A preliminary case study assessment of **climate change impacts and risks for cocoa farming** in Guadalcanal Plain, Solomon Islands

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Assessment summary

Growing cocoa is a valuable industry for smallholder farmers in the Guadalcanal Plain, Solomon Islands, and more generally provides a significant national social and economic benefit. The climate of Guadalcanal Plain is currently suitable for growing cocoa, although there are various climate impacts on the industry, including:

- Periodic flooding that damages farms (e.g. flood in 2013)
- Tropical cyclones, noting that the main impact is the flooding (so is connected to the first risk) while wind speed has little negative impact
- Heavy rainfall that damages flowers and subsequent levels of fruiting on the trees, and also causes damaging ('black pod') fungal disease outbreaks – annual rainfall and associated humidity is often high enough for the fungal outbreaks to be severe, and heavy rainfall and humidity promotes the spread of fungus between cocoa pods.

These risks have the potential to become worse in the future under a changing climate, and other new climate-related risks may also arise.

A preliminary assessment of climate change projections for the Guadalcanal Plain found:

- Average annual daily maximum temperatures in the Guadalcanal Plain could be above the 30–32 °C threshold for growing cocoa by about 2050, possibly sooner under a worst-case scenario. Beyond 2050 and out to 2090 there is a strong effect of emissions scenarios – under a low emissions scenario there is some risk of becoming too warm, but under a high scenario there is a very high risk of becoming too warm.
- Average annual rainfall projections are uncertain: climate change may lead to an increase in rainfall but there may also be little change. This means according to some projections that parts of Guadalcanal may become less suitable by being too wet under a high emissions scenario by the end of the century, but according to other projections they may not. The most valid model projections for Guadalcanal Plain requires further evaluation.
- The conditions for severe fungal disease are very unlikely to go away – suitably high annual rainfall years and extreme (heavy) rainfall events that spread the spores are likely to continue through the century, and could well become more severe under the worst-case emissions scenario.
- The incidence of localised flooding may increase in average intensity and/or frequency over the longer term, but with high year-to-year and decade-to-decade variability.

Other climate changes may occur, including changes to humidity and solar radiation. Also, there may be climate impacts on not only the growing conditions but also the supply chain and the relative advantage of the Solomon Islands compared to other countries (noting that cocoa is a viable and, in many cases, expanding industry sector in many countries around the world subject to various ambient climate conditions, both current and future).

The combination of all these risks is likely to cause some ongoing, and in some cases increasing, challenges to the industry in the period beyond 2030, and especially after 2050 if we continue to follow a high emissions scenario. These challenges will need to be managed through various farm and industry-scale climate adaptation and associated risk mitigation measures in order to build resilience and sustainability for smallholder cocoa farmers in the Guadalcanal Plain.

There are several ways in which the industry can become more resilient to challenges such as climate risk, including introduction of new farm management and associated cultivation and harvest practices, farming in new areas, changing the planting material and stock to more tolerant varieties, and diversifying the farming system to incorporate other products. Further analysis of adaptation options can be found in *Vulnerability of Pacific Island agriculture and forestry to climate change* (Taylor et al. 2016).

Background[1]

Socioeconomic context

Cocoa has been grown in Guadalcanal since the late 1950s and has gone through several periods of development and expansion.

Today, the cocoa industry in the Solomon Islands is entirely smallholder based. It is estimated that more than 20% of the population grows cocoa. In terms of geographical coverage, estimated at 10,000–15,000 ha, it is the second most important cash crop after copra. Cocoa is grown in all provinces except Rennell/Bellona. Highest production is in Guadalcanal, followed by Malaita and then Makira. Cocoa is the third most important export commodity (behind logging and fishing) and was the least affected by the social unrest in Solomon Islands between 1999 and 2003.

The Solomon Islands cocoa industry is robust because:

- Cocoa is a family-friendly crop mostly grown by smallholders with low overhead costs as part of a mixed cropping system.
- There are reasonable economic returns to smallholder farm labour costs, even when market prices are relatively low.
- There is a competitive domestic marketing system together with strong export market demand.
- Increases in transportation and other operating costs can be absorbed by smallholder farmers due to its relatively higher unit market value.

Cocoa has been identified by the Solomon Islands Ministry of Agriculture and Livestock (MAL) as a product with potential for economic development for smallholder farmers. In relation to potential impacts from climate change, the MAL and farmers have expressed significant interest in improving their understanding of the future climate in their region along with the impacts this may have on their crops, products and lifestyles. There is limited information currently available specifically for the impacts of the changing climate on cocoa farming in the Solomon Islands.

Cocoa production and current climate vulnerability

Climate factors affecting the growth of cocoa include:

- Rainfall: total annual rainfall, rainfall distribution, the intensity of rainfall events (particularly on flowering) and the relative dryness and duration of the dry season are important as cocoa is very sensitive to water stress (both too much and too little).
- Humidity: high relative humidity (>70%) is conducive to proliferation of black pod (*Phytophthora palmivora*) fungal disease.
- Winds: regular strong winds are unsuitable for cocoa.
- Solar radiation (sunlight): cocoa needs around 75% sunlight as exposure to strong sunlight will reduce tree carbon dioxide assimilation.
- Temperature: cocoa growth and flowering is directly related to air temperature, with the best range for cultivation 25–30°C.

Black pod is a serious plant pathogen in Guadalcanal that spreads through rain splash and humid conditions, as well as via insect vectors.

The major cropping season is April to July (with flower and fruit set in October to December of the previous year). There is also a minor harvest from October to December (with flower and fruit set around April to December). Extreme rain events can damage flowers and subsequent fruit set, and adequate dry seasons (for solar drying) are needed to process the harvested cocoa for quality beans.

About this case study

As part of an Australian Government funded project[2] designed to facilitate outreach of existing Pacific climate change science data and information to sectoral policy makers, the Solomon Islands Meteorological Service used their expertise, along with the support of the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Secretariat of the Pacific Regional Environment Programme (SPREP) to work with the MAL and cocoa farmers to undertake a preliminary climate vulnerability and risk assessment on cocoa farming in the Guadalcanal Plain. The assessment included both back-office collation and analysis of data and information as well as a subsequent stakeholder workshop in Honiara during August 2017.

The assessment has three goals:

1. Awareness raising – the results can be used to start discussions and raise awareness of the potential climate change impacts on cocoa farming for stakeholders in the Solomon Islands.
2. Climate change impacts – provide decision makers with a preliminary illustration of the potential impact of climate change on the growing conditions of cocoa; to be used as input to a more detailed climate change risk assessment, adaptation planning and associated analysis of adaptation options and action planning.
3. Motivating mitigation – illustrate the effect of emissions scenarios, to demonstrate to the government the benefit of emissions reductions for purposes of informing international (UNFCCC) negotiations.

[1] Contributions from John Konam, pers. comm.

[2] Science-Based Climate Information Services in the Pacific: Communicating New Findings, Supporting Application and Developing In-Country Capacity, CSIRO 2017

Searches of the literature and engagements with key stakeholders identified four key climatic factors relevant to cocoa farming:

A. Temperature envelope for growing cocoa

B. Average annual rainfall and dry season rainfall

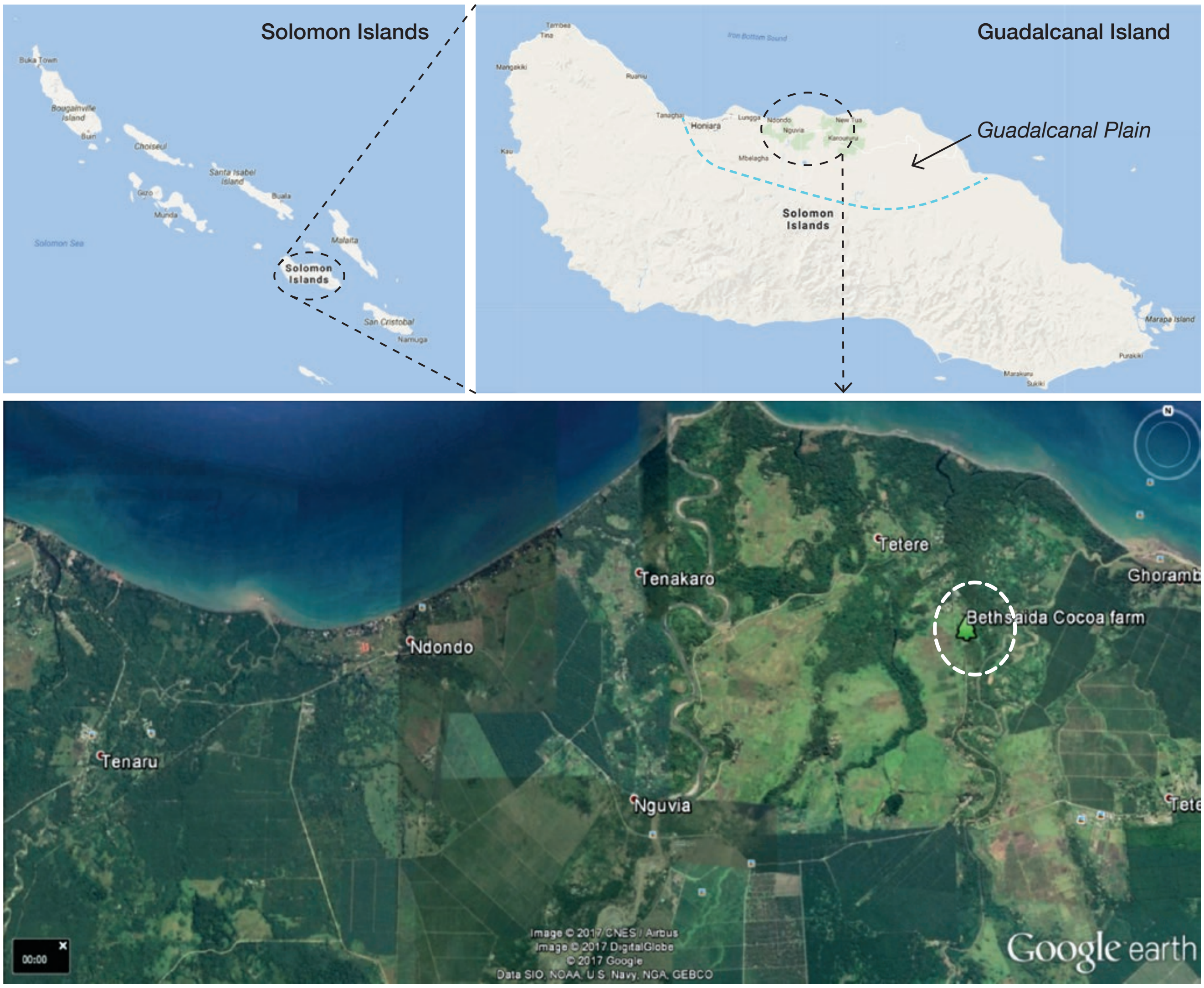
C. Fungal disease *Phytophthora palmivora* (related to high rainfall)

D. Extreme rainfall events, flooding and dry spells

This case study examined these factors with regard to potential climate change impacts and the future of the cocoa industry in Solomon Islands. While these factors show some of the potentially most important direct impacts from a changing climate (and therefore demonstrate the value and principles of undertaking a climate risk analysis), there are many other climate and non-climate related issues that need to be assessed before the overall climate change risk can be understood. These include:

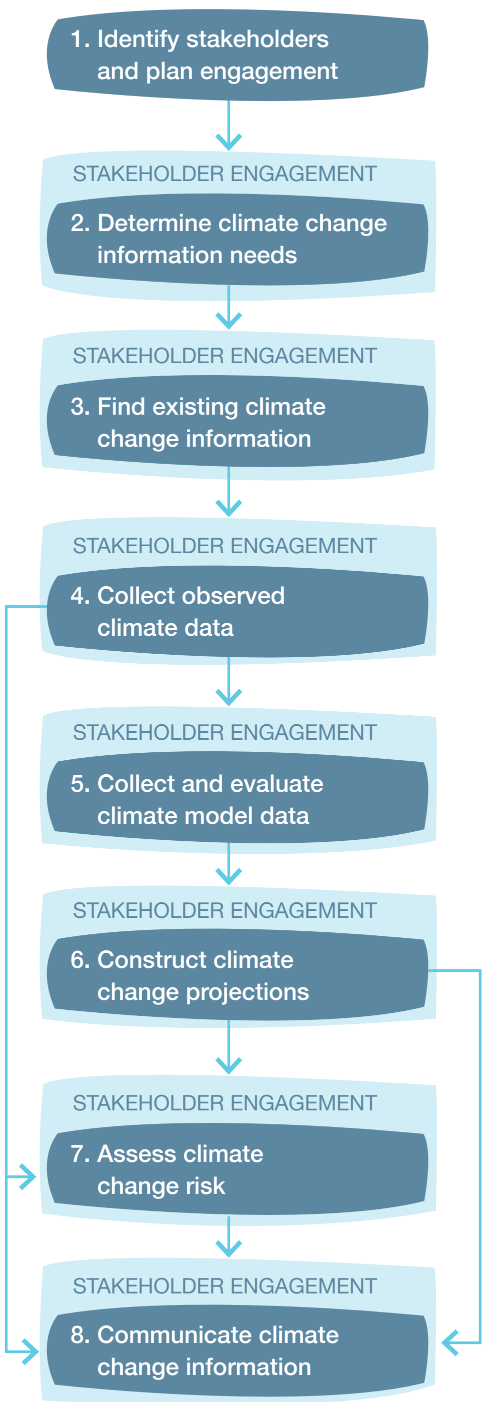
- solar radiation and humidity
- cocoa borer and other pests and diseases
- farm management practices and the cocoa supply chain (processing, storage, transport, etc.)
- the relative advantage or disadvantage of the Solomon Islands cocoa industry compared to production in other developing countries (Papua New Guinea, Ghana, Ivory Coast and others)
- a range of other relevant socio-economic factors impacting on the practices, lifestyles and wellbeing of smallholder cocoa farmers in the Guadalcanal Plain.

Figure 1. Map of the Solomon Islands, Guadalcanal Island and the Guadalcanal Plain on the north side of Guadalcanal. The Bethsaida cocoa farm (circled) was visited during the assessment. (Map from Raymond Vava, MAL)



Process overview

This preliminary (also referred to as 'rapid') assessment was carried out as part of the August 2017 workshop in Honiara using draft guidelines designed to assist sectoral stakeholders in the Pacific develop and apply climate change data and information for risk assessments. The eight-step process is briefly summarised below. Detailed information is available in the guideline document[3], which is available at **www.pacificclimatechangescience.org**. The workshop also served the purpose of trialling and demonstrating the use of the new guidelines for other sectors in Solomon Islands as well as for other Pacific Island Countries.



Identifying and engaging stakeholders is critical to the success of any risk assessment. The implementation of the stakeholder engagement plan is an important aspect of each of the subsequent steps in this process.

It is important to be clear about the purpose of the activity, as well as identifying important climate change systems and thresholds, variables and relevant time frames and steps.

Existing climate change knowledge is used to provide context for new analyses (go to step 4), to undertake risk assessments (go to step 7) and to form the basis of communication products (go to step 8).

Observed climate data puts climate projections (developed in step 6) into the context of what the climate has been like in the past and is like now.

Climate model outputs are used to generate climate change projections, but with many model outputs and datasets available, it is important to select the most appropriate for the assessment being undertaken.

Application-ready data from climate change projections are constructed by applying climate model projections to observed data, either as changes in average climate or as number of days over or under a threshold. Projections and associated application-ready data can be used in a risk assessment (go to step 7) or for communication purposes (go to step 8).

There are a number of approaches to undertaking a climate change risk assessment, but all involve identifying, analysing and evaluating the risk.

Effective communication of climate change information requires an understanding of the objective(s) of the risk assessment and the target audiences, so the information is conveyed in a way that is useful and relevant (and so more likely to be remembered and acted on).

[3] *Developing climate change information for the Pacific: guidance material to raise awareness and facilitate sectoral decision-making using science-based climate change information and services* (CSIRO and SPREP, 2017)

STEP 1
Identify stakeholders and plan engagement

The project team engaged with a range of stakeholders and experts at each step of the assessment process. Engagement activities included:

- A stakeholder workshop in Honiara (August 2017)
- A field visit to a working cocoa farm and interviews with growers (August 2017)
- Email contacts with researchers and cocoa farming stakeholders in Solomon Islands (January–August 2017).

The key stakeholders for this case study included:

- the Solomon Islands Ministry of Agriculture and Lands, including policy makers and extension experts
- Solomon Islands Meteorological Service
- Cocoa farmers in the Guadalcanal Plain
- Secretariat of the Pacific Regional Environment Programme
- CSIRO Climate Science Centre.

This engagement was essential in assessing and identifying which climate variables are more important for cocoa farming than others, and led directly to some changes in identification and interpretation of the relevant research data and information to inform the assessment, including:

- The impact of floods – the assessment initially didn't look at floods, but the importance of this impact became clear from interviewing cocoa farmers about their experience and observations on climate and weather in the past.
- Fungal disease conditions – the assessment determined that not only does high annual rainfall create the conditions for fungal disease to grow, but heavy rainfall on the cocoa pods increases the spread of fungal disease.
- Flowering – it was mentioned by cocoa farmers during the field visit that heavy (extreme) rainfall events often destroy the flowering buds resulting in lower cocoa fruit yield.

Other important considerations that were identified through stakeholder engagement were:

- The list of potential adaptations including practical off-farm/supply-chain options such as the farmer benefits from having a warehouse away from the farm to safeguard harvested crops during floods.
- Ensuring the usefulness of the final risk assessment outputs at national level – it was identified that the primary target group is MAL decision makers for planning purposes, who then have the responsibility for using the information to raise awareness with cocoa growers. Hence, two different reports were needed to be prepared to disseminate information from the assessment to the full range of 'next' and 'end' users.
- The need to develop capacity for sectoral decision makers and for farmers at a local community scale on climate change, extremes and variability, and how to use climate change knowledge as a decision-making tool.
- A detailed assessment is ultimately required to achieve a more comprehensive climate adaptation response, but this rapid assessment approach is appropriate as the entry point.

STEP 2
Determine climate change information needs – the research questions

As previously noted, searches of the literature and engagements with key stakeholders identified four key factors relevant to cocoa farming and climate:

A. Optimal temperature envelope for growing cocoa

B. Average annual rainfall and dry season rainfall

C. Fungal disease *Phytophthora palmivora* (related to high rainfall)

D. Extreme rainfall events, flooding and dry spells

To study these four factors, we need to show the 'envelope' of the average climate conditions for growing cocoa on the Guadalcanal Plain, and how it could change in the future. We also want some general information about projected changes to heavy rainfall and floods.

For our four analysis areas, the research questions are:

- How will the temperature conditions for growing cocoa be affected under future climate change scenarios, and could parts of Guadalcanal become too warm for growing cocoa?
- Under future climate change, could the average annual rainfall become too wet, or could there be too many dry months for growing cocoa in Guadalcanal?
- Under future climate change, could the fungal disease become a greater or lesser threat for growing cocoa in Guadalcanal than it is currently?
- Could extreme rainfall events and/or flooding from tropical cyclones or other sources become more frequent or more intense on average?

[4] See: http://www.pacificclimatechangescience.org/

STEP 3
Find climate change information

A literature and internet search reveals that there is some useful general information about cocoa farming in the Solomon Islands, including a chapter in the recently published book by the Secretariat of the Pacific Community (SPC) on climate change and agriculture (McGregor et al. 2016). A detailed analysis of the climate envelope for cocoa in Africa has been done previously (e.g. Läderach et al. 2013). However, there are no detailed previous studies of the optimal temperature envelope for cocoa growing specifically for Guadalcanal; so we need to do new analysis. The temperature and rainfall thresholds of the climate envelope for cocoa growing in general are fairly well known. According to McGregor et al. (2016) the relevant climate conditions are:

- Annual average daily maximum temperature (Tmax) up to 30–32 °C
- Annual average daily minimum temperature (Tmin) up to 18–21 °C
- Annual average rainfall of 1250–3000 mm (1500–2000 mm is optimum)
- No more than three months of rainfall of less than 100 mm/month per year
- Fungal disease is most severe when annual rainfall is above 2500 mm.

To fully assess the risk with flooding we can't just use the average climate, rather we need detailed daily rainfall datasets and hydrodynamic and geomorphological information about localised floods (e.g. the shape of catchments and flood plains, drainage capacity and rates of run-off, etc.). As this case study is based on a rapid assessment of change in flood risk we are only using existing and available data and information, with no new analysis.

To this end, previous work for the Solomon Islands (Australian Bureau of Meteorology and CSIRO 2014[4]) has found:

- Extreme wet days are projected to increase, where the 1-in-20-year event could become a 1-in-9-year event under moderate climate change (RCP2.6), or a 1-in-4-year event under a worst-case emissions scenario (RCP8.5) by 2090
- Extreme wet seasons may increase (e.g. extreme swings of the El Niño Southern Oscillation)
- Tropical cyclones vary a lot decade to decade, but over the long-term the average number of cyclones may decrease, but more of the ones that do occur might be intense.

All these results suggest that flooding will continue to vary a lot year to year and decade to decade, but over time the risk of floods and extreme rainfall events is likely to increase during this century, especially under a high emissions scenario.

STEP 4
Collect observed climate data

Growing conditions are highly localised, so high-resolution 'surfaces' of the average climate that account for factors such as elevation (higher ground is cooler than sea level) are needed. Only recent average conditions are needed rather than time series or specific information about extreme events. High-resolution climate surfaces for each month are available from Worldclim (Version 2) at **www.worldclim.org**.

These data provide climate averages for the 1970–2000 period. The high-resolution version has ~1 km^2 resolution. It uses weather station data and satellite data as input and fills the gaps between data points by using statistical techniques (thin-plate splines and covariates using elevation). All temperature datasets rely heavily on high-quality weather stations with good coverage. The Solomon Islands is not well covered by stations, so the accuracy of the temperature data will not be as high as in some other places. For more information see Fick and Hijmans (2017).

Daily maximum temperature for the Solomon Islands is currently under the limit of 32 °C (Figure 2). Average annual rainfall is under the 3000 mm limit except in the mountains, but the average rainfall is above the 2500 mm limit for fungal disease in many places (Figure 3). The Guadalcanal region has between zero and four months with less than 100 mm of rainfall, on average (dry years have more months, wet years have fewer months under the threshold). In an average year, the only area that has four or more months with less than 100 mm is a small area of coast near Honiara.

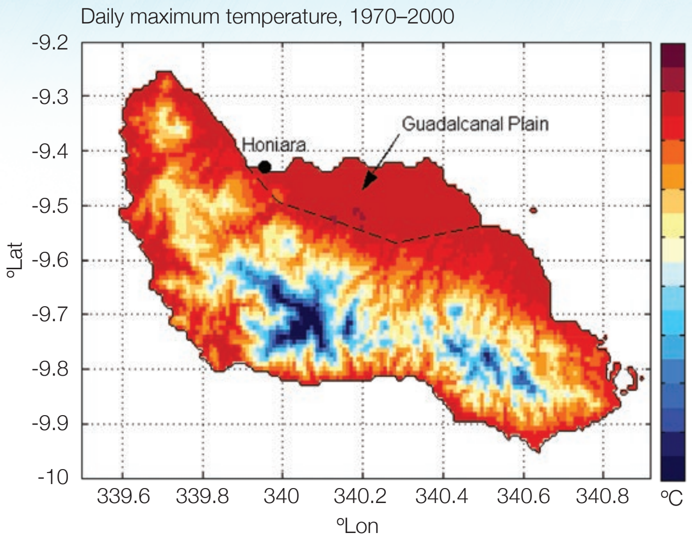
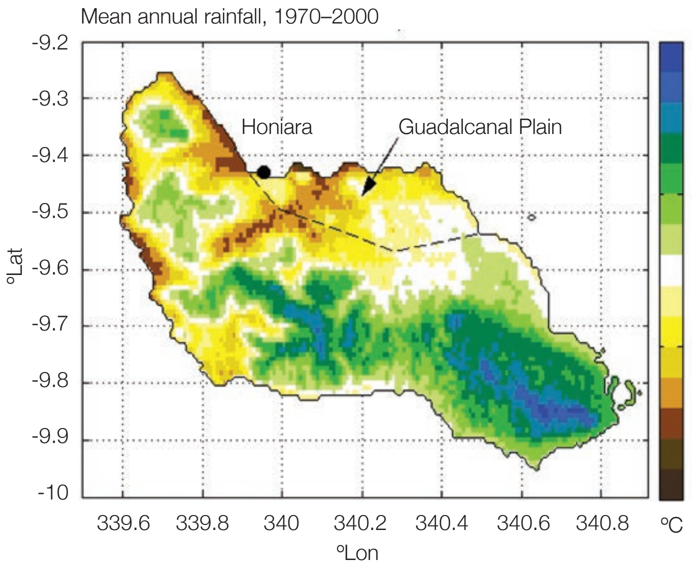


Figure 2. The average annual daily maximum temperature of Guadalcanal in 1970–2000 (left) (source: www.worldclim.org). The panel to the right shows the areas that are below the 32 °C limit (green means suitable).



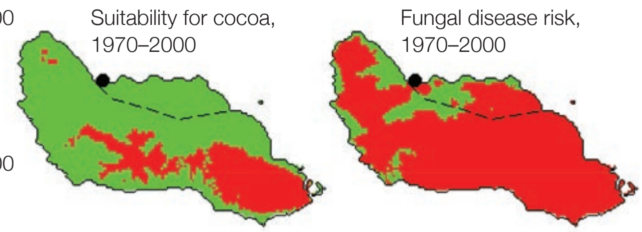


Figure 3. Average annual rainfall in Guadalcanal in 1970–2000 (left) (source: **www.worldclim.org**). The middle panel shows the area that is currently within the 1250–3000 mm growing limit (green) and the area that is too wet (red). The panel to the right shows the areas where the average annual rainfall is below (green) or above (red) the 2500 mm limit for severe fungal disease outbreaks.

STEP 5
Collect and evaluate climate model data

For the analysis of temperature and rainfall 'change factors' are needed – the estimated change in the climate between a baseline period and future periods. These change factors are needed for average annual daily maximum temperature, average annual rainfall and for each month to calculate the number of months with <100 mm. These data are needed for all the emissions scenarios (RCPs) to illustrate the risk under a low emissions scenario compared to higher emissions scenarios to show the benefit of mitigation. Guadalcanal is fairly small, so a single change factor for the whole island is enough. There is no high-resolution downscaling available to use for Solomon Islands, so this assessment has just used the available set of CMIP5 global climate models as input (Australian Bureau of Meteorology and CSIRO 2014).

Based on these data, the ranges of change meet all these requirements. Data from Australian Bureau of Meteorology and CSIRO (2014) use a group of CMIP5 global climate models that have been evaluated and use only the acceptable models – three unsuitable models were rejected (Grose et al. 2014).

Data from Australian Bureau of Meteorology and CSIRO (2014) presents ranges of projected change that are plausible, and values are available for all the RCPs for various time periods. The ranges of projected change are noted in Figures 4 and 5. The lower limits (cold) are not a problem in the Solomon Islands and are very unlikely to be a problem in future, so the focus is on the upper (warm) limit.

STEP 6
Construct climate change projections

For the analysis of future temperature and rainfall conditions in Solomon Islands we can apply the projected change to the observed dataset using a simple scaling approach – adjusting the observed climate surface up or down using the change factor from projections.

The absolute change in temperatures (°C) is applied using an addition:
current + change = future

The proportional change in rainfall (%) is applied using a multiplication:
current × %change = future

Two change factors are applied for each time period and each RCP: the lower end of the projected range, and the upper end. For example, if the average daily maximum temperature in a spatial grid cell is 29.5 °C and the range of projected change is 1.5–2.8 °C, then the future value of that cell is 31–32.3 °C. Following this, the values that are over a threshold are found. The cell is categorised into one of three categories:

1. The range of future conditions is below the threshold.
2. The range of future temperature crosses the threshold (the high value is over, the low is under).
3. The range of future temperature is all above the threshold.

For the example in this case study, the temperature range of 31–32.3 °C for a threshold of 32 °C would be in category 2 (the low end of the range of 31 °C is below the threshold of 32 °C, and the high end of 32.3 °C is above it). Note that the baselines are slightly different between the observations and the projections: 1970–2000 for Worldclim observations, and 1986–2005 for the Australian Bureau of Meteorology and CSIRO (2014) projections. The observed data or the projections can't be adjusted so the results are used as they are and this point is communicated in the results.

STEP 7
Assess climate change risk

A. Temperature

The daily minimum temperature results are similar to daily maximum for the Solomon Islands, so just the daily maximums are shown here. The threshold is fairly broad (30–32 °C) and some of the current averages are quite close to this threshold, so the exact choice makes a big difference to the results. Here the top of the range is used: 32°C. The areas where the projected daily maximum temperature range crosses the temperature threshold for cocoa, and where it is above the threshold for three RCPs and three time periods are shown in Figure 4.

Looking at this plot in terms of climate vulnerability and risk, the areas in green (temperature range below the threshold) can be interpreted as being fairly low risk of being limited by temperature, areas in orange as potentially at risk, and red areas as being very high risk of being unsuitable. In the Guadalcanal Plain area, the effect of the emissions scenario is very important. Under a very low scenario (RCP2.6), Guadalcanal Plain is possibly too warm if the high end of the model range is followed. Under the other scenarios (RCP4.5 and RCP8.5), temperature could become an important limiting factor to cocoa growing by 2050, and certainly by 2090, even if the lower end of the

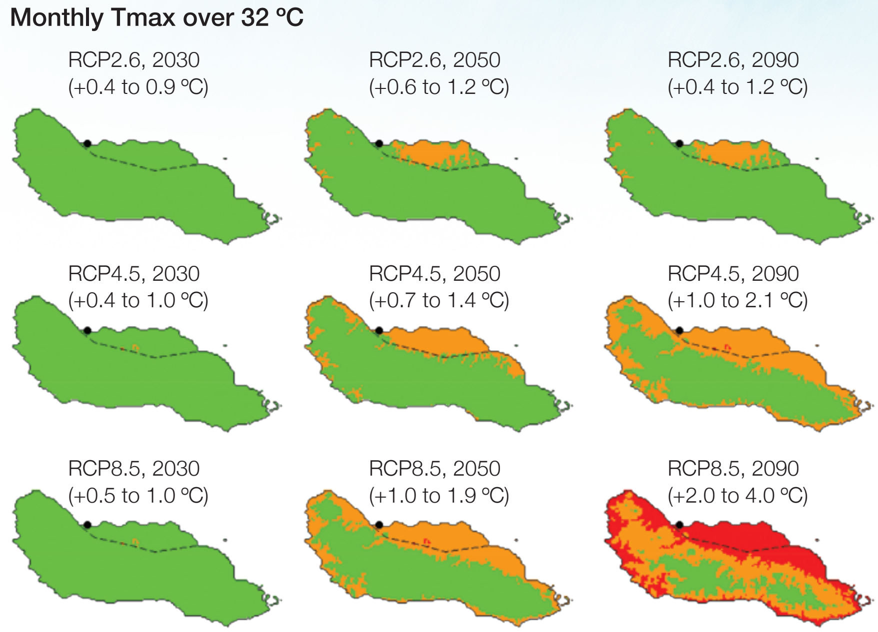


Figure 4. The annual average daily maximum temperature of Guadalcanal: categorisation of regions in relation to the 32 °C threshold for growing cocoa in 2030, 2050 and 2090 under different RCPs (projected ranges of changes in temperature noted in brackets). Green shows the range is all below threshold, orange shows that the range crosses the threshold, and red shows the range is all above the threshold. Dashed line indicates the Guadalcanal Plain.

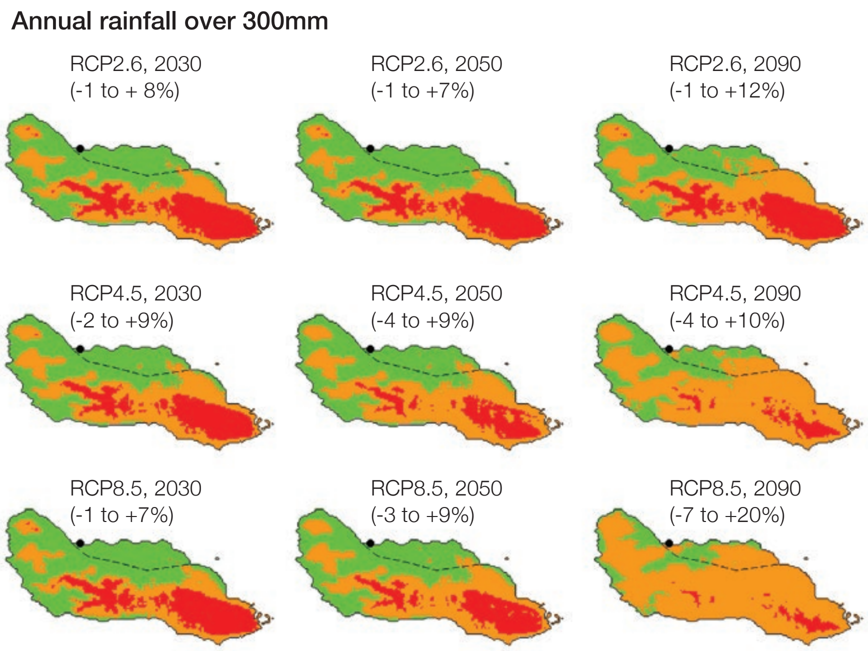


Figure 5. Average annual rainfall of Guadalcanal: categorisation of regions in relation to the 1250–3000 mm limits for growing cocoa in 2050 and 2090 under different RCPs (projected ranges of changes in rainfall noted in brackets). Green shows the range is all below threshold, orange shows that the range crosses the threshold, and red shows the range is all above the threshold. Dashed line indicates the Guadalcanal Plain.

model range is followed. This shows that there is a clear benefit of mitigation by reducing emissions – it makes the difference between a possible risk and a fairly definite risk that the cocoa farming industry in Solomon Islands becomes unviable in the future. Also, the risk prior to 2050 appears low, so it seems that temperature is unlikely to be a limiting factor to the industry in the near future.

This temperature analysis also provides insights into the potential adaptation options for the industry later in the century, noting more elevated areas are less likely to become too warm for growing cocoa. Possible adaptation responses may therefore include:

- Identifying whether cocoa production in the Guadalcanal Plain could be expanded further up the adjacent slopes of the catchment to follow the change in the optimal temperature growing envelope
- Investigating changes through selective breeding to the crop variety could develop higher temperature tolerance strains of cocoa for production in existing farm areas of Guadalcanal Plain.

B. Rainfall

There is a range of projected changes to average annual rainfall in Solomon Islands – from little change through to increase (Australian Bureau of Meteorology and CSIRO 2014). This range of possibilities means that there is also uncertainty about whether the risk of Guadalcanal becoming too wet will increase or decrease. This uncertainty is seen as a decrease in the green and red areas, but an increase in the orange area in the plots through time and for higher RCPs (Figure 5).

The increase in the orange area shows that a greater area may become too wet or too dry for growing cocoa, but there is a lack of agreement in the projections on this. The region of Guadalcanal Plain where cocoa is now grown shows relatively lower potential risk than other areas of Solomon Islands (i.e. which remains green), except in 2090 and especially under RCP8.5. This suggests that average annual rainfall might not become a limiting factor in future.

It must be acknowledged that rainfall projections have lower confidence compared to temperature projections, so changes outside the projected range are possible. This means that specific adaptation strategies with limited flexibility to deal with this uncertainty in climate risk are probably not appropriate, rather more flexible strategies are preferred together with ongoing monitoring and assessment of the issues.

C. Fungal disease

Rainfall projections are uncertain but suggest that average annual rainfall may stay similar to today or may increase in the long term but is less likely to decrease strongly. Since Guadalcanal Plain already experiences risks from fungal disease partly due to existing rainfall patterns, then these rainfall projections suggest that this risk is very likely to remain, and possibly could become more intense or affect more areas in the future. This means that the industry is likely to continue needing to manage fungal disease using techniques such as pruning into the future, especially in wet years.

D. Extreme rainfall, flooding and dry spells

At the dry end of rainfall projections under a high emissions scenario by 2090, there could be a small increase in the average occurrence of dry spells (runs of more than three months below 100 mm rainfall). Under these circumstances the average climate could feature these conditions in a small area in western Guadalcanal Plain (not shown), but this is only a possibility under the strongest change case, and it is not a very likely case.

The results of the average climate don't show the effect of bad years, which needs an analysis of variability including dry years and wet years, and accounting for projected changes to rainfall variability as well as change to the average. Data from Australian Bureau of Meteorology and CSIRO (2014) shows that for the Solomon Islands meteorological drought (an index based only on rainfall) is projected to decrease in frequency and duration, with possibly the exception of extreme droughts, which might increase. This suggests that the projected change in average conditions is not likely to lead to an increase in risk to cocoa growing from dry months but increases in extreme events or extreme drought years may have important impacts. The frequency and intensity of extreme rainfall events are projected to increase in the Solomon Islands (Australian Bureau of Meteorology and CSIRO 2014). Extreme wet days are projected to increase, where the 1-in-20-year event could become a 1-in-9-year event under moderate climate change (RCP2.6), or a 1-in-4-year event under a worst-case emissions scenario (RCP8.5) by 2090. Under these conditions, cocoa farmers in Guadalcanal Plain will likely experience increased risk from localised flooding and damage to plant flowering.

STEP 8
Communicate climate change information

The first step of communicating the results of this case study is to identify the intended audience. For this assessment, the primary audience is MAL. The secondary audience is the farmers and industry stakeholders that MAL deals with.

The main communication product to present the assessment results is this case study report, intended primarily for MAL. A fact sheet is also being prepared that MAL can use in their communication with farmers and industry stakeholders.

Results of this assessment may also be presented in other ways, as appropriate, including:

- Briefings to decision makers, presentations at meetings and conferences
- Media releases
- Scientific paper outlining the results (to add scientific credibility to the findings)

In addition, the results of this preliminary assessment can be used as input to a full, more detailed and comprehensive risk assessment to be undertaken for the cocoa or broader agricultural sector in Solomon Islands at some future date.

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