 400 times higher than established exporters of the same product that have "passed" the risk assessment.

This needs to be seen in a context where on the main potential EU export market, the UK, the government has moved to full cost recovery for all SPS inspections. This has served to increase the costs of SPS inspection fees in the last three years by 236%.

Under current EU rules, this situation of higher SPS charges would continue to prevail until a sufficient number of consignments have been sustained annually for a three year period and a favourable risk assessment has been carried out. Depending on the frequency of flights to EU markets, this situation of higher SPS charges could continue to prevail indefinitely, regardless of the effectiveness of the local SPS controls system set in place, if the annual number of consignments remained below 200. Farmers are unlikely to get to that number of shipments annually and there probably will not even be that number of flights to the UK.

This adds to the difficulties faced by small island states in seeking to diversify exports away from traditional export commodities where the value of traditional trade preferences have been severely eroded by internal EU reforms (e.g. bananas and sugar).

Against this background a case can be made for ***placing a 'ceiling' on SPS fees charged small island states seeking to diversify exports away from traditional export commodities***. Such a 'trade support facility' could be maintained in place until such time as:

a) the volume of trade is sufficient to enable a risk assessment to be undertaken; or

b) the minimum number of consignments requirements has been reviewed to accommodate the realities of small island states with limited production and export capabilities and limited direct transportation links to EU markets.