

Weather Summary for Fiji Islands – December 2002 Rainfall Outlook till March 2003

FIJI METEOROLOGICAL SERVICE

In Brief

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December saw a marked reduction in rainfall over the entire country with Western and Northern Divisions and islands in the Eastern Division experiencing very dry conditions. This is the third consecutive month of below average rainfall in the Western Division.

As is typical during El Niño events, the main rain-producing weather system, the South Pacific Convergence Zone, was further north of its normal position this month until the formation of Tropical Cyclone *Zoe*. With the SPCZ being further north Fiji experienced a hot and humid trade regime till the 24th.

With dry conditions persisting, emergency water was delivered to just about all parts of the West-

Weather Patterns

December began with fine weather experienced in most parts of the country. On the 2nd, a tropical disturbance developed to the northeast of Fiji then later moved southwest, bringing showers to the northern and eastern areas on the 3rd and 4th. Later on the 4th, the disturbance developed into a depression as it moved southeast and was upgraded to Tropical Cyclone *Yolande* on the 5th.

In the meantime, the country was mostly affected by a dry south to southeast wind flow. *Yolande* was later downgraded to a depression twelve hours after it was declared a cyclone. As extratropical cyclone *Yolande*, moved further southeast on the 6th, a weak ridge of high pressure established to the southwest of Fiji. This ridge became the dominant weather feature from the 7th till the 14th maintaining an east and southeast air stream over the country, which produced trade showers about the southeastern parts of the group, while the rest of the country experienced mostly fine weather.

On the 15th, a trough with associated low-pressure system moved over the Lau group and by the 16th, moved across the rest of the country producing moderate rainfall. The trough later retrogressed over the group on the 17th and remained slow moving till the 21st. This resulted in heavy rainfall about the southern and eastern parts of the country. The trough finally moved to the north on the 22nd, giving way to a ridge. The ridge became more pronounced on the 23rd and remained the dominant feature for next six days.

ern Division this month. Deficiencies were being reported from areas half way between Sigatoka and Nadi to as far as Rakiraki. There were reports from rural communities of wells and creeks drying up in several areas.

Tropical Cyclone *Zoe* was closest to Fiji when it passed 290km to the West of Nadi on the 31st. The passage of the cyclone resulted in rain over most places with strong to marginal gale force winds about the western and southwestern parts of the country.

Total sunshine hours were around average across the country.

Southeastern parts of the country experienced some showers while fine and hot weather prevailed over the rest of the group.

On the 24th, a tropical depression was identified along a convergence zone near Rotuma. This depression gradually intensified and developed into Tropical Cyclone *Zoe* on the 26th. The cyclone took a southwest track initially and turned southeast later. As a consequence, Western Viti levu, Yasawa and Mamanuca Group, Kadavu, Vatulele and the nearby smaller islands were placed on strong wind warning on the 30th. These warnings continued till the end of the month. Tropical Cyclone *Zoe* was closest to the group on New Years Eve producing rain over most places and strong to marginal gale force winds about the western and southwestern parts of the country.

The South Pacific Convergence Zone and troughs frequently affected Rotuma in December, bringing rain and isolated thunderstorms. A strong wind warning was issued for Rotuma on the 26th, as a result of Tropical Cyclone *Zoe* and was later cancelled on the 28th.

TABLE 1: Rainfall from October to December 2002

<u>Station</u>	<u>Actual Rainfall (mm)</u>	<u>Has rainfall in the last three months been below average, average or above average?</u>	<u>No. of Rain days in Oct. (% of total rain)</u>	<u>No. of Rain days in Nov. (% of total rain)</u>	<u>No. of Rain days in Dec. (% of total rain)</u>
Penang Mill	93.8*	(Most likely Below Average)*	11	09	06*
Monasavu	938.9*	(Most likely Average)*	21	27	15*
Vatukoula Mine	161.4	Below Average	06 (29)	13 (56)	05 (15)
Rarawai Mill, Ba	133.4	Below Average	08 (37)	09 (28)	02 (35)
Yasawa-I-Rara	NA	NA	No data	No data	No data
Viwa Island	NA	NA	52.2mm (4)	81.6mm (8)	No data
Lautoka	143.5	Below Average	07 (27)	14 (38)	09 (35)
Nadi Airport	195.6	Below Average	07 (20)	12 (67)	09 (13)
Nacocolevu	232.1	Below Average	04 (14)	09 (44)	11 (42)
Navua	761.3	Average	19 (20)	20 (52)	21 (28)
Laucala Bay, Suva	759.9	Average	20 (18)	24 (53)	22 (29)
Nausori Airport	547.7	Average	17 (19)	17 (41)	22 (40)
Nabouwalu	476.5	Average	20 (20)	24 (44)	26 (36)
Labasa Airport	306.1	Below Average	10 (38)	10 (26)	15 (36)
Savusavu Airport	599.5	Average	14 (23)	21 (48)	19 (29)
Udu Point	NA	NA	306.1mm (15)	277.4mm (13)	No data
Matei Airport	641.4	Average	23 (30)	23 (34)	23 (36)
Lakeba	280.7	Average	23 (30)	08 (18)	15 (52)
Matuku	NA	NA	70.0mm (11)	95.4mm (14)	No data
Ono-I-Lau	117.5	Below Average	07 (24)	04 (68)	03 (08)
Vunisea, Kadavu	313.3	Average	16 (20)	16 (35)	16 (45)
Rotuma	820.0	Below Average	23 (29)	27 (38)	24 (33)

* - No observations were conducted at Penang Mill between 23-31st December 2002.

- Data for the period 18-31st December has not been received for Monasavu.

- 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 December

Rainfall has ranged from average to well below average in December with well below average (less than 50%) recorded in the whole of the Western Division and below average the north-western parts of the Northern Division. Ono-I-Lau also recorded well below average with a new record set this month. The Central Division recorded between 56 and 98% of normal rainfall.

Rainfall in the three-months from October to December

The Rainfall forecast for period from September to November in the September 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 low to moderate.

In the last three months rainfall has been below average in the Western Division, Labasa and Ono-I-Lau. Others parts of the country have recorded average rainfall. A number of sites have experienced significantly below average rainfall (less than 50%) in the last three consecutive months. These are Rakiraki, Vatukoula, Ba, Lautoka, Nadi Airport and Ono-I-Lau.

Figure A

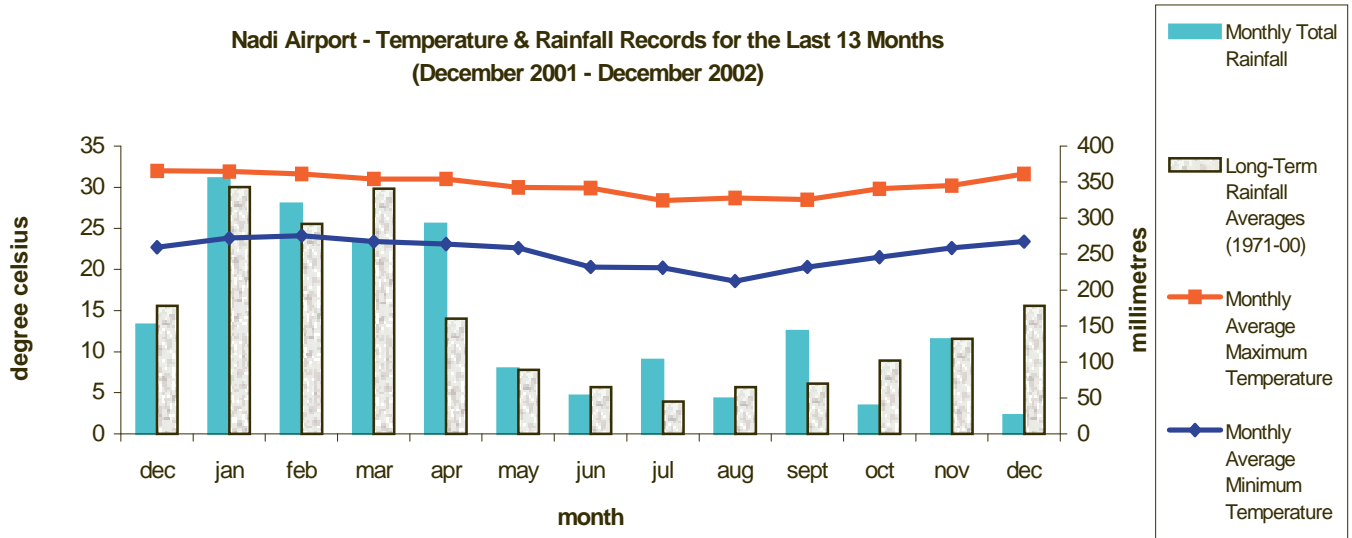


Figure B

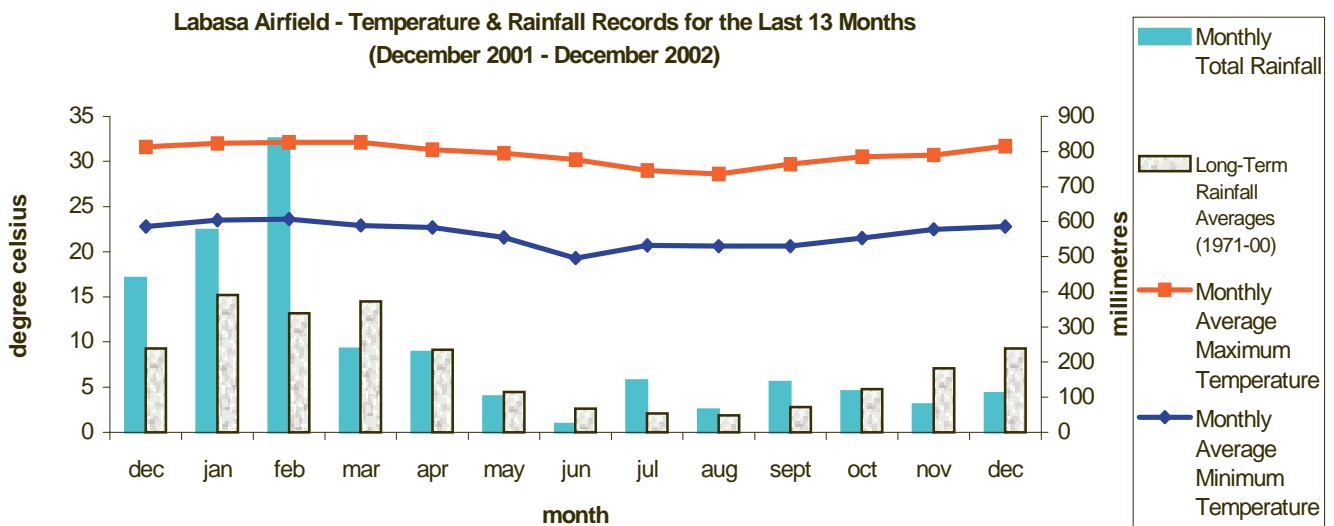
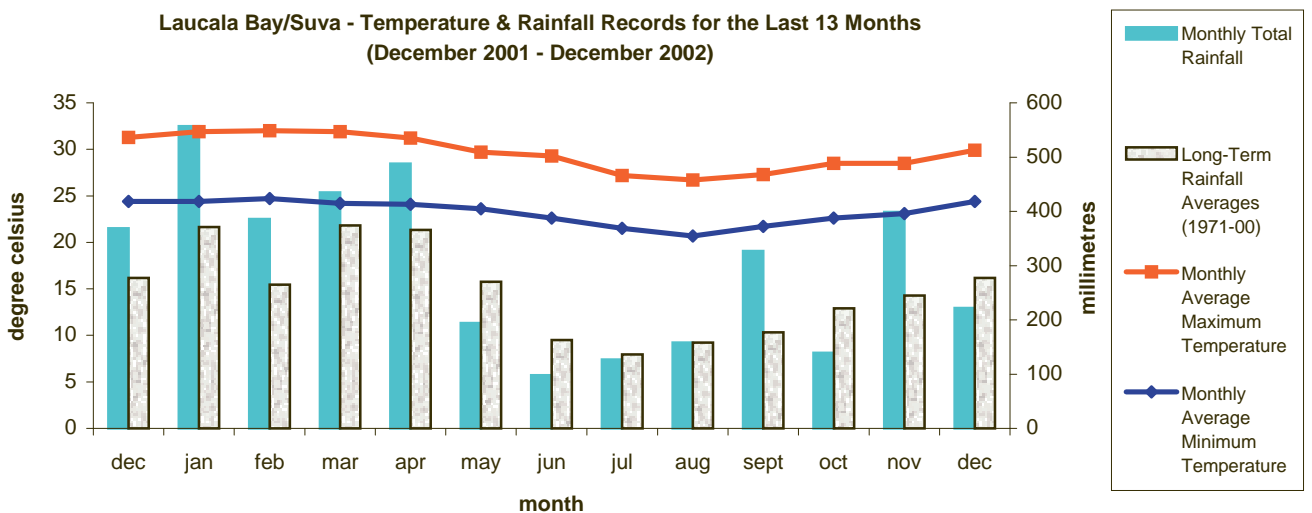


Figure C



Climate in December

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

Day-time temperatures across the country varied around average. The greatest positive departure from normal was at Rarawai, Ba and Lautoka which recorded monthly averages 1.6 and 1.1°C respectively above normal. The greatest negative departure from normal was at Vunisea and Navua which recorded monthly averages 1.4 and 0.8°C below normal.

Relative Humidity (RH) at 0900hrs varied around average across the country with Rarawai Mill, Ba recording the highest negative departure (8%) and Vatukoula (4%). The highest positive departure from normal was 5% at Nabouwalu and Savusavu Airfield and Matei.

Night-time temperatures were average to above in December. The greatest departure from normal was at Savusavu Airfield which recorded 1.7°C above average.

The coolest nights were generally on the 1-2nd, 13-15th. There was no general pattern with the warmest days.

Soil Moisture and Runoffs

Soil moisture conditions ranged from excessive to moderate in the Central Division through the month and excess to ample at Monasavu till the 17th.

vusavu and Matei Airfields conditions were ample to moderate.

In the Western Division conditions were limiting to dry throughout the month except for moderate conditions for about a week in the 3rd week of the month at Nacocolevu.

On Ono-I-Lau conditions were dry throughout the month. Lakeba began off with ample, moderate than dry at the end of month. At Vunisea conditions began off as dry for the first half, ample to excessive than moderate. At Rotuma, conditions were excessive to ample throughout the month.

In the Northern Division soil moisture was limiting to dry for the first half of the month at Nabouwalu and throughout the month at Labasa Airfield. At the Sa-

There were no significant runoffs in December.

Sunshine, Radiation & Winds

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

Wind speed was above average at Nadi Airport, Nabouwalu and Nausori Airport and around average at Rotuma and Vunisea.

Solar Radiation recorded at Nadi Airport and Laucala Bay was 98.7% and 86.3% of average respectively.

Records set in December 2002

<u>Element</u>	<u>Station</u>	<u>Observed (record)</u>	<u>On</u>	<u>Rank</u>	<u>Previous (record)</u>	<u>Year</u>	<u>Records Began</u>
Rainfall	Ono-I-Lau	9.1mm		New Low	13.0mm	1951	1943

November 2002 to April 2003 Tropical Cyclone Season

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

cyclones that have affecting Fiji in January with 3 of them being severe. The years were 1970, 75, 78, 80, 81 (2 events), 82, 85 (2 events), 97, 98, and 00 (2 events).

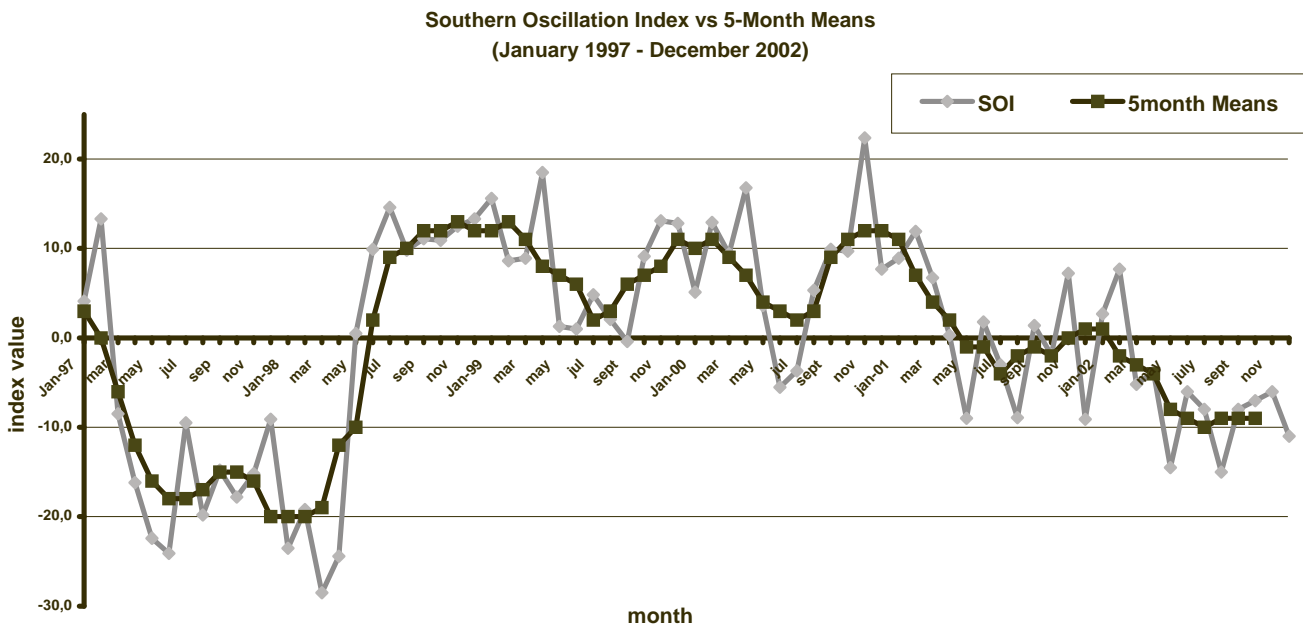
Historical analysis of tropical cyclones affected Fiji show that during El Nino seasons there is a higher chance of being affected by a Tropical Cyclone then during La Nina seasons such as 1998/99, 1999/00, 2000/01, but the chances are slightly lower than during a 'Neutral' season.

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

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

Other than strong winds, rough seas and heavy rain in some areas from the passage of Tropical Cyclones Yolande and Zoe close to the country, Fiji has not been affected by a Tropical cyclone this season to date.

Figure D



ENSO status and Rainfall Outlook to March 2003

Southern Oscillation Index: The Southern Oscillation Index (SOI) for December was -10.6 (November was -6.0) with the five-month running mean of -9 centred on October (September 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 1.7°C above average. The NINO 3 and 4 indices are +1.4°C and +1.3°C respectively. Subsurface ocean temperatures remain warmer than average (although somewhat less so than in recent months), and cloudiness remains enhanced in the central Pacific. So clearly the Pacific is still Warm. The majority of models are now in favour of Neutral conditions in five months' time with seven of the 11 available indicating Neutral in May 2003. These predictions are broadly consistent with historical observations, that El Niños tend to break down in late summer or autumn.

(The ENSO Update and SOI are provided by the National Climate Centre, Australian Bureau of Meteorology which can be found at the following website: <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 are 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 below average rainfall over the next three months for most of the Fiji Group excluding south-

eastern parts of the main islands, north-eastern Vanua Levu and the central Lau Group 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 over the next three months.. Note that the model predicts the chances of receiving at least average rainfall in January to be very low in the Western and Northern Divisions in January (Table. 2).

Outlook for January to March 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 very 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 December 2002

PRELIMINARY CLIMATOLOGICAL DATA FOR MONTH 12 , 2002 : SUMMARY FOR DAYS 1 TO 31

	RAINFALL				AIR TEMPERATURES						SUNSHINE			
	TOTAL	RAIN	MAX.	FALL	AVERAGE DAILY			EXTREME		TOTAL	*			
	MM	%	+		MM	MAX.	#	MIN.	#	MAX.		MIN.	HRS	%
NADI AIRPORT	26	14	9	16	31.6	0.1	23.4	1.0	34.1	23	20.1	15	227	100
SUVA/LAUCALA BAY	222	98	22	40	29.9	-0.4	24.4	0.9	31.6	7	22.0	13	155	79
NACOCOLEVU	98	51	11	31	31.1	0.2	22.4	0.8	34.4	12	17.4	14	142	78
ROTUMA	267	94	24	48	31.2	0.5	25.0	0.3	32.7	20	23.8	27	171	94
*VIWA	faulty aws													
*UDU POINT	faulty aws													
LABASA AIRFIELD	111	47	15	29	31.7	0.0	22.8	1.1	33.8	20	17.6	14		
NABOUWALU	172	67	26	37	29.7	0.1	24.6	0.6	32.7	19	23.0	1		
SAVUSAVU AIRFIELD	172	67	19	34	29.6	-0.6	24.8	1.7	31.5	30	23.0	13		
MATEI AIRFIELD	230	76	23	78	29.5	-0.1	24.1	0.3	33.3	19	22.0	1		
*YASAWA-I-RARA	faulty aws													
VATUKOULA	24	10	5	13	32.9	0.8	22.7	1.3	35.4	28	18.4	14		
MONASAVU	insufficient data													
NAUSORI AIRPORT	218	82	22	38	29.3	-0.4	23.5	0.9	31.4	19	19.0	1		
NAVUA/TOKOTOKO	210	56	21	49	28.7	-0.8	23.3	0.5	30.5	19	19.3	2		
LAKEBA	147	82	15	80	doubtful tempt data									
*MATUKU	faulty aws													
VUNISEA	141	73	16	44	28.0	-1.4	23.3	0.4	29.2	9	21.3	13		
ONO-I-LAU	9	7	3	5	29.3	0.6	24.0	0.5	30.9	7	20.2	1		
BA/RARAWAI MILL	47	21	2	47	33.9	1.6	22.7	1.0	36.0	23	19.5	2		
LAUTOKA AES	51	26	9	16	32.1	1.1	23.9	0.6	34.9	15	19.9	14		
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
NADI AIRPORT	.1MM	54	75	1	75	142	28	0	0	27.5	29.0	24.4	68	27.0	6.1	58	22.0
SUVA/LAUCALA BAY		50	54	15	17	0	0	71	4	27.1	27.5	25.0	81	29.7		39	17.7
NACOCOLEVU		51	75	1	75	60	12	0	0	26.7	27.8	24.5	76	28.2		43	
ROTUMA		52	57	18	0	0	0	77	7	28.1	29.1	26.0	78	31.3	4.3	46	
*VIWA	faulty aws																
*UDU POINT	faulty aws																
LABASA AIRFIELD		52	75	6	51	55	16	0	0	27.2	28.7	24.9	73	28.6			
NABOUWALU		51	75	7	30	17	4	0	0	27.1	27.1	24.8	82	29.5	9.4		
SAVUSAVU AIRFIELD		49	53	6	19	0	0	0	0	27.2	27.3	25.1	83	30.1			
MATEI AIRFIELD		50	41	20	4	0	0	47	1	26.8	27.8	25.6	84	31.0			
*YASAWA-I-RARA	faulty aws																
VATUKOULA		54	75	3	67	138	27	0	0	27.8	29.9	24.1	60	25.5			
MONASAVU	insufficient data																
NAUSORI AIRPORT		48	71	15	19	0	0	46	4	26.4	26.9	24.4	81	28.6	6.6		
NAVUA/TOKOTOKO		48	75	14	31	2	1	51	4	26.0	26.7	24.3	82	28.5			
LAKEBA		50	75	1	75	8	3	0	1	12.3	27.9	25.1	79	29.8			
*MATUKU	faulty aws																
VUNISEA		50	75	1	47	55	15	13	2	25.6	26.5	24.0	81	27.9	8.9		
ONO-I-LAU		50	75	1	75	145	30	0	0	26.7	27.1	23.7	75	26.8			
BA/RARAWAI MILL		54	75	1	33	162	30	0	0	28.3	29.9	24.6	64	26.8			
LAUTOKA AES		54	75	1	64	127	26	0	0	28.0	29.0	24.7	69	27.7			
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.

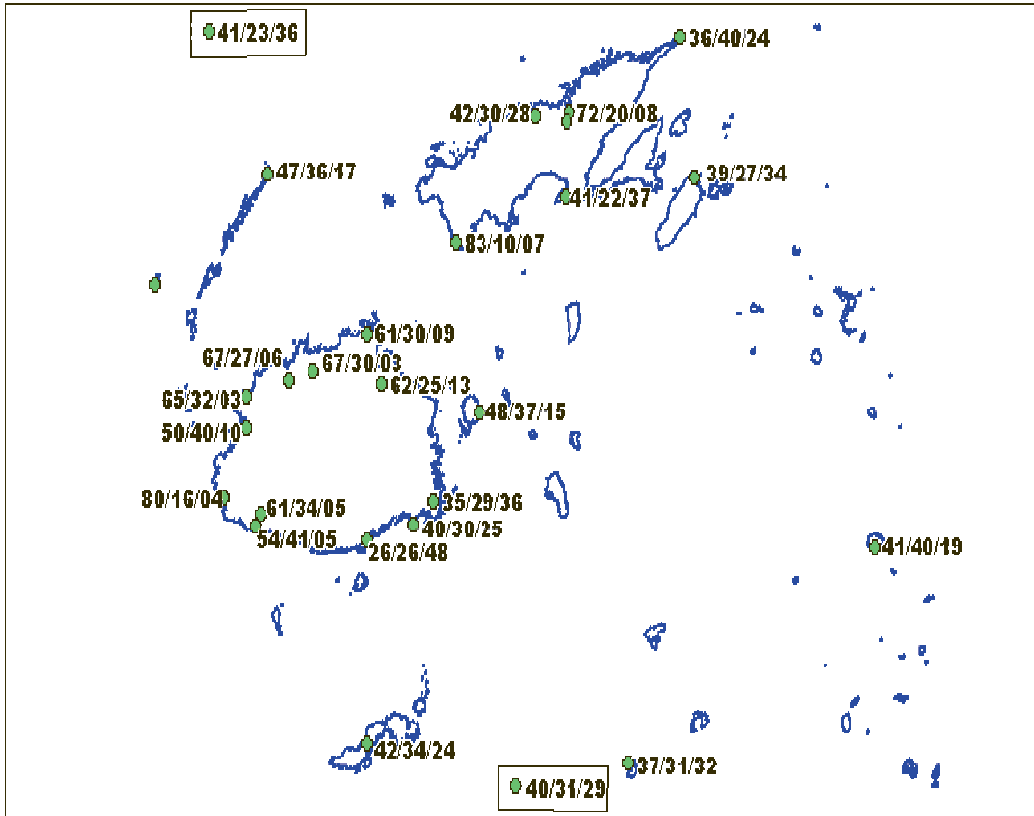
* : PERCENT OF NORMAL.

Note: This summary is prepared for rapid dissemination as soon as possible following the end of the month. The quantitative data are obtained daily on the phone or radiotelephone from a network of climate stations reporting 9 am observations; these data must be treated as provisional. Water balance calculations are approximate and are intended for guidance purposes only. Also, FMS does not guarantee accuracy and reliability of the forecast information presented in this summary but the Department should be sought for expert advice, any clarification or additional information. Any person wishing to re-print any information provided in this summary must seek permission from the Director of Meteorology.

Three Month Rainfall Outlook Probabilities for January to March 2003

The forecast probabilities are presented as

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



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	1016	1194
Vatukoula	1028	1428
Rarawai	948	1223
Penang	1021	1256
Lautoka	821	1058
Nadi	799	983
Lomawai	691	1021
Nacocolevu	699	973
Olosara	647	844
Yasawa	664	836
Central Division		
Navua	963	1276
Suva	888	1132
Nausori	919	1090
Eastern Division		
Levuka	791	1049
Lakeba	637	859
Matuku	589	770
Ono-I-Lau	495	688
Vunisea	690	846
Northern Division		
Labasa Mill	947	1313
Seaqaqa	1058	1347
Nabouwalu	827	1047
Savusavu	709	900
Udu Point	796	1002
Matei	842	1101
Rotuma	929	1195

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

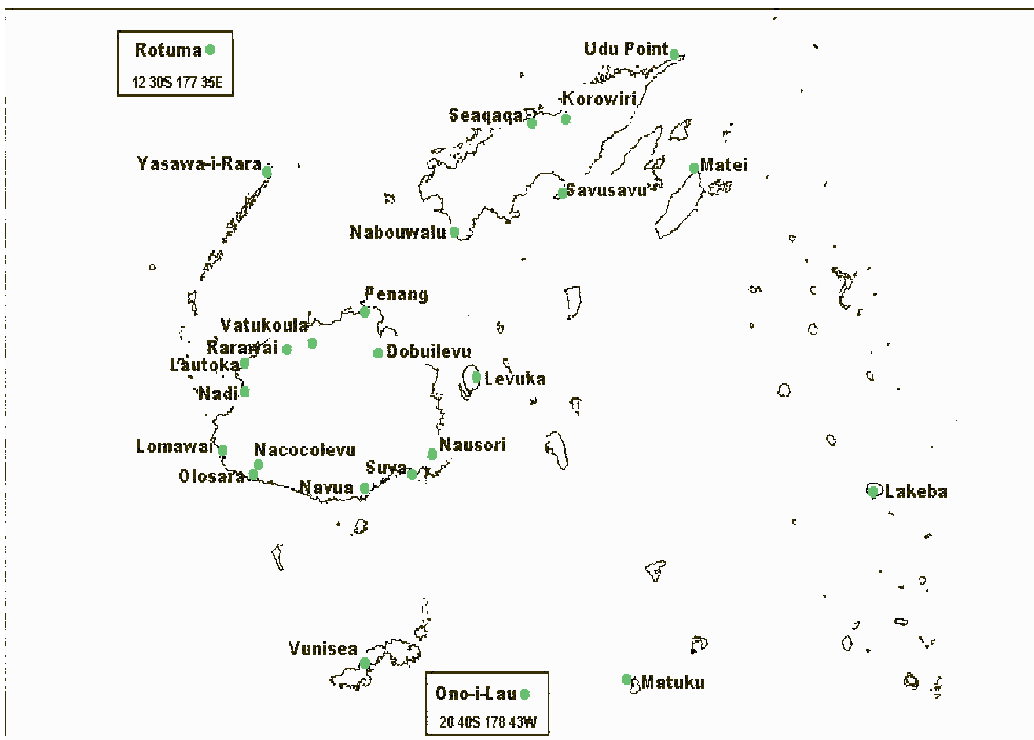


TABLE 3: Monthly Rainfall Outlook Probabilities for January to March 2003

Station Name	January		February		March	
	Average*	Probability#	Average*	Probability#	Average*	Probability#
Western Division						
Dobuilevu	393	10	334	51	429	25
Vatukoula	398	9	386	25	382	28
Rarawai	402	6	347	29	365	23
Penang	396	6	336	27	425	17
Lautoka	371	2	301	28	308	20
Nadi	343	0	292	37	341	36
Lomawai	337	0	250	38	294	25
Olosara	283	10	215	39	258	40
Nacocolevu	276	10	234	50	275	37
Yasawa-I-Rara	235	0	240	40	276	30
Central Division						
Navua - Tamanoa	395	34	283	68	413	59
Suva	371	23	265	59	374	54
Nausori	365	50	268	61	382	50
Eastern Division						
Lakeba	245	19	226	24	293	43
Ono-I-Lau	175	43	194	42	253	69
Northern Division						
Korowiri	395	8	365	29	378	18
Seaqaqa	419	12	389	31	392	25
Nabouwalu	312	13	276	49	335	33
Savusavu	276	11	244	36	283	40
Udu Point	313	30	249	28	320	48
Rotuma	348	44	322	51	369	33

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.