Volume 3: Issue: 2
February 2003

Weather Summary for Fiji Islands – February 2003

Rainfall Outlook till May 2003

FIJI METEOROLOGICAL SERVICE

In Brief

Inside this issue:

The 2002/03 El Niño continues to have an effect on Fiji's rainfall which was below average this month except at Monasavu, Lakeba and Rotuma. These sites recorded around average. In the Western Division most stations recorded well below average rainfall (<40%. Other sites which recorded well below average rainfall were Labasa Airport and Ono-I-Lau.

Day-time temperatures were generally average to above average and night-time temperatures were generally below average across the Group. One new high night–time temperature was set this month at Tokotoko (Navua). There were two day-time equal highs at Labasa Airport and Monasavu and also one equal low at Vunisea.

Newspaper reports indicated that wells, small rivers and creeks in Ba and Tavua were still dry and many areas were dependant on emergency supply from the Public Works Department.

The total sunshine hours were above average across the country.

Weather Patterns

The first half of February was dominated by the presence of mobile ridges to the south. Though there were a number of troughs that affected the country, only two were significant enough to cause widespread rain.

During the first five days of the month, a ridge of high pressure dominated the weather over the country with southeast trades prevailing over the Group and showers confined to the windward side of the islands. Towards the end of the first week, on the 6th, a trough of low pressure with associated low moved over the Group from the east and gradually moved north, to lie just north of Vanua Levu on the 8th. The trough brought rain, occasionally heavy, to most parts of the Group.

From the 9th to the 18th, mobile ridges of high pressure were present to the south of Fiji, maintaining the southeast trades over the country. During this period the trough of low pressure and associated low remained to the north of the Group, in the vicinity of Rotuma. There were also occasions of afternoon showers experienced in the interior and western parts of the main islands during this time.

The trough of low pressure to the north started drifting south, towards Fiji, on the 19th causing moist east to northeast winds to become established over the country. It moved over Viti Levu on the 21st, causing heavy rain over most places before dissipating on the 24th. At the same time, a second trough of low pressure was affecting the Lau Group giving 172.2 mm of rainfall at Lakeba on the 21st. This second trough then moved north towards Vanua Levu and weakened.

On the 23rd, a third trough of low pressure developed in the area between Fiji and Rotuma and remained slow moving in that area until the end of the month. It helped maintain the moist east to northeast flow over the country with significant afternoon showers occurring about the interior and western parts of the main islands. On the 27th a fourth trough of low pressure approached the Group from the southwest and remained over the country until the end of the month, gradually weakening. This trough brought some heavy rain about the interior and the eastern parts of the larger islands.

Rotuma experienced showers almost everyday of the month. A trough of low pressure remained slow moving in the vicinity of the island from the 9th to the 19th and from the 23rd to the end of the month. Significant falls were noted on the 10th, 14th, 15th, 19th and 22nd as the trough went through temporary bursts of intensification.

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TABLE 1: Rainfall from December 2002 to February 2003

Station	Actual Rainfall (mm) (Dec – Feb)	Has rainfall in the last three months been below average, average or above average?	No. of Rain days in Nov. (% of total rain)	No. of Rain days in Dec. (% of total rain)	No. of Rain days in Jan. (% of total rain)
Penang Mill	292.4	Below Average	14 (23)	18 (56)	10 (21)
Monasavu	1454.3	Below Average	29 (45)	26 (23)	21 (32)
Vatukoula Mine	255.2	Below average	05 (09)	14 (41)	13 (50)
Rarawai Mill, Ba	382.8	Below average	02 (12)	13 (34)	10 (54)
Yasawa-I-Rara	NA	NA	NA	NA	
Viwa Island	NA	NA	95.9mm (09)	71.7mm (09)	NA
Lautoka	278.3	Below average	09 (18)	13 (49)	10 (33)
Nadi Airport	232.7	Below average	09 (11)	14 (64)	12 (25)
Nacocolevu	423.4	Below average	11 (23)	13 (58)	10 (19)
Navua	924.9	Average	23 (50)	25 (28)	18 (18)
Laucala Bay, Suva	746.3	Below Average	22 (30)	28 (54)	24 (16)
Nausori Airport	697.3	Below Average	22 (31)	24 (42)	22 (27)
Nabouwalu	724.3	Below Average	26 (24)	24 (59)	12 (17)
Labasa Airport	450.4*	NA	15	11*	09
Savusavu Airport	416.5*	NA	19	09*	09
Udu Point	NA	NA	NA	NA	NA
Matei Airport	424.0*	NA	23	07*	15
Lakeba	641.1	Average	15 (23)	14 (42)	09 (15)
Matuku	NA	NA	68.7mm (15)	237.4mm (16)	NA
Ono-I-Lau	440.1*	NA	03	09*	09
Vunisea, Kadavu	380.4	Below average	16 (37)	22 (38)	13 (25)
Rotuma	768.6	Below average	24 (35)	18 (25)	21 (40)

* Due to Cyclone *Ami*, no observations were conducted at Labasa Airport (13-18th), Matei (13-25th), and Ono-I-Lau (14th, 16th and 22nd to 24th) January 2003 are not available.

Rainfall in the last three months

Rainfall in February

Rainfall in February ranged from well below average to average across the country. All the stations on Viti Levu recorded below average except for Monasavu which recorded around average. Almost all stations in the Western Division recorded well below average (<40%) with Nadi Aiport, Penang Mill recorded their second lowest monthly totals. Labasa Airport, Matei Airport (second lowest) and Ono-I-Lau also recorded well below average rainfall. The Central Division recorded 46-71% of the normal rainfall.

Rainfall in the three-months from December to February

The Rainfall forecast for period from December to February in the November Fiji Islands Weather Summary was for rainfall to be below average to average across the country except for Rotuma where rainfall was predicted to be average. The skill level of the forecast for the above period was moderate.

With a considerable amount of rainfall data missing due to Cyclone *Ami* it isn't possible to fully verify the forecast. For areas where data is available the forecast was generally accurate except for Rotuma which recorded less rainfall than expected.

The Western Division continues to experience significantly below average rainfall. Nadi Airport, Lautoka, Rarawai, Vatukoula and Penang have recorded 29%, 32%, 49%, 25% and 29% of their three-month averages respectively. In the case of Nadi, Matei and Penang, the 58.9mm, 114.0mm and 62.8mm received will go down on record as the second lowest December to February three-month total since records began at those sites. (Lowest rainfall ever recorded at these sites were 46mm in 1959 for Nadi, 101.1mm in 1998 at Matei and 39.1mm in 1959 at Penang).

Figure A

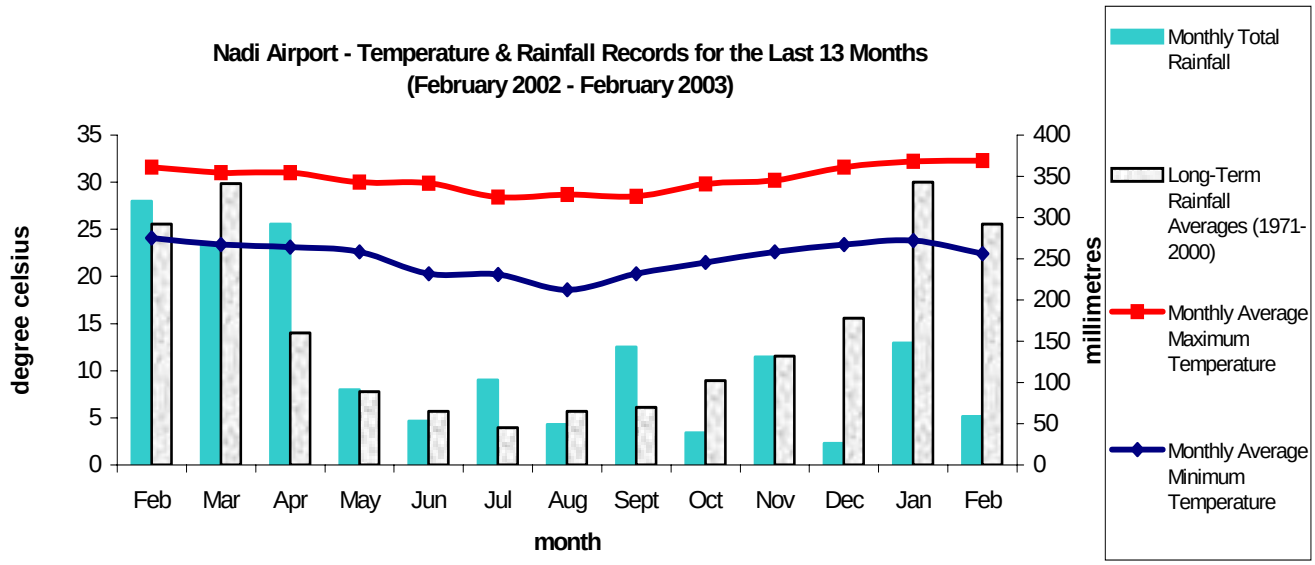


Figure B

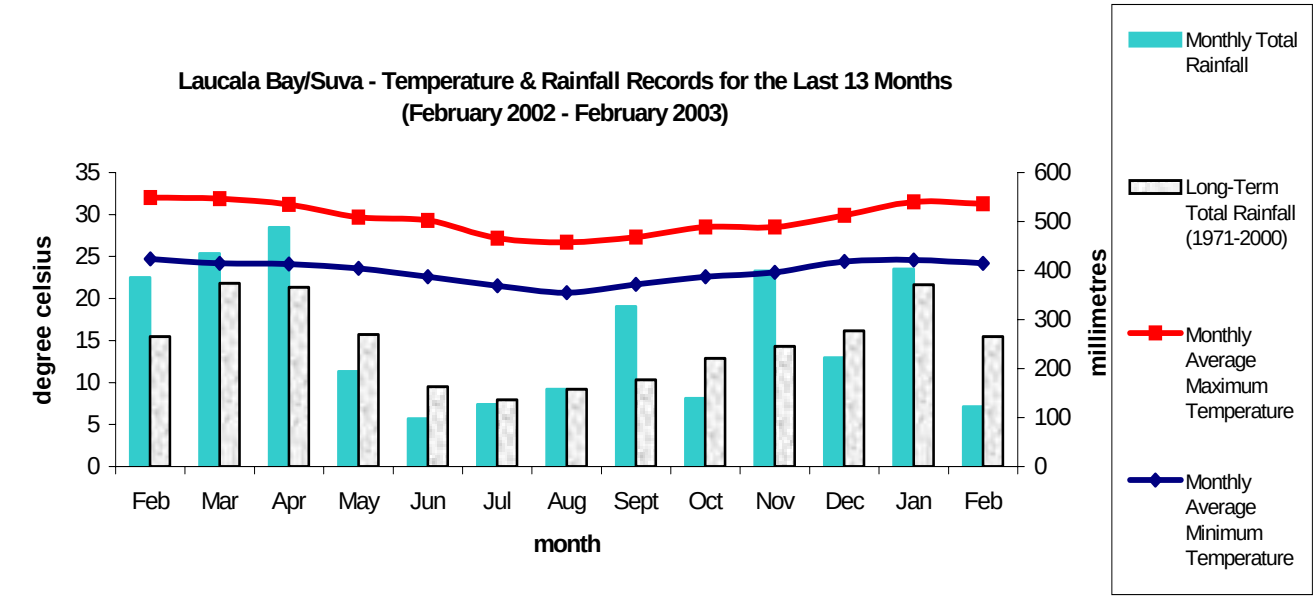
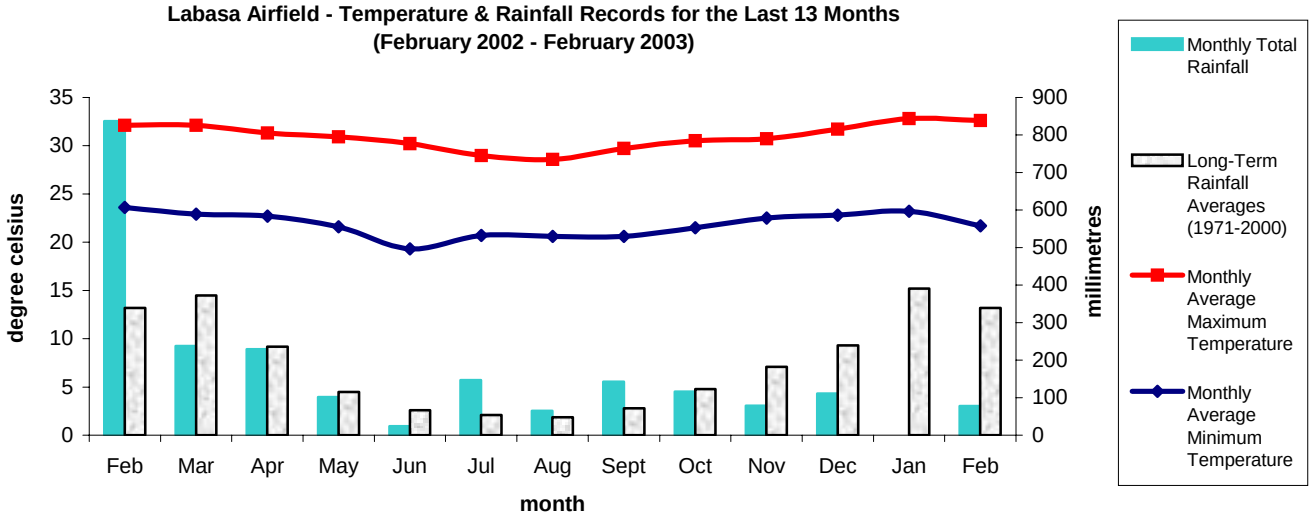


Figure C



Climate in February

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

Day-time temperatures in February were average to above across the country. The greatest positive departures from normal were observed at Rotuma, Labasa Airport, and Penang Mill which recorded monthly averages 1.2, 1.0 and 1.0°C respectively above normal.

Night-time temperatures were generally below average except Savusavu Airport and Rotuma this month. The greatest departures from normal were observed at Savusavu to be 1.0°C and 0.8°C above average. In contrast 1.4°C, below average recorded at Ono-I-Lau.

The coolest nights were generally from the 2nd-5th and 13-16th. The warmest days were generally from the 2nd-4th, 6-9th, 18-20th and 24-28th.

Relative Humidity (RH) at 0900hrs were below average across the country with Labasa Airfield recording the highest negative departure of -17%. Rarawai Mill, Lautoka and Nadi Airport also recorded second highest departures of -11% from normal.

Soil Moisture and Runoffs

Soil moisture conditions in the Central Division ranged from ample to moderate throughout the month except for Suva which recorded limiting to dry conditions till the 22nd then moderate for the rest of the month.

In the Western Division, conditions were limiting to dry throughout the month except at Rarawai Mill where the conditions ranged from dry to limiting for the first week then moderate to ample till 22nd and excessive to ample during the last week of the month.

In the Northern and Eastern Division soil moisture ranged from to moderate to ample for the first half the month and then dry to ample in Vunisea, limiting to dry in Savusavu, and Matei during the last week of the of the month

Lmiting to dry conditions prevailed at Ono-I-Lau while Rotuma and Monasavu had ample to moderate soil conditions.

There were significant runoffs at Monasavu (338.9mm), Rotuma (184.0mm) and Lakeba (92.4mm) in February.

Sunshine, Radiation & Winds

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

Solar Radiation recorded at Nadi Airport and Laucala Bay was 96.0% and 94.4% of average respectively.

Average wind speed in February was around average at Nadi Airport, below average at Rotuma and above average at Nabouwalu, Nausori Airport and Vunisea.

Records set in February 2003

Element	Station	Observed (record)	On	Rank	Previous (record)	Year	Records Began
Max Temp	Labasa Air	34.7	22nd	Equal High	34.7	1991	1957
Max Temp	Monasavu	30.0	2nd	Equal High	30.0	1987	1980
Min Temp	Tokotoko, Nav	19.5	3rd	New Low	19.9	1995	1992
Min Temp	Vunisea	18.9	14th	Equal Low	18.9	1947	1947

November to April 2002/03 Tropical Cyclone Season

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

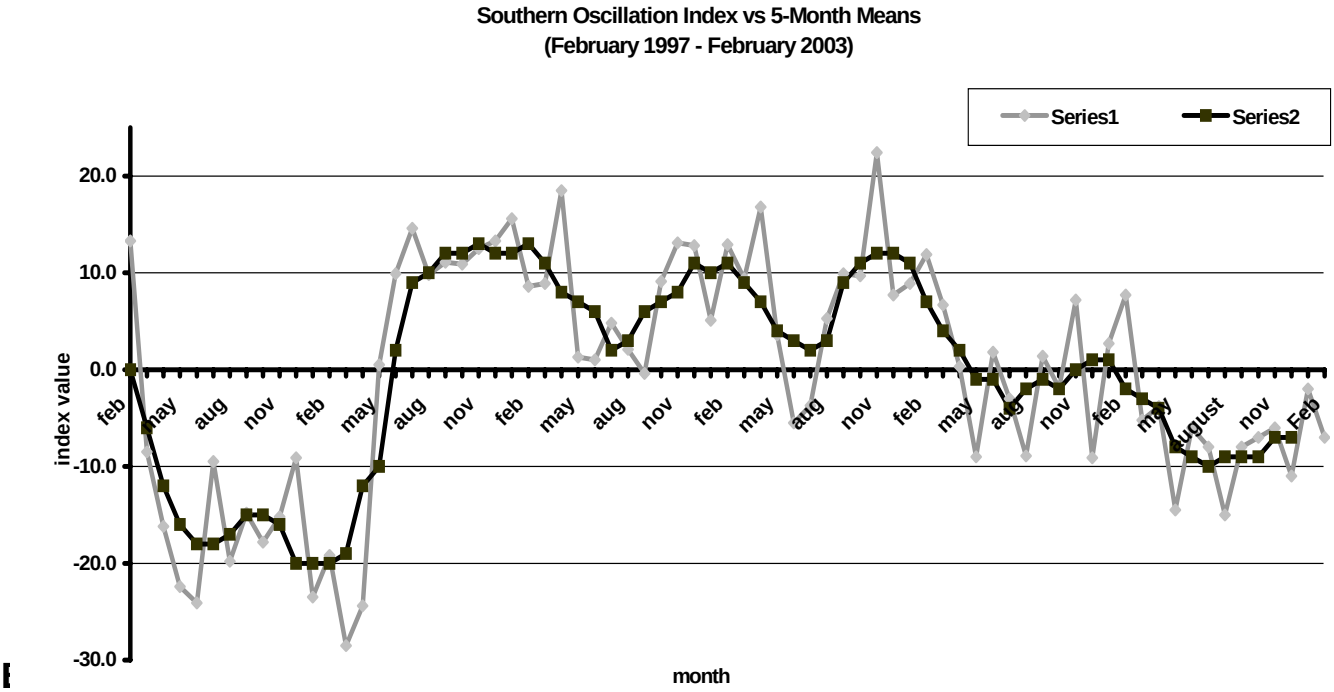
Historical analysis of tropical cyclones affecting Fiji show that during El Niño seasons there is a higher chance of being affected by a Tropical Cyclone then during La Nina seasons such as 1998/99, 1999/00, 2000/01, but the chances are slightly lower than during a 'Neutral' season.

Based on past events, the highest chance of being affected by a tropical cyclone is in January followed by March, February than December. Since 1970 there have been 13 cyclones that have affecting Fiji in March. The years were 1971, 79, 80, 83, 84, 85 (2 events), 89, 90, 92, 94 and 97 (2 events). Five of these cyclones reached hurricane intensity (1979, 83, 85, 92 and 94).

Fiji has been affected by one cyclone this season (*Ami*) with two others (*Zoe & Cilla*) brushing past the Group.

During a cyclone regular updates will be provided on the Fiji Met Service http://www.met.gov.fj website and via the media.

Figure D



Southern Oscillation Index: The Southern Oscillation Index (SOI) for February was -7.0 (January was -2.0) with the five-month running mean of -7 centred on December (October was –7) (Figure D).

Currently most of the ENSO indicators are showing the decaying phase of El Niño conditions.

There has been marked cooling of the tropical Pacific during the past month, both on and below the surface. The NINO3 index is now below the El Niño threshold with the strongest anomalies persisting in the central Pacific. The NINO3.4 was +0.9^{o}C and NINO4 +1.0^{o}C for February which indicates that Pacific is still warm. Eight out of eleven models are for neutral conditions in five months time with two warm and one cool. In eight month time six out of eight indicate returning to neutral conditions. These predictions are consistent with historical observations that El Niño tend to break in around late autumn. However, this should be viewed cautiously as they are predicting across the so-called "predictability barrier" between March and 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. <u>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.</u>*

The model forecasts rainfall to be below average across the country except for parts of the Central Division, Matei, Udu Point and Matuku which are forecast to receive around average rainfall (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 the chances of receiving at least average rainfall is 'variable' across the country in the next three months (Table. 2).

<u>Outlook for March to May 2003:</u>

Based on the model predictions and current climatic conditions, Fiji's rainfall is likely to below average to average.

The Western Division, northern parts of Vanua Levu and the Eastern Division in particular are likely to receive below average rainfall in the next three months. However, this could change should tropical cyclone(s) and depressions pass over or close to Fiji.

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

Preliminary Climatological Summary for February 2003

FIJI METEOROLOGICAL SERVICE DATE 04/03/2003

PRELIMINARY CLIMATOLOGICAL DATA FOR MONTH 2 , 2003 : SUMMARY FOR DAYS 1 TO 28

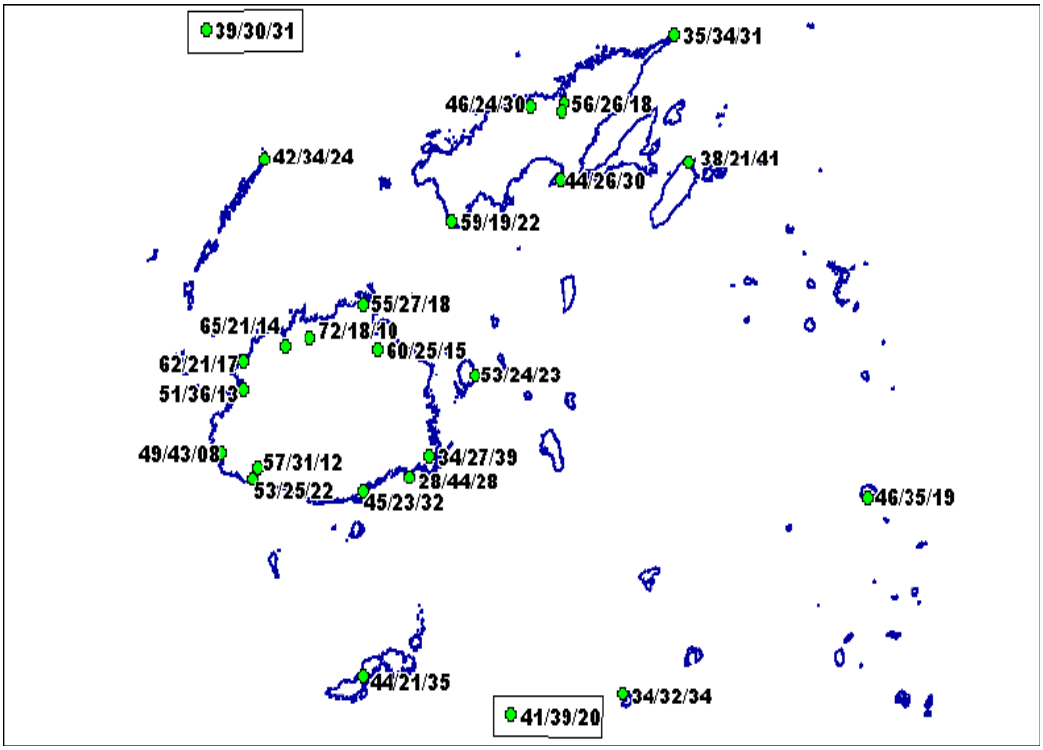
	RAINFALL				AIR TEMPERATURES								SUNSHINE	
	TOTAL	RAIN * DAYS	MAX. FALL		AVERAGE DAILY MAX. #		MIN. #		EXTREME MAX.		MIN.		TOTAL HRS	* %
	MM	% +	MM	ON	C	C	C	C	C	ON	C	ON		
NADI AIRPORT	59	20 12	16	9	32.3	0.7	22.4	-0.5	34.0	6	19.6	13	215	115
SUVA/LAUCALA BAY	122	46 24	22	18	31.3	0.1	24.2	0.2	33.2	26	22.0	13	214	122
NACOCOLEVU	82	35 10	33	28	32.0	0.5	21.8	-0.8	33.5	19	18.5	13	177	109
ROTUMA	306	94 21	75	19	31.8	1.2	25.1	0.4	33.2	27	23.8	20	169	105
*VIWA	Faulty AWS													
*UDU POINT	Faulty AWS													
LABASA AIRFIELD	78	23 9	29	27	32.6	1.0	21.7	-0.7	34.7	7	19.2	16		
NABOUWALU	125	45 12	50	23	30.8	0.4	25.2	0.8	32.4	28	23.3	23		
SAVUSAVU AIRFIELD	99	41 9	42	7	30.8	0.0	24.7	1.0	33.8	27	21.9	13		
MATEI AIRFIELD	114	40 15	38	7	30.6	0.2	24.5	0.3	31.5	6	21.9	14		
*YASAWA-I-RARA	Faulty AWS													
VATUKOULA	126	33 13	37	10	32.1	0.3	22.0	-0.1	34.4	17	19.5	13		
MONASAVU	469	88 21	81	7	26.2	0.5	18.9	-0.4	30.0	16	14.5	13		
NAUSORI AIRPORT	189	71 22	54	23	30.6	-0.2	22.7	-0.6	33.0	26	19.5	13		
NAVUA/TOKOTOKO	170	67 18	26	5	29.8	-0.2	22.7	-0.3	31.0	19	19.5	3		
LAKEBA	226	100 9	172	21	Max-	-U/S	24.5	0.4	Max-U/S		20.0	16		
*MATUKU	Faulty AWS													
VUNISEA	94	41 13	24	6	29.6	-0.8	23.2	-0.4	32.0	26	18.9	14		
ONO-I-LAU	64	33 9	15	17	29.4	-0.4	23.2	-1.4	31.6	26	20.6	14		
BA/RARAWAI MILL	207	60 10	59	23	32.5	0.4	21.7	-0.6	33.8	17	18.5	13		
LAUTOKA AES	91	30 10	30	7	31.6	0.5	23.4	-0.5	34.1	6	20.9	21		
PENANG MILL	63	19 10	39	23	31.5	1.0	23.5	-0.4	33.0	6	20.0	14		

	PE	WATER BALANCE(MM)					TEMPERATURE(C)			HUMIDITY		WIND	SUN	RAD
		MAX.	LAST	DEF	NO	RO NO	DLY	DRY	WET	RH%	VP		%OF	MJ/
	.1MM	DS	ON	DS	DYS	DYS	MEAN	(AVERAGE AT 9AM)				KT	POS	SQ.M
NADI AIRPORT	51	75	1	75	84 19	0 0	27.3	28.4	24.3	70	27.2	4.6	61	19.7
SUVA/LAUCALA BAY	48	75	13	48	9 3	0 0	27.8	28.1	25.2	78	29.8		61	18.5
NACOCOLEVU	49	75	1	34	97 23	0 0	26.9	28.1	25.0	77	29.3		54	22
ROTUMA	50	25	9	18	0 0	184 9	28.5	29.0	26.1	79	31.4	2.6	53	21
*VIWA	Faulty AWS													
*UDU POINT	Faulty AWS													
LABASA AIRFIELD	49	75	1	48	86 18	0 0	27.1	28.8	24.5	69	27.5			
NABOUWALU	48	75	15	34	25 7	0 0	28.0	28.7	24.4	75	29.4	6.8		
SAVUSAVU AIRFIELD	48	75	26	75	10 3	15 1	27.7	28.2	24.7	74	28.5			
MATEI AIRFIELD	48	63	28	63	0 0	0 0	27.6	28.6	25.4	76	29.8			
*YASAWA-I-RARA	Faulty AWS													
VATUKOULA	51	75	1	46	46 10	0 0	27.0	28.9	24.1	66	26.2			
MONASAVU	38	36	4	0	0 0	339 11	22.6	22.2	20.4	85	22.7			
NAUSORI AIRPORT	47	61	4	0	0 0	9 3	26.6	27.5	24.8	80	29.2	4.0		
NAVUA/TOKOTOKO	46	46	27	36	0 0	41 4	26.3	27.5	24.8	80	29.3			
LAKEBA	48	75	1	30	46 11	92 1	12.2	28.4	25.3	77	29.9			
*MATUKU	Faulty AWS													
VUNISEA	48	75	1	75	40 12	0 0	26.4	27.7	24.6	77	28.4	4.3		
ONO-I-LAU	48	75	1	75	70 17	0 0	26.3	26.7	24.4	82	28.7			
BA/RARAWAI MILL	52	75	1	24	36 7	46 3	27.1	28.6	24.5	70	27.5			
LAUTOKA AES	51	75	1	75	52 12	0 0	27.5	29.2	24.4	66	26.8			
PENANG MILL	51	75	1	65	90 21	0 0	27.5	27.2	24.2	77	28.0			

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.
(NOTE: ROTUMA, VIWA, MONASAVU AND VATUKOULA 'NORMALS' ARE SHORT PERIOD MEANS;
* DENOTES THE AUTOMATIC WEATHER STATIONS).

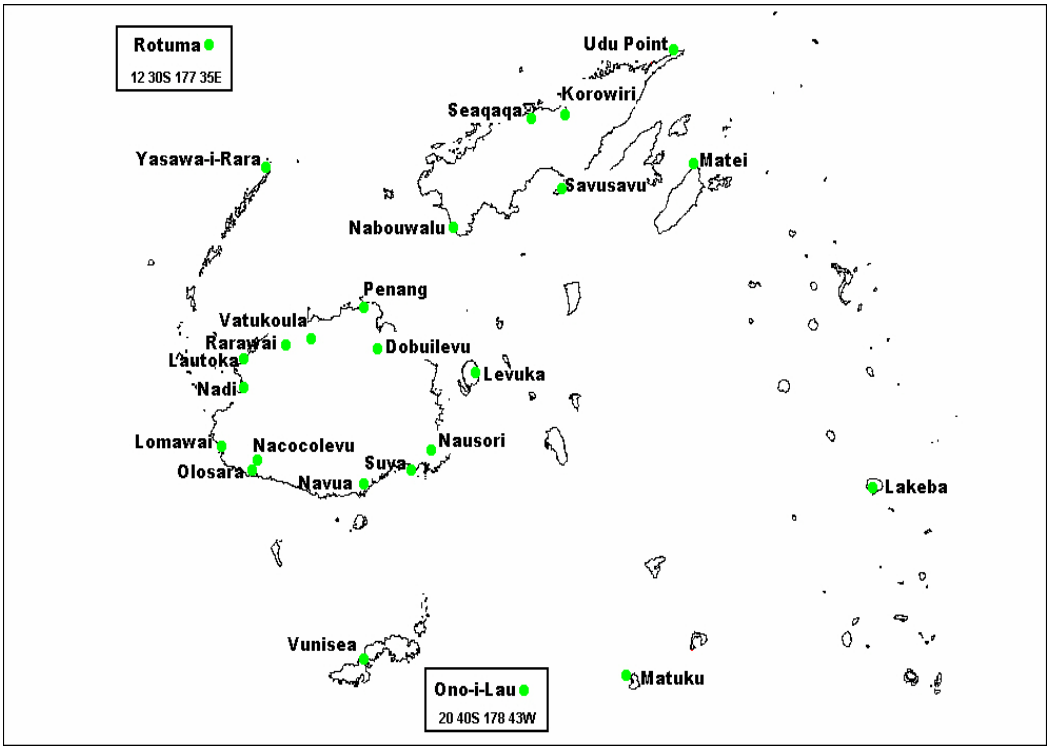
Three Month Rainfall Outlook Probabilities for March to May 2003

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	692	903
Vatukoula	513	862
Rarawai	519	784
Penang	591	873
Lautoka	506	691
Nadi	501	665
Lomawai	449	660
Nacocolevu	445	646
Olosara	480	613
Yasawa	458	643
Central Division		
Navua	1004	1258
Suva	829	1066
Nausori	803	1048
Eastern Division		
Levuka	710	951
Lakeba	538	722
Matuku	483	641
Ono-I-Lau	425	663
Vunisea	594	752
Northern Division		
Labasa Mill	556	810
Seaqaqa	606	847
Nabouwalu	669	897
Savusavu	601	833
Udu Point	590	811
Matei	709	987
Rotuma	840	1041

TABLE 3: Monthly Rainfall Outlook Probabilities for March to May 2003

	February		March		April	
Station Name	**Average***	**Probability#**	**Average***	**Probability#**	**Average***	**Probability#**
Western Division						
Dobuilevu	429	**25**	286	**18**	130	**28**
Vatukoula	382	**28**	221	**13**	78	**31**
Rarawai	365	**23**	207	**19**	95	**30**
Penang	425	**17**	269	**16**	161	**28**
Lautoka	308	**20**	187	**13**	84	**20**
Nadi	341	**36**	160	**16**	89	**23**
Lomawai	294	**25**	169	**44**	90	**28**
Olosara	258	**40**	166	**38**	99	**16**
Nacocolevu	275	**37**	155	**28**	85	**28**
Yasawa-I-Rara	276	**30**	209	**20**	85	**26**
Central Division						
Navua - Tamanoa	413	**59**	448	**28**	287	**07**
Suva	374	**54**	366	**39**	270	**23**
Nausori	382	**50**	356	**20**	248	**10**
Eastern Division						
Lakeba	293	**43**	206	**19**	136	**26**
Ono-I-Lau	253	**69**	157	**17**	103	**31**
Northern Division						
Korowiri	378	**18**	251	**18**	116	**18**
Seaqaqa	392	**25**	269	**12**	125	**20**
Nabouwalu	335	**33**	300	**37**	171	**16**
Savusavu	283	**40**	261	**16**	96	**40**
Udu Point	320	**48**	276	**14**	167	**22**
Rotuma	369	**33**	294	**32**	296	**31**

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.

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