Volume 3: Issue: 1
January 2003

Weather Summary for Fiji Islands – January 2003

Rainfall Outlook till April 2003

FIJI METEOROLOGICAL SERVICE

In Brief

The weather in the first month of 2003 was very contrasting with the Western Division being predominately dry and the Northern and Eastern Divisions affected by Tropical Cyclone *Ami* and other rain producing systems. Some sites in the Western Division received well below average rainfall (less than 50%).

Tropical Cyclone *Ami* passed over Eastern Vanua Levu, Taveuni and the central Lau Group on the 13th and 14th and severely affected these areas with storm to hurricane force winds, high intensity rainfall that resulted in severe sea surge, and flooding. Towards the end of the month a Tropical Depression which later developed into Cyclone *Cilla* also passed over these areas bringing significant rainfall and more flooding.

Generally, January was dominated by troughs of low pressure that caused significant rainfall mostly over Northern and Eastern parts of the group in the later two thirds of the month. The South Pacific Convergence Zone (SPCZ) remained between Rotuma and Vanua Levu for most of this month especially after the development of Cyclone *Ami*.

Both day and night-time temperatures were average to above average across the Group. Three new high day-time temperatures were set this month at Labasa Airfield, Vatukoula and Ono-I-Lau.

Total sunshine hours were around average

Weather Patterns

The month began with a Tropical Depression (TD1) - former Tropical Cyclone (TC) *Zoe*, lying to the southwest of Fiji. A trough from TD1 lay over the southern parts of the group and caused significant rainfall over the Southern Lau Group on the 1st and 3rd. The trough later weakened and moved to the southeast by the 5th. On the 7th a weak trough developed over the group causing heavy rain over Eastern Viti Levu on the 7th and 8th.

A second Tropical Depression (TD2) developed to the northeast of Rotuma on the 11th and by midday 12th developed into TC *Ami*. The system moved southwest initially, threatening Rotuma, but curved south later requiring a TC Alert to be issued for the whole of Fiji. Specific warnings were issued for the Northern and Eastern parts of the country. The eye of the cyclone passed over Eastern Vanua Levu during the early hours of 14th and later in the morning passed over the western part of Taveuni. The cyclone then moved in a south-southeast direction, passing through the Lau Group and later turned southeast leaving the Fiji Group around midnight on the 14th. In summary, TC *Ami* caused severe devastation to infrastructure crops and vegetation.. There were 14 lives lost with three still regarded as missing. The cost of the cyclone is likely to exceed F$100 Million.

On the 15th a trough moved over the Fiji Group from the west and caused some rain over Viti Levu until the 17th and over the Southern Lau Group on the 16th. The trough had moved to the northeast of Vanua Levu by the 18th but again moved back over the Group on the 19th causing significant showers about the main islands on the 19th and 20th.

A trough with an associated third Tropical Depression (TD3) developed to the north of Fiji on the 22nd and slowly moved southwards. By the 23rd the trough had moved over the group and became slow moving causing widespread heavy rain over most parts of the group from 23rd to 26th. On the 25th TD3 was located to the northwest of Nadi and was moving slowly eastwards. It was anticipated that TD3 would develop into a TC and consequently a TC Alert was issued for the Fiji Group on the morning of 26th. The depression continued on the eastward track accelerating and turning southeast while passing over Vanua Levu during early hours of 27th and over Northern Lau Group later in the morning. The TC Alert for Fiji was cancelled on the morning of 27th when it was certain that the depression would pose no threat to Fiji. By midday on the 27th the depression developed into TC *Cilla* while located just northeast of Lakeba. The cyclone continued on its southeast track moving away from the Fiji.

Rotuma received below average for the month due to the SPCZ displaced south of the island for most of the month. Strong winds affected Rotuma on the 13th due to TC *Ami.*

Inside this issue:

Further Information:

The Director
Fiji Meteorological Service
Private Mail Bag NAP 0351
Nadi Airport
Fiji

Ph: (679) 672 4888
Fax: (679) 672 0430

Email: fms@met.gov.fj
Web Site: www.met.gov.fj

TABLE 1: Rainfall from November 2002 to January 2003

Station	Actual Rainfall (mm)	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	188.8*	NA	09	07*	13*
Monasavu	1395.1	Below average	27 (29)	NA (47)	26 (24)
Vatukoula Mine	220.1	Below average	13 (41)	05 (11)	14 (48)
Rarawai Mill, Ba	213.5	Below average	09 (18)	02 (22)	13 (60)
Yasawa-I-Rara	NA	NA	NA	NA	NA
Viwa Island	NA	NA	81.6mm (8)	95.9mm (9)	NA
Lautoka	241.2	Below average	14 (22)	09 (21)	13 (57)
Nadi Airport	304.5	Below average	12 (43)	09 (09)	14 (48)
Nacocolevu	444.9	Below average	09 (23)	11 (22)	13 (55)
Navua	861.1	Average	20 (46)	21 (24)	25 (30)
Laucala Bay, Suva	1023.8	Above average	24 (39)	22 (22)	28 (39)
Nausori Airport	732.5	Average	17 (31)	22 (30)	24 (39)
Nabouwalu	810.2	Above average	24 (26)	26 (21)	24 (53)
Labasa Airport	451.3*	NA	10	15	11*
Savusavu Airport	602.3*	NA	21	19	09*
Udu Point	NA	NA	277.4mm (13)	NA	NA
Matei Airport	529.5*	NA	23	23	07*
Lakeba	219.6*	NA	08	15	05*
Matuku	NA	NA	95.4mm (14)	68.7mm (15)	NA
Ono-I-Lau	456.6*	Average	04	03	09*
Vunisea, Kadavu	395.6	Below average	16 (28)	16 (36)	22 (36)
Rotuma	775.0	Below average	27 (40)	24 (35)	18 (25)

* - No observations were conducted at Penang Mill between 23 December 2002 and 12 January 2003. No report received on 23/1/2003.
- Due to Cyclone *Ami* Labasa Airport (13-18th), Matei (13-25th), Lakeba (13th- present) and Ono-I-Lau (14-24th) are not available.
- Data for Yasawa-I-Ra has not been received for the last three months and Viwa, Udu Point and Matuku for December.

Rainfall in the last three months

Rainfall in January

Rainfall ranged from well below average to well above average in January. Most sites in Viti Levu recorded below average except for Nausori Aiport, Laucala Bay and Nacocolevu which recorded average and above average in the case of L. Bay. Other than the eastern side of the island, less rainfall than expected was received on Viti Levu during Cyclone *Ami*'s passage over Fiji. Rotuma also recorded below average rainfall.

Although it cannot be verified via actual records, the eastern parts of the Northern & Eastern Divisions would most likely have received well above average rainfall during the passage of Cyclone *Ami.*

Rainfall in the three-months from November to January

The Rainfall forecast for period from November to January in the October 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 to above. The skill level of the forecast for the above period was moderate.

With a considerable amount of rainfall data missing either due to missed observations or Cyclone *Ami* it is impossible to fully verify the forecast. For areas where there is data the forecast was generally accurate except for Rotuma which recorded less rainfall than expected.

The Western Division continues to experience significantly below average rainfall. Vatukoula, Ba, Lautoka, Nadi Airport have recorded 30%, 28%, 34% and 47% of their three-month averages respectively. In the case of Ba, the 213.5mm recieved will go down on record as the second lowest Nov-Jan three-month total since records began in 1910 (Lowest is 188.6mm in 1958/59).

Figure A

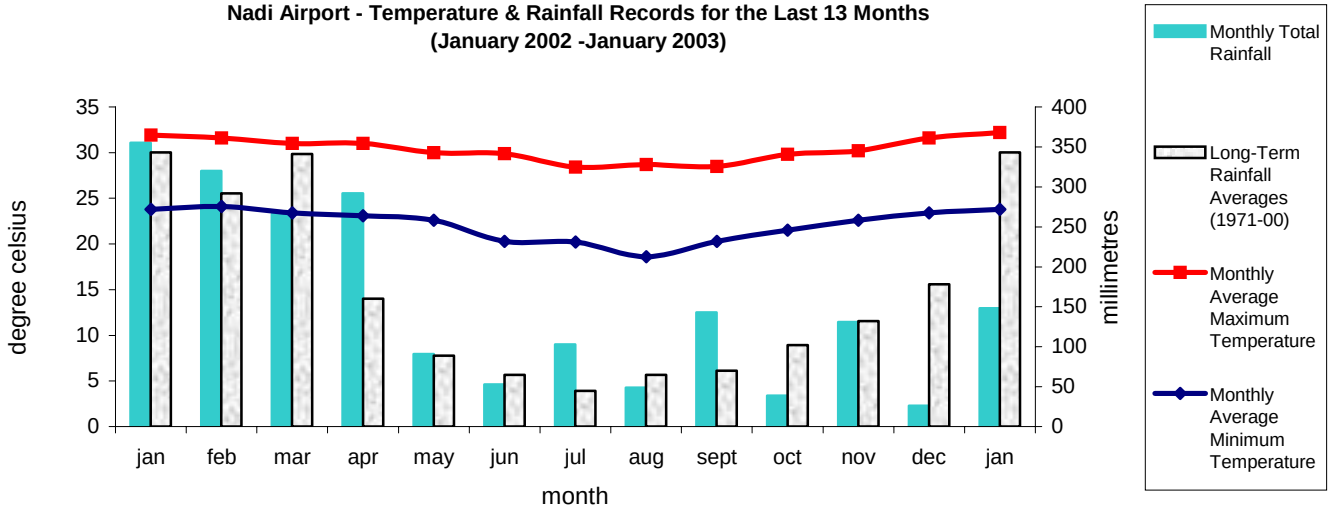


Figure B

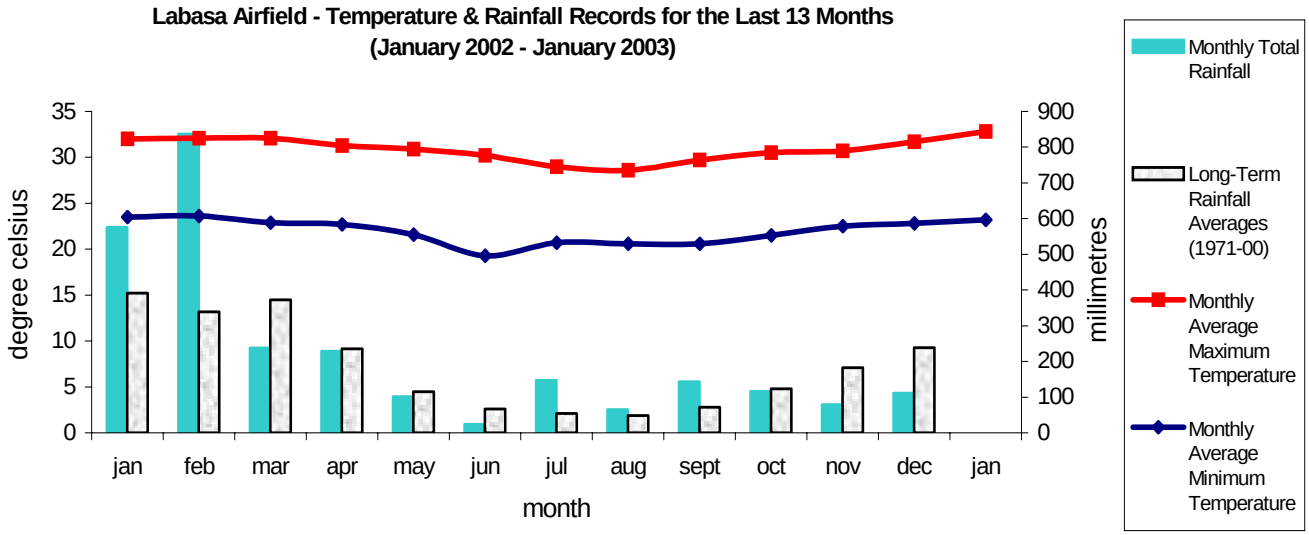
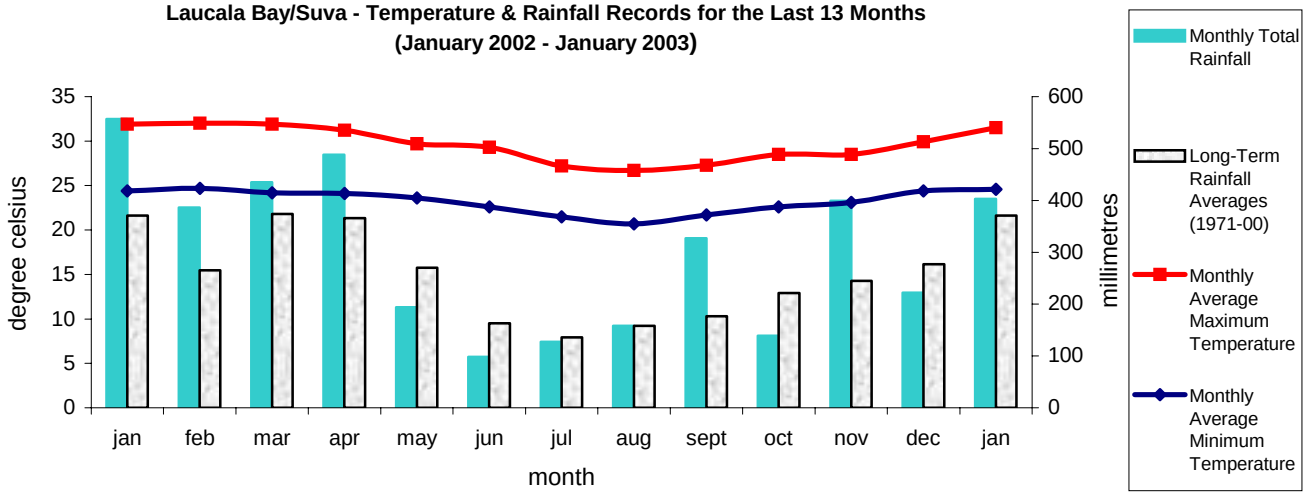


Figure C



Climate in January

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

Day-time temperatures across the country were average to above. The greatest positive departures from normal were at Monasavu, Nacocolevu, and Ba/Rarawai Mill which recorded monthly averages 1.5, 1.4 and 1.3°C respectively above normal.

Night-time temperatures were also average to above in January. The greatest departures from normal were at Vatukoula and Ba/Rarawai Mill. Both sites recorded 1.8°C above average.

The coolest nights were generally from the 2-5th. . The warmest days were generally from the 10-13th and 16-17th.

Relative Humidity (RH) at 0900hrs varied around average across the country with Rarawai Mill, Ba and Monasavu and recording the highest negative departure (- 6%) and (- 4%) respectively. The greatest positive departure from normal was at Vunisea and Nabouwalu (+5).

Soil Moisture and Runoffs

Soil moisture conditions ranged from excessive to moderate in the Central Division and Monasavu throughout the month except for about the first week.

In the Western Division and Vunisea conditions were limiting to dry during the first half of the month then moderate to ample during the second half except for Vatukoula which returned to limiting conditions on the 21st.

In the Northern Division and Lakeba soil moisture was limiting to dry for the first half of the month then most likely excessive to ample during and after TC *Ami*. On Ono-I-Lau conditions ample to moderate till TC *Ami* then again most likely excessive to ample during and after the cyclone.

There significant runoffs at Nabouwalu (257.2mm), Laucala Bay (216.2mm) and Monasavu (198.9mm) in January.

Sunshine, Radiation & Winds

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

Solar Radiation recorded at Nadi Airport and Laucala Bay was 93.4% and 77.5% of average respectively.

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

Records set in December 2002

Element	Station	Observed (record)	On	Rank	Previous (record)	Year	Records Began
Max Temp	Labasa Air	34.9	11th	New High	34.8	1981	1957
Max Temp	Vatukoula	37.4	12th	New High	35.6	1992	1985
Max Temp	Ono-I-Lau	33.2	10th	New High	33.1	1949/55	1943

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.

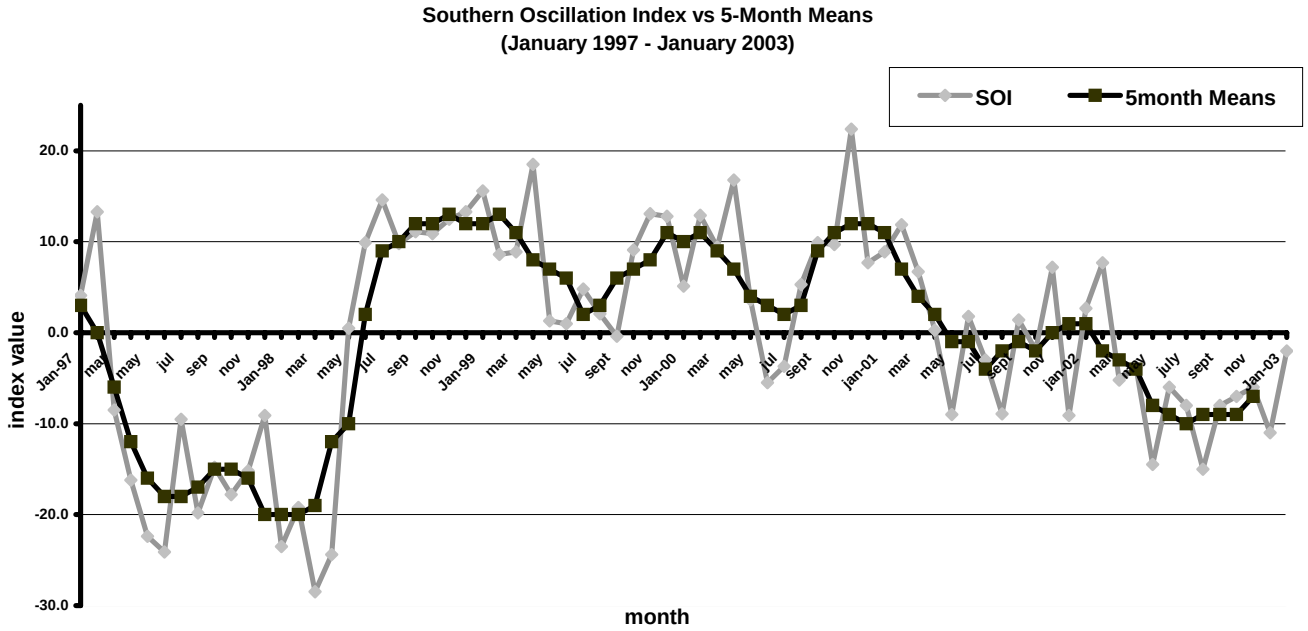
Historical analysis of tropical cyclones affecting Fiji show that during El Niño seasons there is a higher chance of being affected by a Tropical Cyclone then during La Nina seasons such as 1998/99, 1999/00, 2000/01, but the chances are slightly lower than during a 'Neutral' season.

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 8 cyclones that have affecting Fiji in February. The years were 1973, 78, 83, 86, 88, 93 (2 events) and 2001. Three of these cyclones reached hurricane intensity (1983, 88 and 2001).

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



ENSO status and Rainfall Outlook to April 2003

Southern Oscillation Index: The Southern Oscillation Index (SOI) for December was -2.0 (November was -10.6) with the five-month running mean of -7 centred on November (October was -9) (Figure D).

Currently the main ENSO indicators show mature phase El Niño conditions.

The strongest anomalies continue to be in the central Pacific with the NINO3.4 index being about 1.4°C above average. The NINO 3 and 4 indices are +1.1°C and +1.2°C respectively, so clearly the Pacific is still Warm. The consensus of the models is for Neutral conditions in five months' time, with nine of the 11 available indicating Neutral in June 2003. These predictions are broadly consistent with historical observations, that El Niños tend to break down in late summer or autumn. There are now just two models persisting the current warmth into the middle of 2003. However, these should be viewed cautiously as they're 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. 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.*

The model forecasts rainfall to be below average across the country except for the Central Division, Matei, Matuku and Rotuma where the forecast is for around average (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. Note the model predicts lower chances of receiving average rainfall closer to the dry season i.e. in April (Table. 2).

Outlook for February to April 2003:

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 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 January 2003

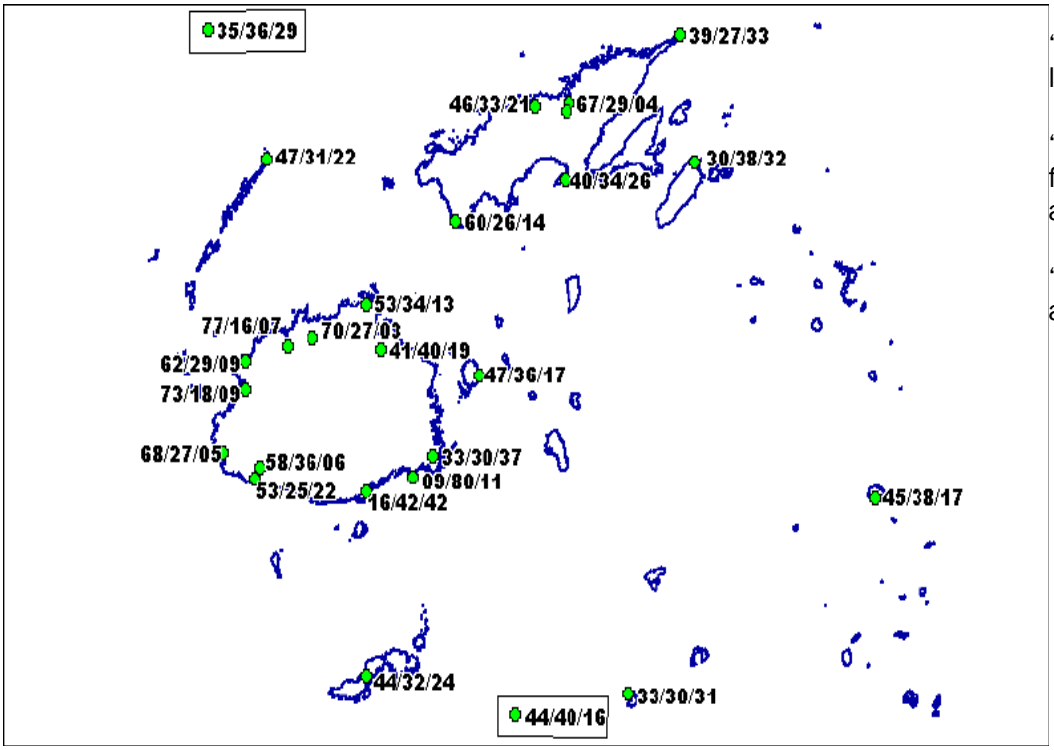
	RAINFALL				AIR TEMPERATURES							SUNSHINE	
	TOTAL	*	RAIN DAYS	MAX. FALL	AVERAGE DAILY MAX.	#	MIN.	#	EXTREME MAX.	ON	MIN.	ON	TOTAL
	MM	%	+	MM ON	C		C		C		C		HRS %
NADI AIRPORT	148	43	14	37 20	32.2	0.7	23.8	1.0	34.7	12	21.0	5	220 104
SUVA/LAUCALA BAY	403	109	28	150 26	31.5	0.7	24.6	0.7	33.9	16	21.5	4	169 88
NACOCOLEVU	244	88	13	100 25	32.6	1.4	23.2	0.9	35.5	12	19.9	4	169 95
ROTUMA	195	56	18	33 12	31.7	1.1	25.1	0.4	33.1	7	22.9	6	158 93
*VIWA	FAULTY AWS												
*UDU POINT	FAULTY AWS												
LABASA AIRFIELD	INSUFFICIENT DATA												
NABOUWALU	428	137	24	79 13	31.2	1.1	25.2	1.0	33.7	16	22.4	4	
SAVUSAVU AIRFIELD	INSUFFICIENT DATA												
MATEI AIRFIELD	INSUFFICIENT DATA												
*YASAWA-I-RARA	FAULTY AWS												
VATUKOULA	105	26	14	30 15	32.7	0.9	23.6	1.8	37.4	12	20.8	5	
MONASAVU	338	51	26	75 13	26.8	1.5	19.6	0.8	29.9	8	15.5	5	
NAUSORI AIRPORT	290	80	24	76 13	31.4	1.0	23.8	0.7	34.3	16	20.9	5	
NAVUA/TOKOTOKO	255	58	25	64 26	30.3	0.6	23.8	0.8	33.0	13	20.0	4	
LAKEBA	INSUFFICIENT DATA												
*MATUKU	FAULTY AWS												
VUNISEA	145	50	22	36 23	30.0	0.1	23.9	0.5	31.6	17	21.6	3	
ONO-I-LAU	INSUFFICIENT DATA												
BA/RARAWAI MILL	129	32	13	40 25	33.3	1.3	23.9	1.8	36.0	12	20.5	5	
LAUTOKA AES	136	37	13	41 25	31.9	0.9	24.8	1.1	34.1	12	22.6	5	
PENANG MILL	INSUFFICIENT DATA												

	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	22	68	14	5	1	28.0	29.1	25.3	73	29.3	5.1	56	19.8
SUVA/LAUCALA BAY	48	68	6	6	0	0	216	9	28.1	28.4	26.1	83	31.9		43	16.2
NACOCOLEVU	49	75	1	9	66	16	92	2	27.9	28.8	25.9	79	31.3		43	
ROTUMA	50	46	10	13	0	0	53	8	28.4	29.3	26.4	79	32.3	3.6	44	
*VIWA	FAULTY AWS															
*UDU POINT	FAULTY AWS															
LABASA AIRFIELD	49	75	1	10	69	15	114	3	28.0	29.5	25.8	74	30.4			
NABOUWALU	48	75	8	22	6	2	257	7	28.2	28.4	26.2	83	32.2	5.4		
SAVUSAVU AIRFIELD	INSUFFICIENT DATA															
MATEI AIRFIELD	INSUFFICIENT DATA															
*YASAWA-I-RARA	FAULTY AWS															
VATUKOULA	51	75	1	68	60	12	0	0	28.2	29.5	24.9	69	28.0			
MONASAVU	38	44	6	3	0	0	199	17	23.2	23.5	21.3	82	23.6			
NAUSORI AIRPORT	47	72	6	8	0	0	104	7	27.6	27.7	25.7	85	31.4	3.8		
NAVUA/TOKOTOKO	46	57	5	15	0	0	91	5	27.1	28.0	25.8	83	31.6			
LAKEBA	INSUFFICIENT DATA															
*MATUKU	FAULTY AWS															
VUNISEA	48	75	2	23	56	16	0	0	27.0	28.0	25.9	84	31.7	3.3		
ONO-I-LAU	48	53	24	20	0	0	164	3	27.5	27.6	25.5	84	31.1			
BA/RARAWAI MILL	52	75	1	40	68	14	0	0	28.6	29.8	25.6	71	29.4			
LAUTOKA AES	51	75	1	40	57	13	0	0	28.3	29.2	25.4	73	29.6			
PENANG MILL	INSUFFICIENT DATA															

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.
:DEPARTURE FROM NORMAL.
+ :NUMBER OF DAYS WITH 0.1 MM OR MORE RAIN. * :PERCENT OF NORMAL.
* DENOTES THE AUTOMATIC WEATHER STATIONS.

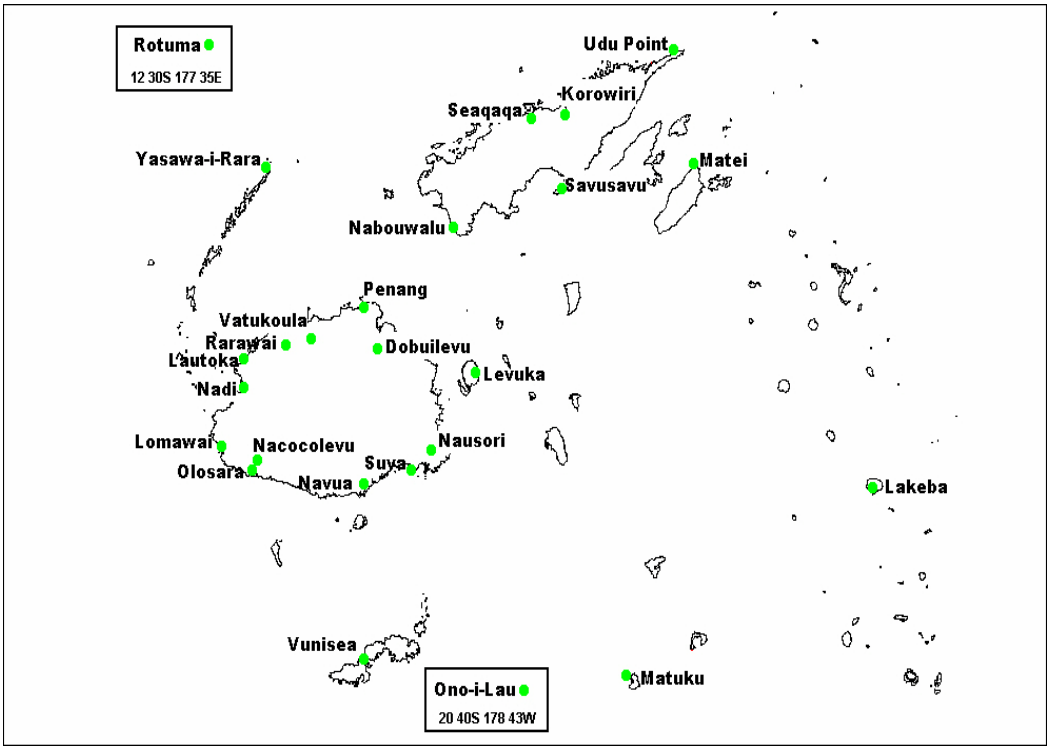
Three Month Rainfall Outlook Probabilities for February to April 2003

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	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 2003

	February		March		April	
Station Name	**Average***	**Probability#**	**Average***	**Probability#**	**Average***	**Probability#**
Western Division						
Dobuilevu	334	**51**	429	**25**	286	**18**
Vatukoula	386	**25**	382	**28**	221	**13**
Rarawai	347	**29**	365	**23**	207	**19**
Penang	336	**27**	425	**17**	269	**16**
Lautoka	301	**28**	308	**20**	187	**13**
Nadi	292	**37**	341	**36**	160	**16**
Lomawai	250	**38**	294	**25**	169	**44**
Olosara	215	**39**	258	**40**	166	**38**
Nacocolevu	234	**50**	275	**37**	155	**28**
Yasawa-I-Rara	240	**40**	276	**30**	209	**20**
Central Division						
Navua - Tamanoa	283	**68**	413	**59**	448	**28**
Suva	265	**59**	374	**54**	366	**39**
Nausori	268	**61**	382	**50**	356	**20**
Eastern Division						
Lakeba	226	**24**	293	**43**	206	**19**
Ono-I-Lau	194	**42**	253	**69**	157	**17**
Northern Division						
Korowiri	365	**29**	378	**18**	251	**18**
Seaqaqa	389	**31**	392	**25**	269	**12**
Nabouwalu	276	**49**	335	**33**	300	**37**
Savusavu	244	**36**	283	**40**	261	**16**
Udu Point	249	**28**	320	**48**	276	**14**
Rotuma	322	**51**	369	**33**	294	**32**

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.