



DEMOCRATIC REPUBLIC OF TIMOR LESTE
MINISTRY OF AGRICULTURE AND FISHERIES
Seeds of Life - PO Box 221, Dili Timor-Leste



Seeds of Life
Fini ba Moris

‘Improved food security through increased productivity of major food crops’.

Climate Change Research in Timor Leste

Summary Release, 2013

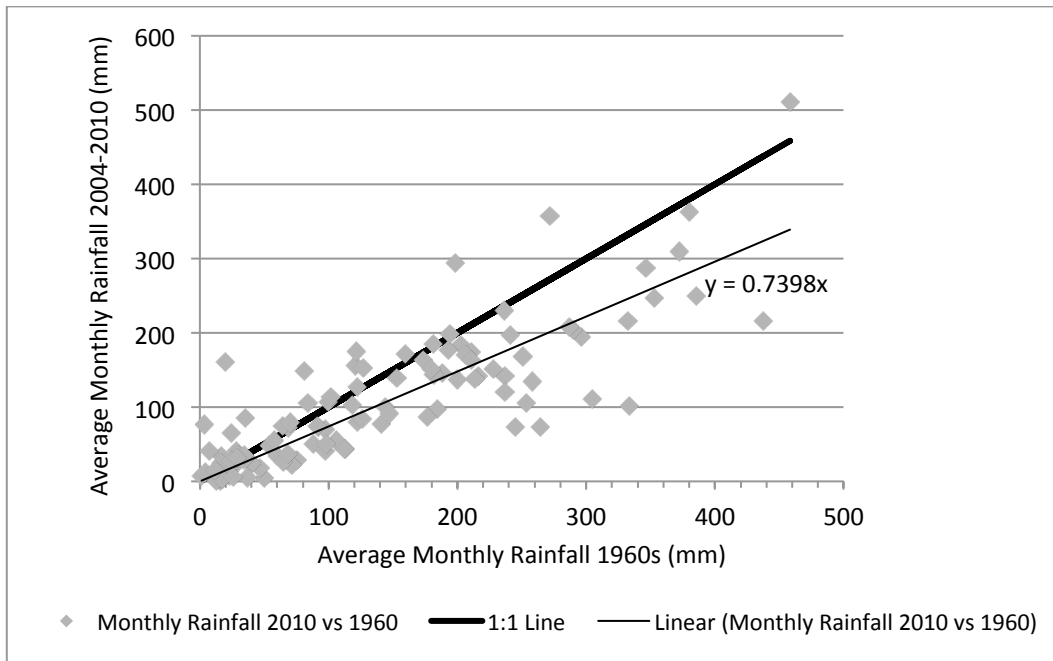
The current understanding around climate change states that the temperature is rising and the rainfall fall will increase in wetter areas but decrease in drier areas. Climate modelling by CSIRO based on an A2A (high emissions scenario) from data released by the International Panel for Climate Change (IPCC) Report 3 showed that the temperature in Timor Leste would increase by 1.5°C and rainfall would increase by 0-10% in 2050. (Molyneux, 2012) In 2007, IPCC released their 4th report which supported a 1.5°C change in temperature but rainfall predictions were modified to not changing or a slight decrease in Timor Leste. (Aust. BoM, 2011) The following research considers how climate has changed from the 1960s using temperature data (Ferreira, 1965) and rainfall data (Santika, 2004) collected during the Portuguese period compared to 2004-2012 using data collected by Agro-meteorology, Land use and Geographic Information Systems (ALGIS) department in the Ministry of Agriculture (Mau, 2013). Current data was used from 9 automatic weather stations established at Ainaro, Maubisse, Maliana, Aileu, Fuiloro, Dare, Betano, Manatuto and Viqueque.

During the last 50 years it was found that the average monthly rainfall across the 9 sites has decreased by 30.7mm. This is a 19% decrease in rainfall. The average maximum temperature increased to 1.8°C and the average minimum temperature has remained unchanged when compared with temperatures in the Portuguese period. An exception to the trend in warming was that the minimum temperatures during June were cooler than historical minimums. In Aileu, minimum temperatures were significantly lower than the general trend. For the other 8 sites, minimum temperatures rose on average by 0.5°C.

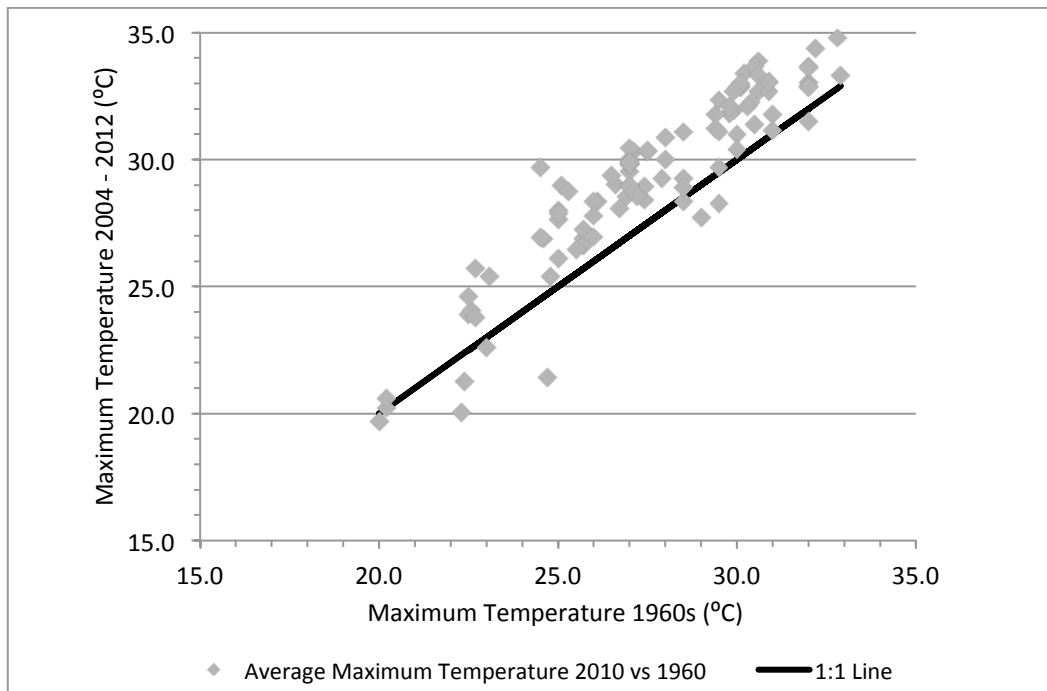
The change in rainfall and temperature at the 9 sites with different elevations can be seen in Table 1. Results show that changes in rainfall and temperature are not consistently the same across all sites. In Maubisse at an elevation of 1406m above sea level, the maximum temperature increased by 0.5°C, the minimum temperature decreased by 0.4°C and rainfall decreased by 31%. By comparison, in Manatuto on the north coast, the maximum temperature increased by 2.6°C, the minimum temperature increased by 0.2°C and rainfall increased by 23%. The change in climate is site specific especially in Timor-Leste which has large variation in climate and topography.

Location	Alt.	1954-1974			2004-2012			Change in Climate			
		Tmax (°C)	Tmin (°C)	Annual Rain (mm)	Tmax (°C)	Tmin (°C)	Annual Rain (mm)	Δ Tmax (°C)	Δ Tmin (°C)	Δ Ann. Rain (mm)	Δ Rain (%)
Aileu	990	26.0	18.4	1726	28.3	15.0	1383	2.3	-3.3	-343	-20%
Ainaro	809	25.8	16.2	2604	27.8	17.5	2212	2.0	1.3	-392	-15%
Betano	3	-	-	1329	31.7	22.0	1128	-	-	-201	-15%
Dare	492	27.0	21.3	1572	30.1	21.8	1073	3.1	0.6	-499	-32%
Lospalos	394	27.8	19.1	1905	28.9	20.2	1213	1.1	1.0	-693	-36%
Maliana	298	30.9	20.7	2053	33.0	20.9	1315	2.1	0.2	-738	-36%
Manatuto	4	30.1	22.5	570	32.7	22.6	698	2.6	0.2	128	23%
Maubisse	1406	22.3	14.7	1500	22.8	14.3	1031	0.5	-0.4	-469	-31%
Viqueque	108	30.9	21.2	1617	31.3	21.9	1506	0.4	0.7	-111	-7%
Average		27.6	19.2	1653	29.6	19.5	1284	1.7	0.0	-369	-19%

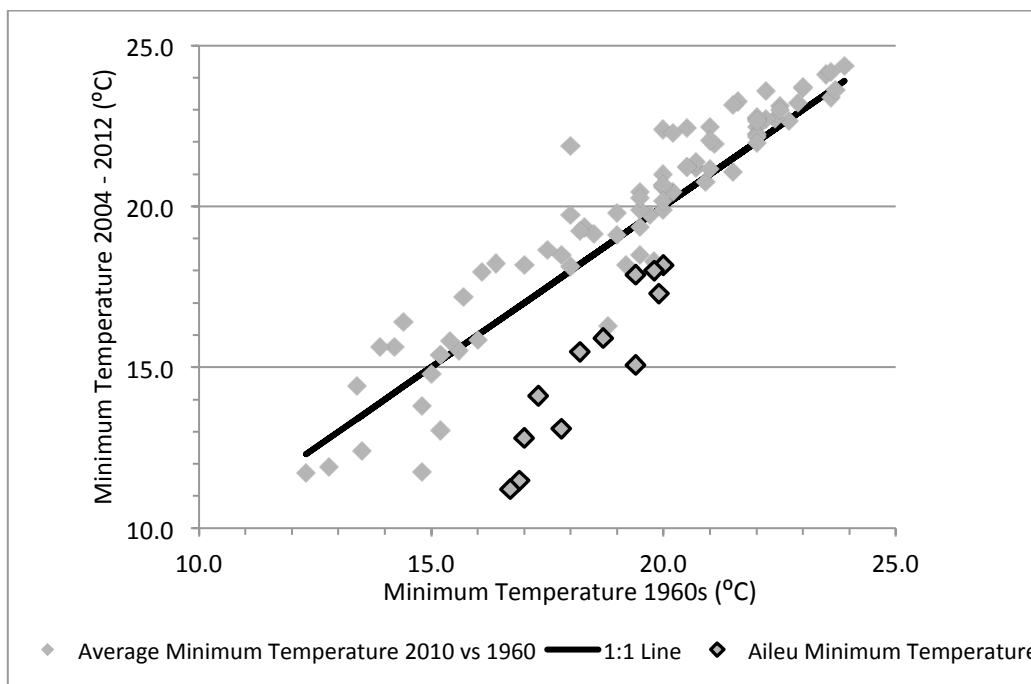
Table 1: Annual rainfall, maximum and minimum temperatures at 9 locations with anomalies showing the change in climate.



Graph 1: Current monthly rainfall plotted against historical rainfall data shows that there has been a reduction over the last 50 years.



Graph 2: Current monthly maximum temperatures plotted against historical monthly maximum temperatures show an increase in temperature.



Graph 3: Current monthly minimum temperatures plotted against historical monthly minimum temperatures show an increase in temperature except for the Aileu site.

Minimum temperatures do not show the same dramatic increase as the maximum temperature change. For Aileu, monthly minimum temperatures have decreased especially during the dry season months. Due to this dramatic drop in minimum temperatures, extra sources of Aileu temperature data were accessed for comparison (Table 2). It is unlikely that the dramatic drop in temperature at Aileu could be explained by a local difference in the collection site. Temperatures collected at 3 different sites around Aileu town all show a similar pattern of maximum and minimum temperatures. A calibration test of the ALGIS temperature gauge showed that it was recording temperatures 0.7 °C lower than the SoL temperature gauge at the same location for a 24 hour period.

Data Source	Max Temp (°C)	Min Temp (°C)
O Clima 1916-1923	26.1	18.3
O Clima 1965	26.0	18.4
ALGIS 2004-2012	28.3	15.0
SoL Quintal Portugal (2012-2013)	28.1	15.9
SoL Selo Malere (2012-2013)	28.6	15.8

Table 2: Comparison of various data sources for temperatures at Aileu

The changes in climate presented here are in contrast to the current perception of climate change. Many older Timorese say that there is much more rain now than there was 30 or 40 years ago. Although the data demonstrates a clear decline in rainfall, further analysis could be conducted on climate data in relation to long term climate variation such as the Inter-decadal Pacific Oscillation which varies over a 20 year cycle. The change in rainfall should be considered in management of agriculture, health and infrastructure. An important threat to crop production is high temperatures during flowering. Climate change research for Timor-Leste should consider the significant changes in maximum temperatures at different sites across the country that are important for cropping.

This summary research was prepared for inclusion in the Seeds of Life Annual Research Report, 2013, English translation. It is based on research conducted by Isabel Soares Pereira, Florindo Morais Neto and Samuel Bacon and forms part of a paper presented at the Timor Leste Studies Association in 2013 (Pereira, 2013).

References

Australian Bureau of Meteorology and CSIRO, 2011. *Climate Change in the Pacific: Scientific Assessment and New Research*. Volume 2: Country Reports.

Ferreira, A.H., 1965, *O Clima De Portugal, Fasciculo XII, Provincia De Timor*, Servico Meteorologica Nacional, Lisboa.

Mau, R., 2012, *ALGIS Weather Data*, Agro-meteorology, Land use and Geographic Information Systems, Ministry of Agriculture, Government of Timor-Leste.

Molyneux, N., Cruz, G.R.D., Williams, R.L., Andersen, R., Turner, N.C., 2012. *Climate Change and Population Growth in Timor Leste: Implications for Food Security*. AMBIO.

Pereira, I.S., Neto, F.M., Mau, R., Bacon, S., Williams, R., 2013, *Oinsa Lalaok Mudansa Klimatika Hahu Husi Tempo Português To' o agora Iha Timor Leste?*, Timor Leste Studies Association Conference Proceedings 2013, (yet to be published).

Santika, T., 2004. *Timor Leste Rainfall*, Canberra: Centre for Resource and Environmental Studies, Australian National University.

Soares, F. A., 1957, *O Clima E O Solo De Timor*, Ministerio Do Ultramar, Lisboa.