Volume 4: Issue: 1
January 2004

Fiji Islands Weather Summary
January 2004
Rainfall Outlook till April 2004

FIJI METEOROLOGICAL SERVICE

In Brief

Abnormally dry conditions, warmer then normal days and cooler than normal nights persisted throughout January across most of the country. Except for Rotuma, Udu Point, Savusavu Airport and Navua the rest of the country received well below average rainfall (<40% of normal). The four sites mentioned above received just over 40%. Two record low rainfall records were set this month at Monasavu and Nausori Airport.

Significantly below average rainfall in the last three months has caused parts of the country to fall into serious rainfall deficiency situation. Historical records show that Labasa, Nausori and Ono-I-Lau have received rainfall which falls into the lowest 10% on record. This is especially important for the Labasa area as rainfall in the last nine months has been below average. Recent media reports indicate a 'drought-like' situation in the Tavua area as well.

Rainfall in Fiji Islands in the next three months is expected to vary around average. The amount of rainfall received at this time of the year is very much dependant on the number of and effect tropical disturbances (cyclones, depressions etc.) have on the Fiji Group.

Day-time air temperatures were average to above average while night-time temperatures were below average to average. A new night-time low temperature record of 14.0°C was set at Monasavu. Relative humidity was below average across the country.

Total sunshine hours were average at Rotuma and above average at Laucala Bay, Suva, Nacocolevu and Nadi Airport.

Weather Patterns

January rainfall was significantly below average across the country. However, there were two definite wet periods. The first occurred from the 16th to 18th, mostly over Vanua Levu and the second rain event occurred from the 25th until the end of the month with significant rainfall recorded over most of the country.

For the first half of January, east to southeast wind flow persisted over Fiji as mobile sub-tropical high-pressure systems were persistent south of the country. As Tropical Cyclone *Heta* moved south, Fiji was placed on *Strong Wind Warning* and *Heavy Swell Warning* from Sunday 04th to Wednesday 7th.

On the 13th a weak front developed over the Lau Group, extending north towards Vanua Levu. Though weak, the front remained slow moving over the area for the next few days producing rain across the Lau Group, Vanua Levu and the southeastern parts of Viti Levu. The front gradually weakened on the 19th before moving off to the northeast of the country the next day. From the 19th to the 24th a ridge of high pressure to the south maintained a dry southeast wind flow over the group.

On the 25th a trough of low pressure developed over the Southern Lau Group and Kadavu and moved north over the country, producing showers over most places. For the western parts of the main islands, most of the shower and thunderstorm activity occurred during the afternoon. The trough remained over the group until the 28th before moving away to the southeast, leaving moist northeast winds over the country until the end of the month.

Rotuma experienced similar weather conditions to Fiji, remaining dry for the first half of the month. Rain and thunderstorms were recorded almost everyday of the second half of January as the South Pacific Convergence Zone moved either over or near the island.

Inside this issue:

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TABLE 1: Rainfall from October to December 2003

Station	Actual Rainfall (mm)	Has rainfall in the last three months been below average, average or above average?	No. of Rain days in November (% of total rain)	No. of Rain days in December (% of total rain)	No. of Rain days in January (% of total rain)
Penang Mill	432.9	Below Average	11 (19)	20 (69)	13 (12)
Monasavu Dam	1258.6	Below Average	19 (21)	31 (65)	16 (14)
Vatukoula Mine	373.8	Below Average	09 (11)	14 (67)	09 (22)
Rarawai Mill, Ba	553.7	Average	10 (12)	18 (77)	08 (11)
Yasawa-I-Rara	-	-	-	-	-
Viwa Is.	188.5	Below Average	11 (47)	19 (46)	05 (07)
Lautoka Mill(Research)	271.6	Below Average	09 (19)	22 (68)	10 (13)
Nadi Airport	428.5	Below Average	10 (21)	13 (49)	09 (30)
Nacocolevu, Sigatoka	363.3	Below Average	07 (16)	27 (63)	07 (21)
Tokotoko, Navua	867.9	Average	20 (26)	24 (50)	15 (24)
Laucala Bay, Suva	523.9	Below Average	21 (16)	26 (63)	20 (21)
Nausori Airport	502.4	Below Average	18 (18)	31 (61)	16 (21)
Nabouwalu	677.9	Average	24 (42)	19 (46)	15 (12)
Labasa Airport	382.4	Below Average	10 (30)	23 (48)	10 (22)
Savusavu Airport	480.3	Below Average	14 (35)	26 (37)	09 (28)
Udu Point	597.1	Below Average	18 (18)	26 (55)	14 (27)
Matei Airport	696.1	Below Average	14 (11)	27 (72)	20 (17)
Lakeba Is.	354.2	Below Average	06 (20)	14 (59)	15 (21)
Matuku Is.	-	-	-	-	-
Ono-I-Lau Is.	152.9	Well Below Average	08 (64)	06 (20)	07 (16)
Vunisea, Kadavu	295.4	Below Average	11 (19)	19 (67)	17 (14)
Rotuma	733.8	Below Average	23 (41)	22 (39)	16 (20)

Rainfall in the last three months

Rainfall in January

Most of the country received well below average rainfall (<40% of normal) except Rotuma, Udu Point, Savusavu Airport and Navua which received just above 40%. In the Western Division rainfall ranged from (6-37%), Northern Division (22-52%), Eastern Division (14-29%) and Central Division (30-47%) of normal. Two new rainfall records were set in January. Monasavu received 175.7mm and Nausori Airport 108.2mm.

Rainfall in the 3-months from November to January

The Rainfall forecast for the period November to January in the October Fiji Islands Weather Summary was for rainfall range from below average to average. The confidence level of the forecast was moderate.

Of the twenty sites that reported in time for this summary, seventeen sites reported well below average or below average and three sites average.

Below average rainfall in the last three months (mainly January) has caused parts of the country to fall into serious rainfall deficiency situation. Historical records show that Labasa, Ono-I-Lau and Nausori have received three-month rainfall which falls into the lowest 10% on record. This is especially important for the Labasa area as rainfall in the last nine months has been below average.

Figure A

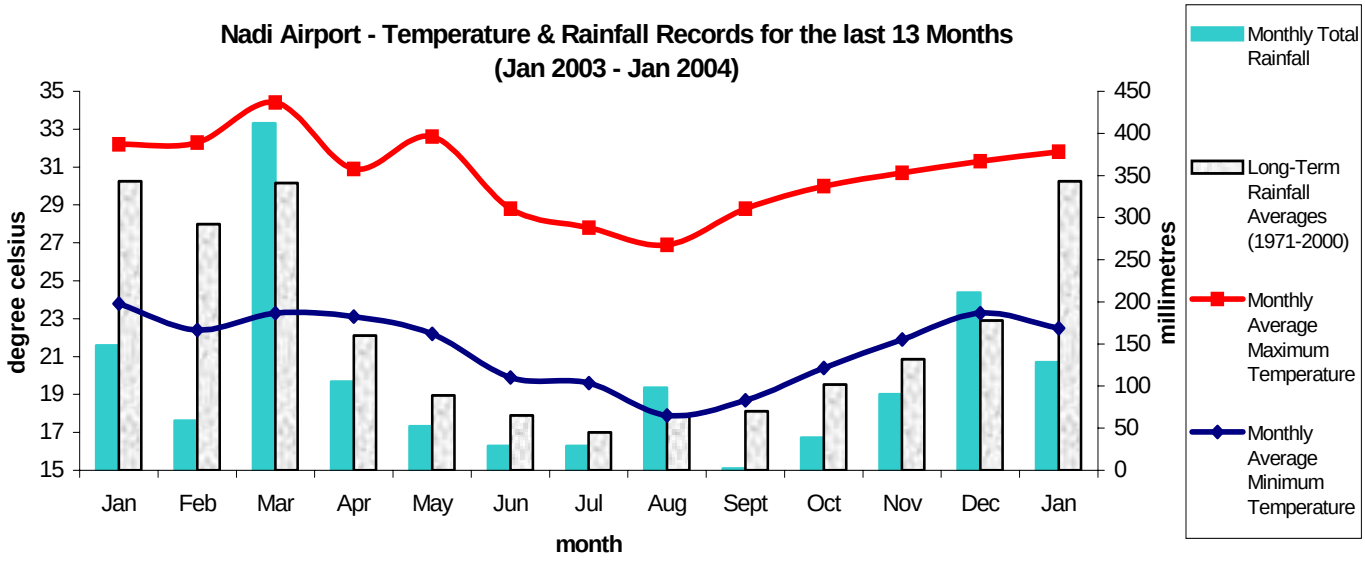


Figure B

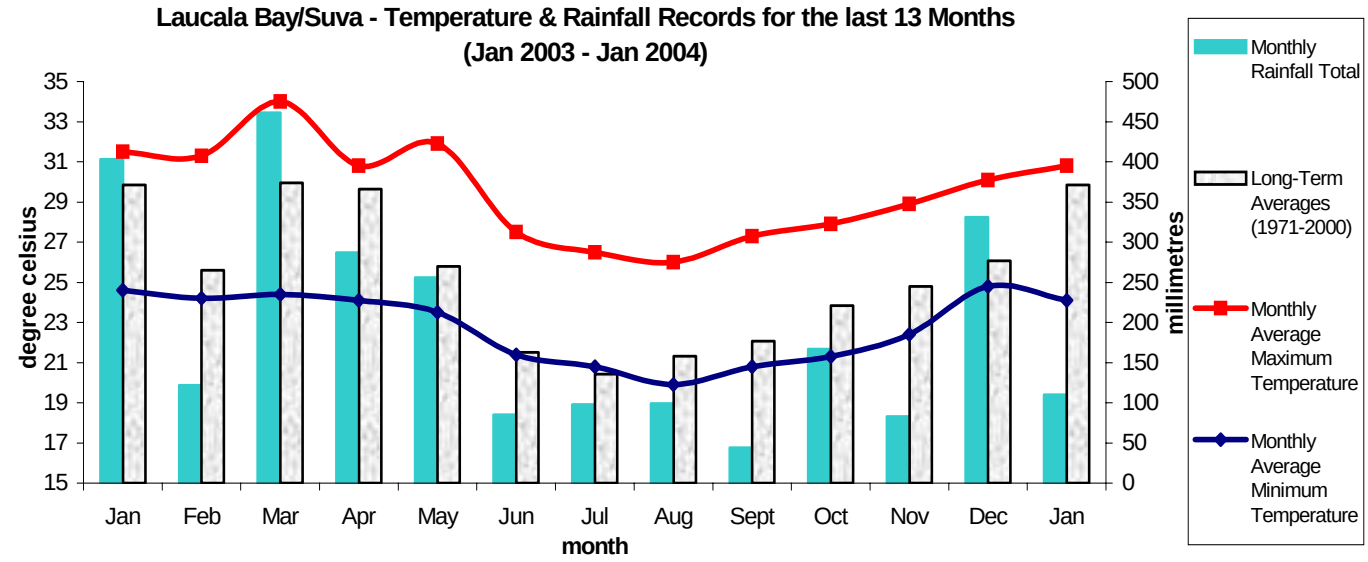
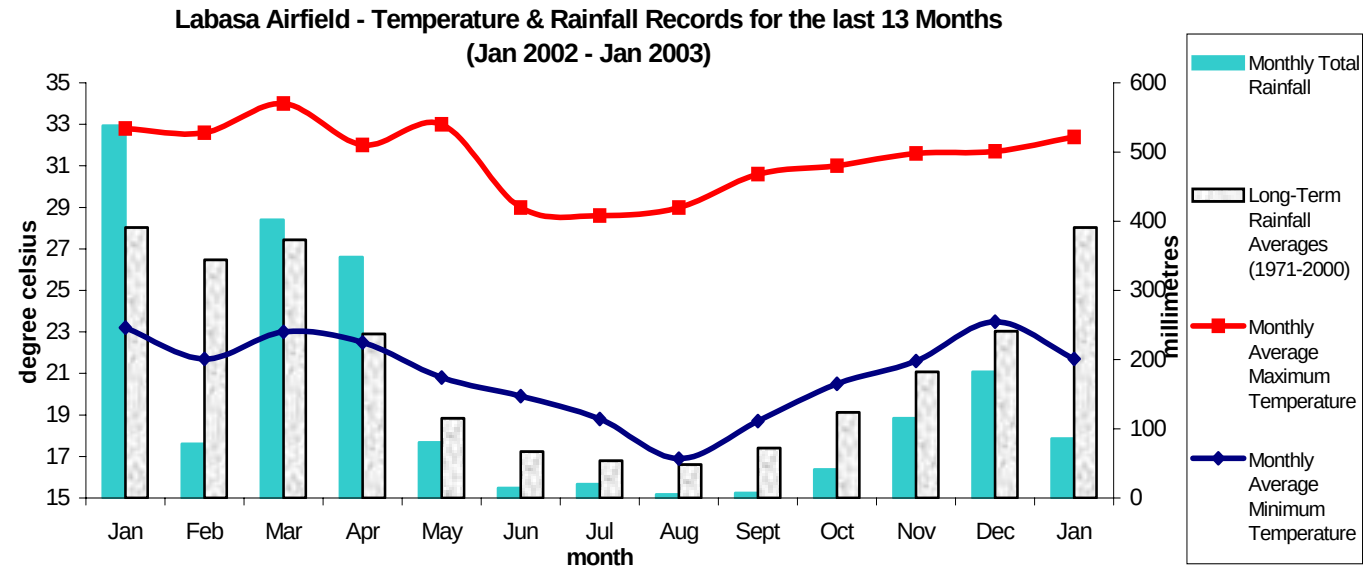


Figure C



Climate in January

Mean Day-time and Night-time Air Temperatures and Relative Humidity at 0900hrs.

Day-time temperatures were generally average to above average across the country. The greatest positive departures were recorded at Rotuma and Penang Mill which recorded 1.4 and 1.1°C respectively above normal. The greatest negative departures were recorded at Savusavu Airport and Tokotoko, Navua which recorded 0.6 and 0.4°C below normal.

Night-time temperatures were generally below average to average. The greatest positive departures from normal were recorded at Savusavu Airport and Rotuma/Nabouwalu which both recorded 1.1 and 0.5°C respectively above normal. The greatest negative departures were recorded at Nacocolevu and Ono-I-Lau which both recorded 1.1°C below normal. A new night-time low record was set at Monsavu.
Relative Humidity (RH) at 0900hrs was below average across the country. There were no positive departures. The greatest negative departures were recorded at Rarawai Mill - 12%, Penang Mill/Lautoka Mill/Vatukoula - 11%.

Soil Moisture and Runoffs

Soil moisture conditions varied considerably throughout the month and across the country.

In the Western Division conditions were limiting to dry throughout most of the month except for the first week when conditions were moderate and the last week in the case of Nadi Airport and Nacocolevu.

In the Central Division conditions were limiting to dry in the middle of the month and excessive to ample (Navua) and moderate (Suva/Nausori) during the first and last weeks.

In the Northern and Eastern Divisions conditions were limiting to dry during the middle of the month but varied from ample to dry across the Divisions during the first and last weeks. Two sites which stand out are Labasa and Ono-I-Lau which were limiting to dry for the whole month.

Rotuma recorded moderate to dry conditions throughout most of the month and excessive to ample conditions during the first five and last two days of the month.

The only significant runoffs were recorded at Navua

Sunshine, Radiation & Winds

Total sunshine hours were average to above average. Nadi Airport recorded 136%, Laucala Bay/Suva, 131%, Nacocolevu 128% and Rotuma 102% of normal.

Global Solar Radiation (average per day) recorded at Nadi Airport was 22.6MJ/ M^2.

Wind speed were above average at Nausori Airport and below average at Lakeba, Vunisea and Nadi Airport. Wind speed was well below average at Rotuma (33% of normal).

Records set in January 2004

Element	Station	Observed (record)	On	Rank	Previous (record)	Year	Records Began
Rainfall	Monasavu	175.7mm		New Low	265.5mm	1984	1980
Rainfall	Nausori Airport	108.2mm		New Low	111.4mm	1958	1957
Min Temp	Monasavu	14.0°C	20th	New Low	14.6°C	1987	1980

November to April 2003/04 Tropical Cyclone Season

The South West Pacific Tropical Cyclone Season officially began on 1st November and will continue till 30th April 2004.

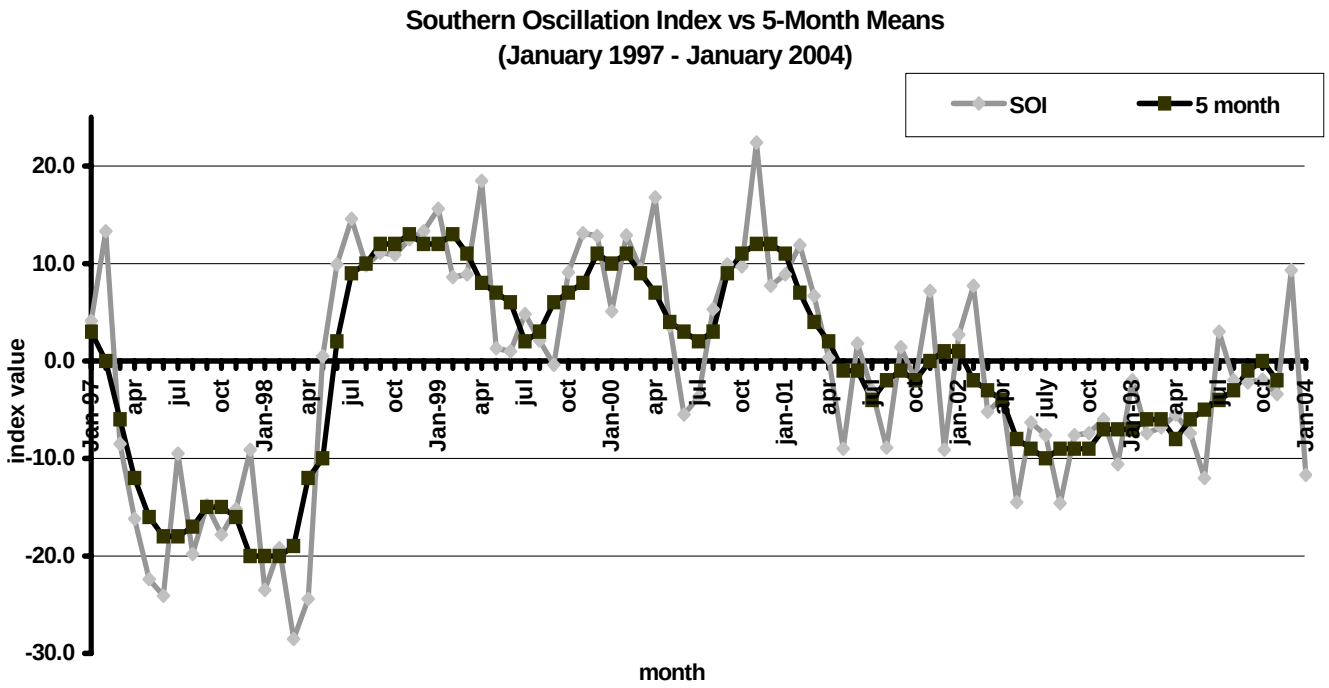
The chances of cyclone activity in the Fiji region this season are slightly higher than normal based on the prediction that *Neutral* conditions will continue through the season. The average number of cyclones that have affected Fiji (including pre-season events) since 1969/70 is between 1 and 2. However, there have been as many as six events such as in 1996/97.

Historical records of tropical cyclones affecting Fiji since the 1969/70 show that eight cyclones have affected Fiji in February with one of them causing severe damage. The years were 1973, 78, 83, 86, 88, 93 (2 events) and 2001.

There has only been one cyclone (TC *Heta*), develop in the SW Pacific this season.

Prior to and during a cyclone information on the event and regular updates will be provided on the Fiji Met Service *http://www.met.gov.fj* website, via *Poll fax* and the media.

Figure D



ENSO status and Rainfall Outlook to April 2004

The Southern Oscillation Index (SOI) for January was -11.7 (December was 9.8) with the five-month running mean of -2 centred on November (October was 0) (Figure D).

The current El Niño-Southern Oscillation status remains neutral. The surface of the equatorial Pacific is exhibiting close to average temperatures, except in the west where an area of warmer than average water remains. Temperatures across much of the tropical Pacific have cooled over the last fortnight, in response to strengthened Trade Winds in the west and weak upwelling in the far east.
The westerly wind burst observed early in January has caused subsurface warming in the western Pacific in the form of a weak downwelling Kelvin wave. However cooling in the eastern Pacific has simultaneously intensified, strengthening the temperature gradient across the tropical Pacific subsurface waters.
Experience has shown that the development of a Kelvin Wave at this time of year often leads to renewed speculation about a possible El Niño developing during the southern autumn and winter. However, this westerly wind event and associated Kelvin Wave are likely to be too early in the year to facilitate the development of an El Niño event. The critical period for westerly wind bursts aiding the development of an El Niño is March to June.

(The ENSO Update and SOI are provided by of the National Climate Centre, Australian Bureau of Meteorology and can be found at http://www.bom.gov.au)

FMS Rainfall Prediction Model: *This model is based on schemes, which have run successfully at the Australian Bureau of Meteorology's National Climate Centre. These a statistical scheme based on the relationship between SOI and subsequent three-month rainfall totals. In each case the probability of low, medium or high rainfall in the oncoming three-month period is provided. The scheme uses the SOI averaged over the most recent three-month period. The reliability of the model is high during the wet season (Nov-Mar) but decreases during the dry season (May-Sept) and during the transitions months, April and October.*

Below average rainfall is predicted for the Western Division, western half of the Northern Division. Below average to average rainfall is predicted for the eastern parts of the Northern and Eastern Division. Average to above average rainfall is predicted for the Central Division and Rotuma (Figure E).

Australian Rainman: *This is a Rainfall Prediction Model was created from joint efforts between Australia Meteorological and Agricultural Agencies. The model incorporates the use of SOI to test its effects on the probability of rainfall in upcoming months. It shows the relationship between ENSO (El Niño - Southern Oscillation) events and rainfall. Due to public demand this model is currently used to present the probability of receiving rainfall in the coming individual months over a three-month period. Please note that the reliability of forecast for one month is lower than for a combined three month period.*

The model predicts a 29-68% chance (depending on location) of receiving average rainfall across Fiji in next three months (Table. 2).

Outlook for February to April 2004:

Based on the model predictions and 'neutral' conditions, Fiji's rainfall is expected to vary considerably around average in the next three months.

The amount of rainfall received at this time of the year is very much dependant on the number of and effect tropical disturbances (cyclones, depressions etc.) have on the Fiji Group.

NOTE: The confidence level in the outlook is 'moderate'.

Preliminary Climatological Summary for January 2004

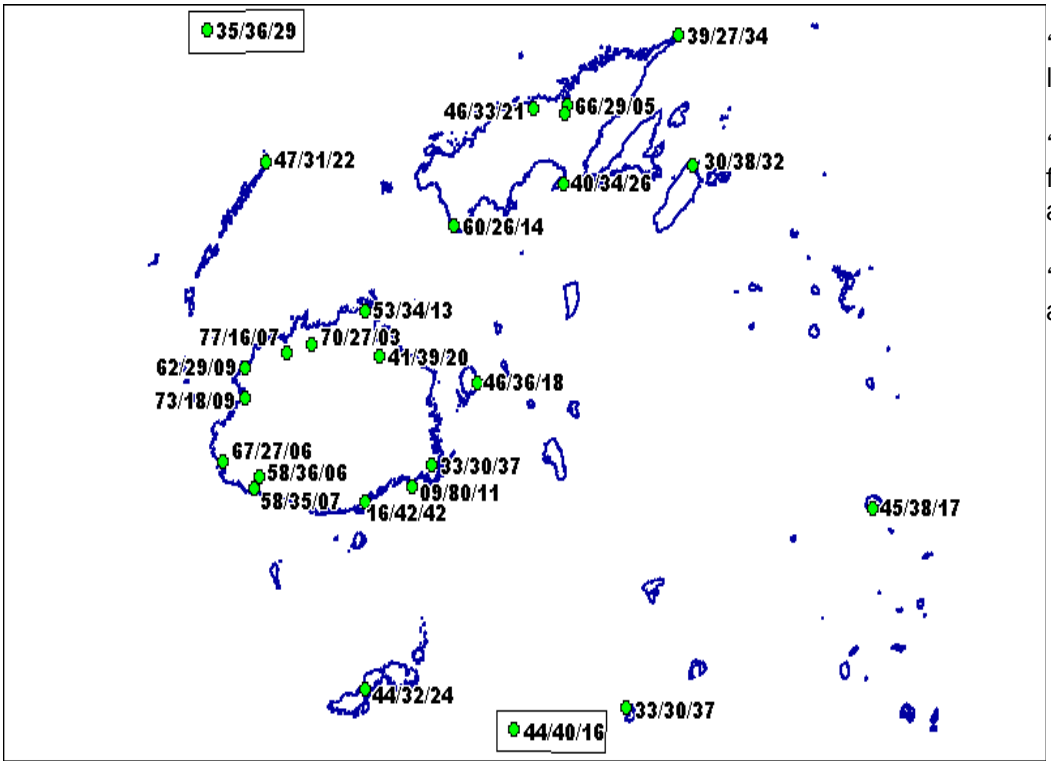
	RAINFALL			AIR TEMPERATURES								SUNSHINE	
	TOTAL	RAIN *	DAYS +	MAX. FALL MM	ON	AVERAGE DAILY MAX. C	# C	MIN. C	# C	EXTREME MAX. C	ON	EXTREME MIN. C	ON	TOTAL HRS	* %
NADI AIRPORT	128	37	9	41	27	31.8	0.3	22.5	-0.3	34.2	4	19.0	20	288	136
SUVA/LAUCALA BAY	110	30	20	24	26	30.8	-0.0	24.1	0.2	32.2	27	21.0	13	253	131
NACOCOLEVU	74	27	7	21	30	31.8	0.6	21.2	-1.1	34.0	25	17.5	20	227	128
ROTUMA	150	43	16	50	30	32.0	1.4	25.2	0.5	33.0	23	24.0	10	174	102
VIWA	14	6	5	6	24	32.0	0.9	25.1	0.1	34.0	27	22.5	17		
UDU POINT	164	52	14	47	26	31.0	0.5	23.9	-0.4	32.8	24	21.0	19		
LABASA AIRFIELD	86	22	10	21	26	32.4	0.7	21.7	-0.5	33.7	3	17.4	13		
NABOUWALU	82	26	15	37	29	30.6	0.5	24.7	0.5	32.2	3	23.4	14		
SAVUSAVU AIRFIELD	127	46	9	72	18	30.0	-0.6	24.6	1.1	31.6	30	22.0	12		
MATEI AIRFIELD	120	34	20	25	4	30.0	0.0	23.8	-0.3	31.0	23	20.9	19		
*YASAWA-I-RARA	Faulty AWS														
VATUKOULA	84	21	9	42	18	32.5	0.7	21.8	0.0	34.7	25	18.8	20		
MONASAVU	176	26	16	35	31	25.9	0.6	18.2	-0.6	28.8	27	14.0	20		
NAUSORI AIRPORT	108	30	16	24	17	30.1	-0.3	22.1	-1.0	32.4	28	18.6	21		
NAVUA/TOKOTOKO	207	47	15	85	25	29.3	-0.4	22.0	-1.0	30.5	28	18.8	13		
LAKEBA	72	29	15	17	26	30.6	0.5	23.5	0.4	32.0	2	19.0	12		
*MATUKU	Faulty AWS														
VUNISEA	39	14	17	14	26	29.6	-0.3	23.0	-0.4	30.8	28	18.9	20		
ONO-I-LAU	24	14	7	17	26	30.1	0.9	23.1	-1.1	31.5	29	19.8	20		
BA/RARAWAI MILL	61	15	8	20	26	32.7	0.7	21.3	-0.8	35.7	25	19.3	13		
LAUTOKA AES	34	9	10	11	2	31.9	0.9	23.3	-0.4	34.3	4	20.1	20		
PENANG MILL	54	14	13	16	28	31.4	1.1	23.0	-1.0	33.0	27	20.1	20		

	PE	WATER BALANCE(MM)						TEMPERATURE(C)			HUMIDITY		WIND	SUN	RAD
	MAX. .1MM	LAST DS	ON	DEF DS	NO DYS	RO DYS	NO	DLY MEAN	DRY (AVERAGE	WET AT 9AM)	RH%	VP	KT	%OF POS	MJ/ SQ.M
NADI AIRPORT	51	75	9	0	80 17	12	1	27.1	29.0	24.0	65	26.0	6.1	74	22.6
SUVA/LAUCALA BAY	48	75	20	33	20 5	0	0	27.4	27.9	24.3	74	27.7		65	-1
NACOCOLEVU	49	75	4	36	98 21	0	0	26.5	28.5	24.4	71	27.5		67	25
ROTUMA	50	70	19	14	0 0	0	0	28.6	29.7	26.2	75	31.1	1.5	49	20
VIWA	53	75	1	75	151 30	0	0	28.5	29.3	24.9	69	28.1			
UDU POINT	48	75	14	5	33 9	0	0	27.4	28.3	25.1	77	29.5			
LABASA AIRFIELD	49	75	2	75	60 15	0	0	27.0	29.0	24.2	66	26.3			
NABOUWALU	48	75	15	42	40 9	0	0	27.7	28.2	24.7	75	28.5	6.6		
SAVUSAVU AIRFIELD	48	75	13	39	20 5	0	0	27.3	27.8	24.6	76	28.5			
MATEI AIRFIELD	48	75	23	65	6 2	23	2	26.9	27.9	24.9	77	29.1			
*YASAWA-I-RARA	Faulty AWS														
VATUKOULA	51	75	1	73	76 16	0	0	27.2	29.2	23.3	59	24.0			
MONASAVU	38	50	24	0	0 0	50	3	22.1	21.8	19.7	82	21.3			
NAUSORI AIRPORT	47	62	16	52	0 0	0	0	26.1	27.4	23.9	74	27.0	4.8		
NAVUA/TOKOTOKO	46	68	24	5	0 0	59	4	25.7	27.3	24.0	75	27.4			
LAKEBA	48	75	19	61	31 7	0	0	27.1	28.5	24.5	71	27.6			
*MATUKU	Faulty AWS														
VUNISEA	48	75	19	75	45 11	0	0	26.3	27.5	23.7	72	26.5	6.2		
ONO-I-LAU	48	75	1	75	125 28	0	0	26.6	27.5	23.3	69	25.5			
BA/RARAWAI MILL	52	75	5	55	100 21	0	0	27.0	29.4	24.5	65	26.8			
LAUTOKA AES	51	75	11	75	85 20	0	0	27.6	29.0	23.9	64	25.7			
PENANG MILL	51	75	13	67	54 14	0	0	27.2	26.8	23.6	75	26.6			

DS IS SOIL MOISTURE DEFICIT,LIMIT 75 MM; RO IS WATER SURPLUS (INDEX OF RUNOFF)
DEF (AE-PE) IS EVAPOTRANSPIRATION DEFICIT (INDEX OF IRRIGATION WATER NEEDED.
PE IS LONG TERM MEAN PENMAN POTENTIAL EVAPOTRANSPIRATION (CALCULATED OR ESTIMATED).
MEAN TEMPERATURE IS (MAX+MIN)/2; WIND IS MEAN SPEED AT 06,12,18,24 HOURS.
$:SOLAR RADIATION CALCULATED FROM SUNSHINE DURATION. # :DEPARTURE FROM NORMAL.
+ :NUMBER OF DAYS WITH 0.1 MM OR MORE RAIN. * :PERCENT OF NORMAL.

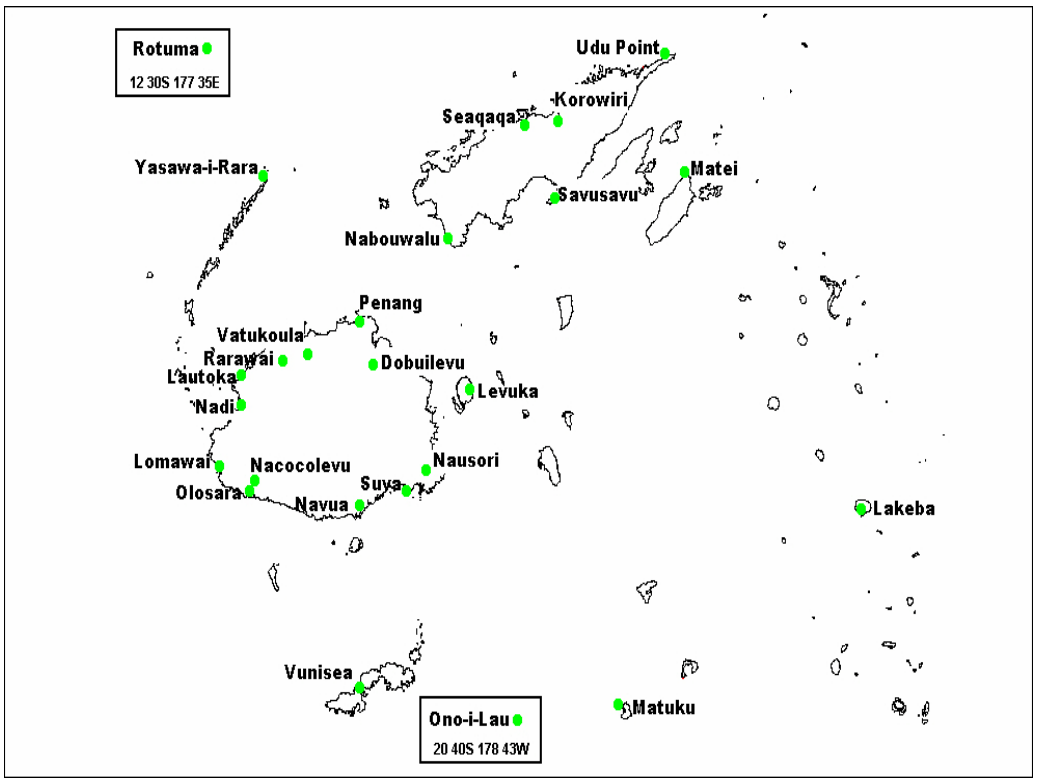
Three Month Rainfall Outlook Probabilities for February to April 2004

FIGURE E*:* Three Month Forecast for Selected Stations in Fiji using the Fiji Meteorological Services Rainfall Prediction Model



Please note that the probabilities are listed beside of the corresponding station marker or dot.

FIGURE F*:* Reference Map of selected Climate/Rainfall sites in Fiji



The forecast probabilities are presented as

DRY/NORMAL/WET

'DRY' range refers to rainfall less than 33rd percentile.

'NORMAL' (average) range refers to rainfall between 33rd and 67th percentiles.

'WET' range refers to rainfall above 67th percentile.

Reference Table for 33rd and 67th Percentile

Station	33% (mm)	67% (mm)
Western Division		
Dobuilevu	862	1146
Vatukoula	821	1116
Rarawai	809	1076
Penang	827	1092
Lautoka	713	925
Nadi	663	904
Lomawai	573	832
Nacocolevu	597	771
Olosara	554	776
Yasawa	589	843
Central Division		
Navua	1052	1243
Suva	874	1058
Nausori	891	1041
Eastern Division		
Levuka	762	961
Lakeba	572	817
Matuku	514	692
Ono-I-Lau	469	736
Vunisea	621	824
Northern Division		
Labasa Mill	847	1117
Seaqaqa	873	1145
Nabouwalu	792	1055
Savusavu	643	911
Udu Point	759	944
Matei	802	1097
Rotuma	908	1098

TABLE 3: Monthly Rainfall Outlook Probabilities for February to April 2004

	February 2004		March 2004		April 2004		Feb to Apr 2004 combined	
Station Name	**Average***	**Probability#**	**Average***	**Probability#**	**Average***	**Probability#**	**Average***	**Probability#**
Western Division								
Dobuilevu	334	**38**	429	**41**	286	**43**	1049	**40**
Vatukoula	386	**51**	382	**23**	221	**68**	989	**52**
Rarawai	347	**37**	365	**53**	207	**71**	919	**49**
Penang	336	**37**	425	**45**	269	**53**	1030	**33**
Lautoka	301	**33**	308	**46**	187	**70**	796	**47**
Nadi	292	**27**	341	**32**	160	**75**	793	**39**
Lomawai	250	**21**	294	**52**	169	**57**	713	**29**
Olosara	215	**49**	258	**36**	166	**69**	639	**45**
Nacocolevu	234	**42**	275	**43**	155	**70**	664	**44**
Yasawa-I-Rara	240	**40**	276	**27**	209	**51**	725	**50**
Central Division								
Navua - Tamanoa	283	**39**	413	**59**	448	**14**	1144	**39**
Suva	265	**54**	374	**45**	366	**18**	1005	**37**
Nausori	268	**46**	382	**46**	356	**19**	1006	**49**
Eastern Division								
Lakeba	226	**22**	293	**27**	206	**26**	725	**44**
Ono-I-Lau	194	**54**	253	**20**	157	**78**	604	**33**
Northern Division								
Korowiri	365	**48**	378	**28**	251	**68**	994	**38**
Seaqaqa	389	**35**	392	**15**	269	**62**	1050	**48**
Nabouwalu	276	**68**	335	**48**	300	**53**	911	**68**
Savusavu	244	**46**	283	**33**	261	**44**	788	**42**
Udu Point	249	**35**	320	**30**	276	**29**	845	**44**
Rotuma	322	**55**	369	**42**	294	**65**	985	**44**

Please note that the above figures should be used with caution, as there is some degree of uncertainty associated with them, and particularly the reliability of the model is low during the transition months and the dry season.

The probabilities in the three-month combined column are not an average of the three individual months. The model in this case has been re-run for three combined months. There is a higher degree of skill association with predicting rainfall for three combined months compared to three individual months.

** 'Long-term Average' for the 30 year period from 1971-2000.*
 # Probability of expecting at least normal rainfall.