Volume 3: Issue: 6
June 2003

Weather Summary for Fiji Islands – June 2003

Rainfall Outlook till September 2003

FIJI METEOROLOGICAL SERVICE

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

In Brief

Rainfall continues to vary across the country from above average to well below average. Rainfall ranged from well below average to average in the Western Division, well below average to below average in the Northern Division, well below average to above average in the Lau Group and below average to average in the Central Division.

Transient sub-tropical highs and ridges influenced Fiji's weather in June. For most of the month, parts, or the whole of Fiji Waters was under a Strong Wind Warning, directly due to strong pressure surges from these highs and ridges. Additionally, temperature and relative humidity fell compared to last month across Fiji as cool and dry air masses were transported from the south.

Day-time temperatures were average to slightly below average and night-time temperatures varied around average across the country with a new night-time high of 25.5^{o}C recorded at Savusavu Airport.

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

Weather Patterns

The whole country (over land as well) was under a Strong Wind Warning on the 1st, brought about by an intense eastward-moving high to the south. With this high weakening, while steadily moving east, the Strong Wind Warning was only retained for the Fiji Waters. Some showers were reported especially about the southeastern parts and interior of the main islands, but as well as Lau, Lomaiviti and Kadavu as the high receded further east, thus allowing for relatively moist trades over the Group.

During this first week, an off-season tropical cyclone, TC Gina, was named by RSMC Nadi, late on the 5th, over the Eastern Solomons. It generally trekked southwest, just north of Northern Vanuatu, to finally decay to the north-northwest of New Caledonia late on the 9th. The cyclone attained hurricane strength, with a maximum intensity of 80 knots.

From the 10th to 12th, a cold front moved across Fiji from the southwest. This system produced relatively substantial rainfall over most places. A high following this front then brought cool and dry southeast trades. However, this was not without some showers till the 17th, especially about the southeastern parts and interior of the larger islands, as the front lingered over the country.

On the 17th, a trough drifted onto Fiji from the north. On the 18th, a front was moving east, but to the south. These systems helped produce rain over most places till the 19th, with moderate falls about the southeastern parts of the main islands. On the 20th, an intense ridge from a high to the southwest directed cool and dry south to southeast winds across Fiji. Except for a few showers about the southeastern parts and interior of the main islands, which incidentally occurred during the Official Opening of the 2003 South Pacific Games in Suva on the 28th, most of the country was dry with cool nights till the end of the month.

Rotuma recorded rain during most of June, as the convergence of the cooler and drier southeast and moister northeasterlies occurred about the island.

TABLE 1: Rainfall from April to June 2003

Station	Actual Rainfall (mm)	Has rainfall in the last three months been below average, average or above average?	No. of Rain days in Apr (% of total rain)	No. of Rain days in May (% of total rain)	No. of Rain days in June (% of total rain)
Penang Mill	617.5	Above	17 (21)	19 (76)	08 (03)
Monasavu Dam	1272.1	Above	24 (20)	24 (63)	25 (17)
Vatukoula Mine	486.5	Above	20 (18)	11 (66)	10 (16)
Rarawai Mill, Ba	386.5	Average	15 (33)	09 (57)	06 (10)
Yasawa-I-Rara Is.	-	-	NA	NA	NA
Viwa Is.	277.3	Below	15 (65)	08 (10)	04 (25)
Lautoka Mill(Research)	258.6	Below	14 (21)	07 (48)	04 (31)
Nadi Airport	186.0	Below	15 (28)	10 (56)	04 (16)
Nacocolevu, Sigatoka	300.1	Average	10 (32)	10 (63)	06 (05)
Tokotoko, Navua	877.4	Average	22 (27)	21 (56)	20 (17)
Laucala Bay, Suva	627.9	Below	25 (41)	24 (46)	19 (13)
Nausori Airport	711.6	Average	22 (37)	25 (53)	20 (10)
Nabouwalu	669.6	Above	25 (30)	21 (62)	22 (08)
Labasa Airport	442.2	Average	17 (18)	08 (79)	04 (03)
Savusavu Airport	413.6	Average	16 (18)	13 (76)	06 (06)
Udu Point	-	-	NA	NA	NA
Matei Airport	440.6	Below	17 (42)	19 (49)	08 (09)
Lakeba Is.	328.2	Below	14 (19)	15 (40)	15 (41)
Matuku Is.	-	-	143.7mm	226.6mm	NA
Ono-I-Lau Is.	118.2	Below	05 (38)	08 (44)	05 (18)
Vunisea, Kadavu	453.0	Average	17 (39)	21 (43)	19 (18)
Rotuma	724.0	Below	26 (23)	20 (36)	21 (41)

* Data not available at the present time for Nacocolevu (27-28th) and Savusavu Airport (4th)

Rainfall in the last three months

Rainfall in June

Rainfall continues to vary across the country from above average to well below average. Rainfall recording sites in the Western Division recorded well below average to average rainfall. Well below average rainfall was received at Nacocolevu and Penang Mill.

In the Northern and Eastern Divisions rainfall ranged from well below average at the Labasa, Savusavu & Matei Airfields and Ono-I-Lau to below average at Nabouwalu and above average at Lakeba.

In the Central Division below average rainfall was recorded at Laucala Bay and Nausori Airport and average at Tokotoko, Navua.

Rainfall in the three-months from April to June.

The Rainfall forecast for period from April to June in the March Fiji Islands Weather Summary was for rainfall to be variable but for most sites to receive below average to average rainfall. The skill level of the forecast for the above period was low due to the forecast period coinciding with the transition period from *Wet* to *Dry* Season.

The forecast was almost perfect with the northern and central parts of Viti Levu and Western Vanua Levu receiving above rainfall (4 sites) while the remaining parts of the country received average (7 sites) to below average (8 sites).

Figure A

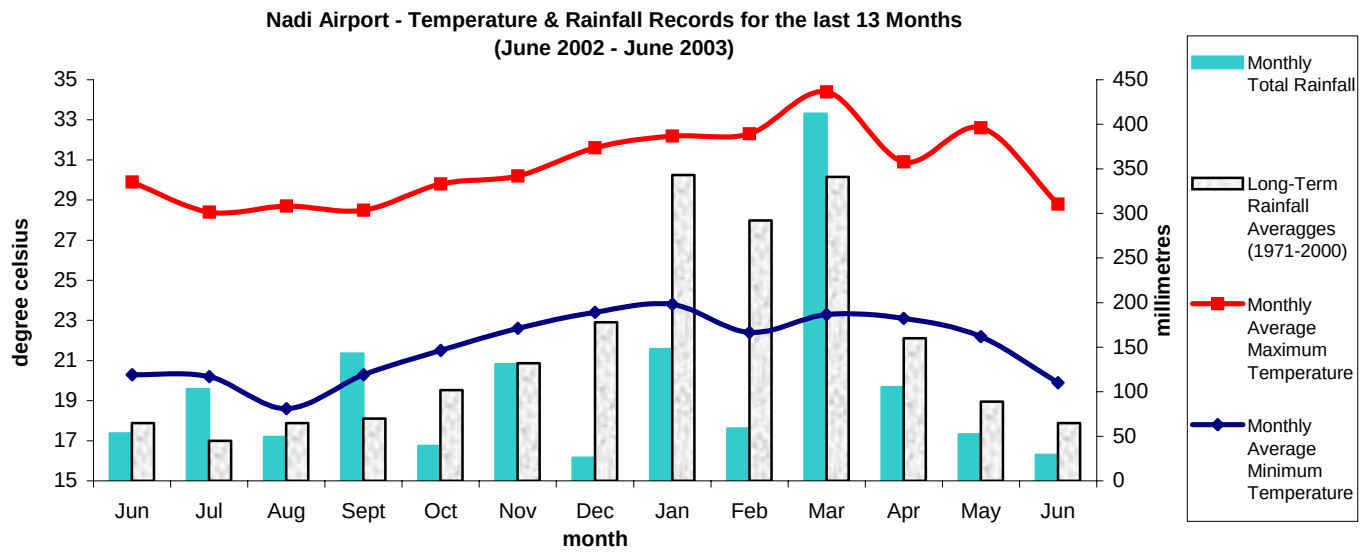


Figure B

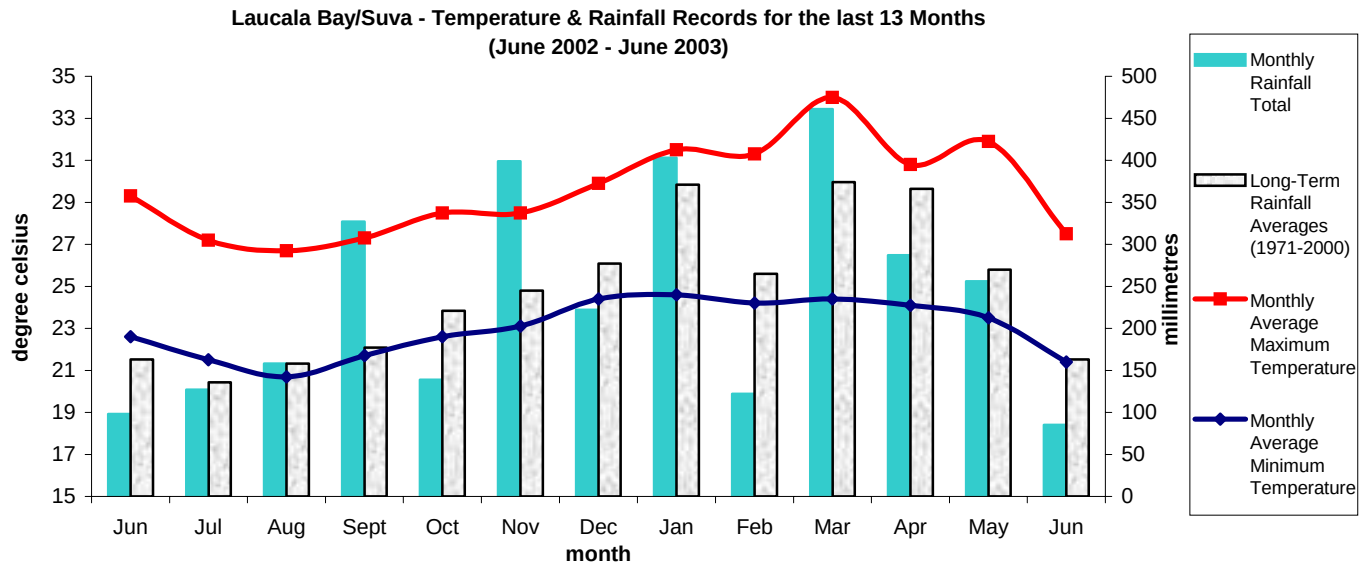
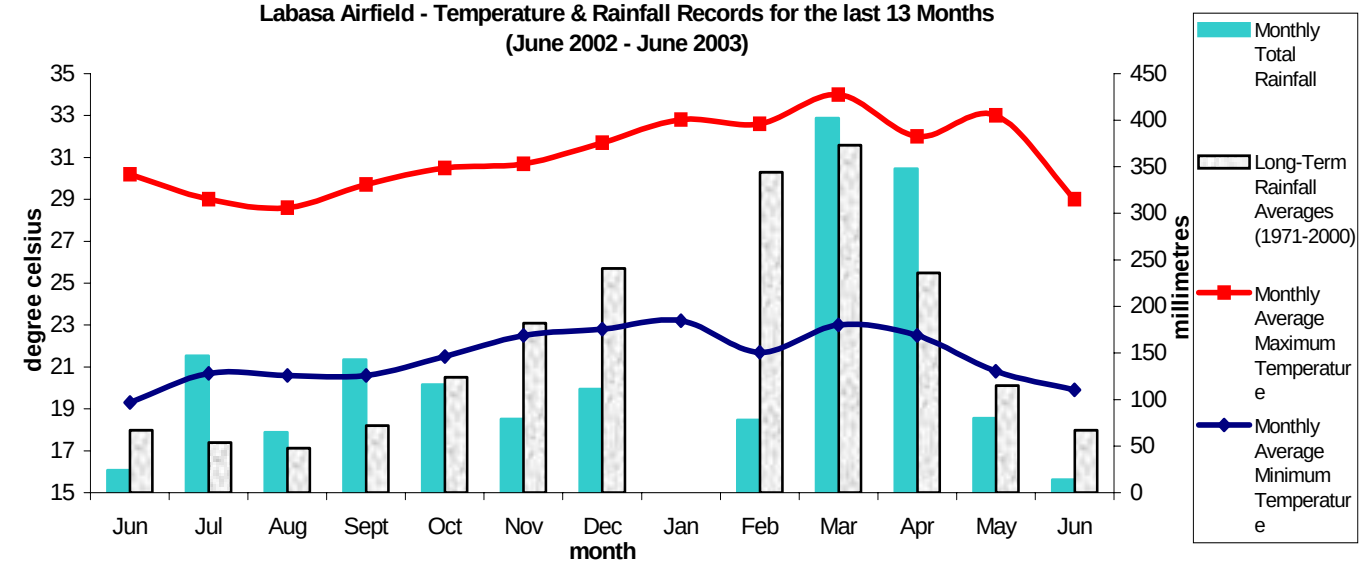


Figure C



Climate in June

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

Day-time temperatures in June were average to slightly below average at most sites across the country. The greatest positive departures from normal were observed at Rotuma and Nacocolevu which recorded monthly averages 0.4 and 0.3°C respectively above normal. The greatest negative departures were at Vunisea, Monsavu and Labasa Airport which recorded 1.0, 0.8 and 0.8°C respectively below normal.

Night-time temperatures varied around average across the country with a new night-time high of 25.5°C recorded at Savusavu. The greatest positive departures from normal were observed at Savusavu, Vatukoula and Labasa Airport which recorded 1.3°C, 1.0, 1.0°C above average respectively. The greatest negative departures were at Penang Mill and Nausori Airport which recorded 0.8 and 0.5°C respectively below normal.

Relative Humidity (RH) at 0900hrs was below average at all sites across the country except at Monsavu where it was +4% of average. Ba, Navua and Labasa Airport recording the greatest negative departure of –7% of normal.

Soil Moisture and Runoffs

Soil moisture conditions generally ranged from excessive to ample in the Central Division throughout the month at Nausori Airport and Navua. At Laucala Bay conditions were moderate then ample in the second half of the month.

In the Western Division, conditions were generally limiting to dry during most of the month. Penang, Ba and Rarawai recorded moderate conditions during the first week. Monasavu recorded excessive to ample conditions throughout the month.

In the Northern Division, soil moisture was generally moderate at Nabouwalu and limiting to dry at the Savusavu and Labasa Airports. Conditions were excessive to ample during the first week then moderate throughout the rest of the month at Matei Airport.

Limiting to dry conditions prevailed at Ono-I-lau, limiting then moderate then excessive to ample conditions at Lakeba, and excessive to ample throughout the month at Rotuma and at Vunisea.

There were significant runoffs at Rotuma (180.4mm), Monasavu (157.9mm) and Navua (62.7mm) in May.

Sunshine, Radiation & Winds

Total sunshine hours were around average at Nadi Airport, Laucala Bay, Nacocolevu and Rotuma (81-104%).

Global Solar Radiation recorded at Nadi Airport and Laucala Bay was 13.5 and 8.5 MJ/m^2 respectively.

Wind speeds during the month were around average at all wind recording sites except Nabouwalu where the winds were above average.

Records set in June 2003

Element	Station	Observed (record)	On	Rank	Previous (record)	Year	Records Began
Min Temp	Savusavu	25.5	4th	New High	25.0	1988/90	1956

Summary for 2002/03 Tropical Cyclone Season

The 2002/03 South Pacific Tropical Cyclone Season has officially ended. Since the 1969/70 Season a Tropical Cyclone hasn't occurred in July, August and September although there is an unconfirmed report of a Tropical Cyclone (gale) affecting the Southern Cooks/F. Polynesia on 20-22 July 1970.

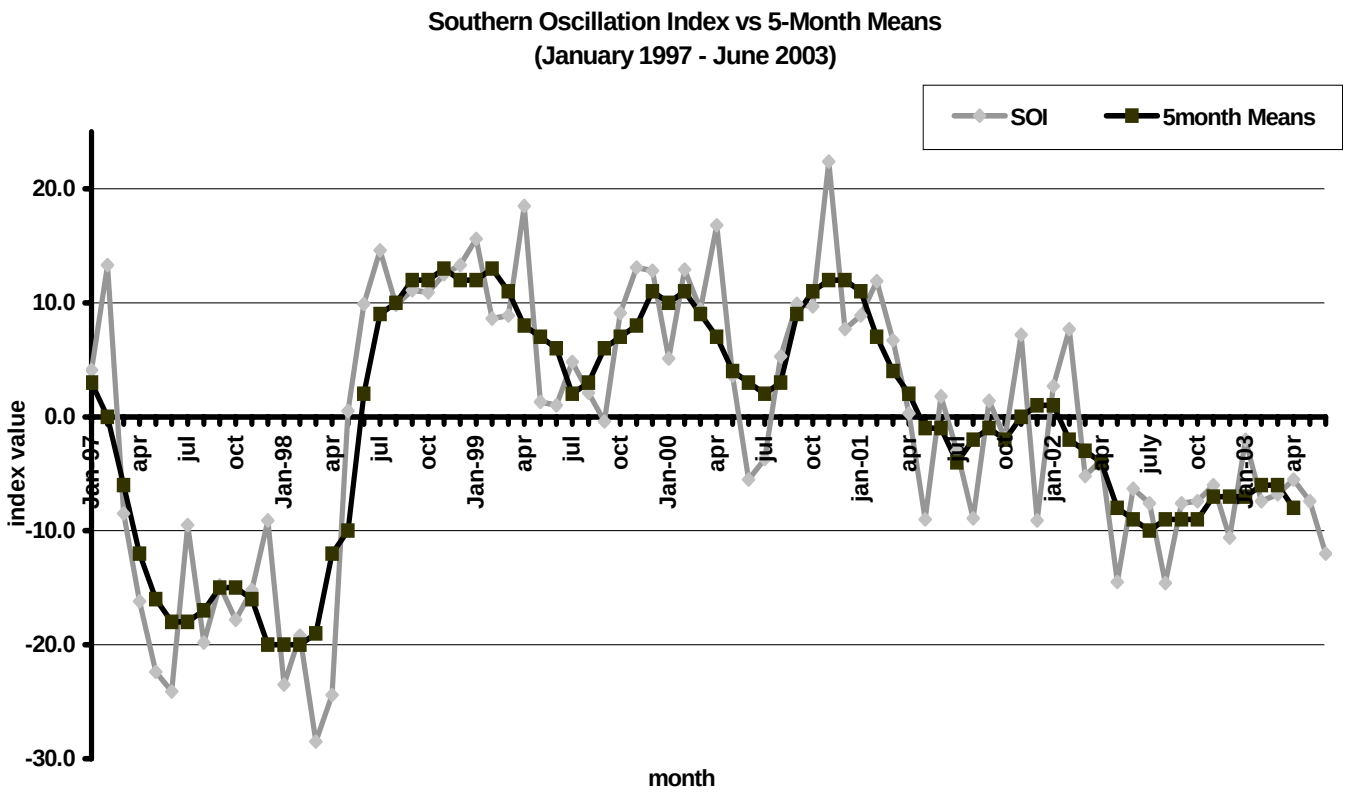
There were 11 (2 in June) tropical cyclones this season which is slightly more than the long-term average of 9-10 events over the 1969/70 to 2001/02 period. January was the most active month with three occurrences. The 2002/03 tropical cyclone season has been the most active since 1997/98 when there were 17 events.

Of the 11 cyclones this season, eight originated in the Fiji's area of responsibility. Five of the cyclones formed east of the dateline and six to the west.

The three most devastating tropical cyclones of the season were *Zoe, Ami and Erica*. Fiji was only directly affected by one cyclone (*Ami*) with three others (*Zoe*, *Cilla* and *Eseta*) brushing past the Group. *Ami* severely affected the northern and eastern parts of Fiji, with fifteen people swept away by floodwaters and four regarded as missing. The cyclone caused extensive damage in Vanua Levu and the Lau Group.

Zoe had marginal effects on Yasawa-I-Rara while *Eseta* produced significant rain and strong winds.

Figure D



ENSO status and Rainfall Outlook to September 2003

Southern Oscillation Index: The Southern Oscillation Index (SOI) for June was –12.0 (May was -7.4) with the five-month running mean of –8 centred on March (February was -6) (Figure D).

A Strong westerly wind burst caused warming across the tropical Pacific , both on and below the sea surface, in the past month. The NINO3 and NINO3.4 indices are –0.2°C and +0.2°C respectively. Most of the models predict a gradual warming of the Pacific during the coming eight months but keep Neutral values for NINO3 in five months time with two predicting Cool conditions. In eight months time, all 9 of the available models indicate Neutral conditions.

(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 in the Western parts of Viti Levu and across most of Vanua Levu (except Nabouwalu - average) the remaining parts of the country are predicted 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 'variable' rainfall across the country in the next three months (Table. 2).

Outlook for July to September 2003:

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

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

Preliminary Climatological Summary for June 2003

PRELIMINARY CLIMATOLOGICAL DATA FOR MONTH 6 , 2003 : SUMMARY FOR DAYS 1 TO 30

	RAINFALL					AIR TEMPERATURES								SUNSHINE	
	TOTAL		RAIN DAYS *		MAX. FALL	AVERAGE DAILY MAX.	#	MIN.	#	EXTREME MAX.		MIN.		TOTAL	*
	MM	%	+	MM	ON	C	C	C	C	C	ON	C	ON	HRS	%
NADI AIRPORT	29	45	4	24	10	28.8	-0.2	19.9	0.7	31.0	20	15.6	14	212	104
SUVA/LAUCALA BAY	85	52	19	16	19	27.5	-0.2	21.4	0.0	31.9	10	19.0	26	114	81
NACOCOLEVU	16	21	6	7	10	28.7	0.3	18.5	-0.2	31.5	10	14.5	14	137	92
ROTUMA	297	129	21	68	3	30.0	0.4	24.5	-0.1	31.7	10	22.6	5	163	86
VIWA	69	102	4	39	19	28.6	0.2	24.1	0.9	30.6	9	21.2	25		
*UDU POINT	Faulty AWS														
LABASA AIRFIELD	14	21	4	7	11	29.0	-0.8	19.9	1.0	31.8	20	16.4	3		
NABOUWALU	49	49	22	17	10	27.3	0.2	23.1	0.5	31.9	10	21.3	13		
SAVUSAVU AIRFIELD	25	21	6	12	11	27.5	-0.4	22.9	1.3	30.4	9	20.5	16		
MATEI AIRFIELD	42	34	8	11	18	27.4	-0.6	22.5	0.3	30.6	10	20.9	14		
*YASAWA-I-RARA	Faulty AWS														
VATUKOULA	79	109	10	52	11	29.3	-0.4	19.5	1.0	31.6	7	15.3	25		
MONASAVU	216	90	25	40	11	21.0	-0.8	16.1	-0.0	24.7	10	9.4	3		
NAUSORI AIRPORT	74	49	20	15	10	26.9	-0.3	20.0	-0.5	29.7	10	15.8	14		
NAVUA/TOKOTOKO	147	75	20	50	19	26.5	-0.3	20.0	-0.2	30.0	10	15.5	14		
LAKEBA	133	170	15	52	10	26.7	-0.5	22.3	0.3	29.7	10	17.1	30		
*MATUKU	Faulty AWS														
VUNISEA	83	66	19	18	18	25.6	-1.0	21.2	0.7	28.6	10	19.2	13		
ONO-I-LAU	21	24	5	11	19	26.0	0.2	21.4	-0.0	28.5	9	18.4	28		
BA/RARAWAI MILL	41	46	6	19	11	29.8	-0.2	18.3	0.3	31.9	9	14.0	25		
LAUTOKA AES	82	114	4	29	10	28.7	-0.1	20.6	-0.1	30.5	10	17.0	15		
PENANG MILL	19	19	8	5	10	27.5	-0.2	20.6	-0.8	30.0	19	16.5	25		

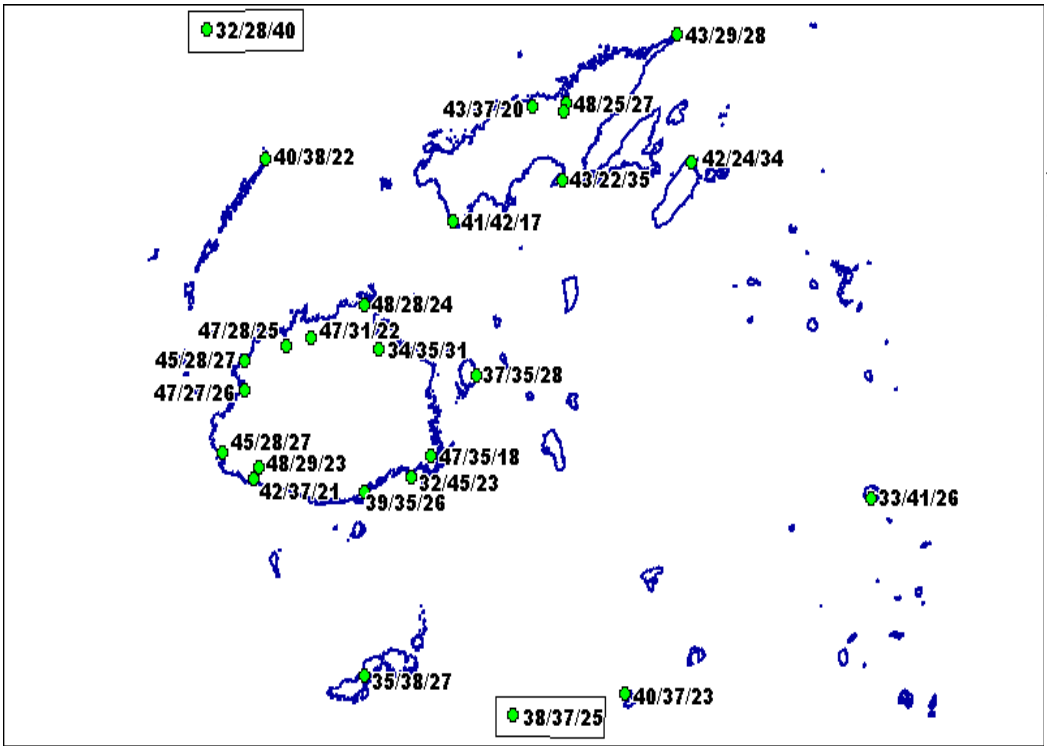
	PE	WATER BALANCE(MM)						TEMPERATURE(C)			HUMIDITY		WIND	SUN	RAD
	MAX.		LAST	DEF	NO	RO	NO	DLY	DRY	WET	RH%	VP		%OF	MJ/
	.1MM	DS	ON	DS	DYS	DYS		MEAN	(AVERAGE		AT 9AM)		KT	POS	SQ.M
NADI AIRPORT	29	75	1	75	58	21	0	0	24.3	24.0	21.1	76	22.8	4.1	67	13.5
SUVA/LAUCALA BAY	28	38	9	28	0	0	9	1	24.5	24.9	21.9	77	24.1		37	8.5
NACOCOLEVU	26	75	22	75	21	9	0	0	23.6	24.0	21.8	82	24.5		52	13
ROTUMA	33	30	1	13	0	0	180	9	27.3	28.0	25.1	79	29.7	5.0	53	15
VIWA	33	75	1	62	44	14	0	0	26.3	26.3	23.2	76	26.0			
*UDU POINT	Faulty AWS															
LABASA AIRFIELD	29	75	1	75	73	26	0	0	24.4	25.7	22.3	74	24.4			
NABOUWALU	28	60	30	60	0	0	0	0	25.2	25.2	22.2	77	24.6	11.4		
SAVUSAVU AIRFIELD	28	75	1	75	57	22	0	0	25.2	25.5	22.3	75	24.4			
MATEI AIRFIELD	28	52	30	52	0	0	0	0	25.0	25.5	22.5	77	25.0			
*YASAWA-I-RARA	Faulty AWS															
VATUKOULA	29	75	5	57	13	5	0	0	24.4	25.5	21.6	70	22.8			
MONASAVU	20	8	25	2	0	0	158	19	18.5	18.6	17.5	89	19.2			
NAUSORI AIRPORT	27	30	9	26	0	0	2	1	23.4	24.1	21.6	79	23.9	4.3		
NAVUA/TOKOTOKO	27	22	9	15	0	0	63	3	23.3	24.2	21.4	77	23.3			
LAKEBA	28	75	5	27	11	5	23	1	24.5	24.7	21.4	74	23.1			
*MATUKU	Faulty AWS															
VUNISEA	27	23	30	23	0	0	21	4	23.4	23.8	21.1	77	22.9	7.3		
ONO-I-LAU	26	75	1	75	57	24	0	0	23.7	23.5	20.4	75	21.7			
BA/RARAWAI MILL	29	74	30	74	0	0	0	0	24.0	24.8	21.6	74	23.3			
LAUTOKA AES	29	75	1	54	26	9	0	0	24.6	25.5	21.8	71	23.2			
PENANG MILL	29	75	19	75	28	11	0	0	24.0	23.7	21.1	79	23.1			

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: 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.

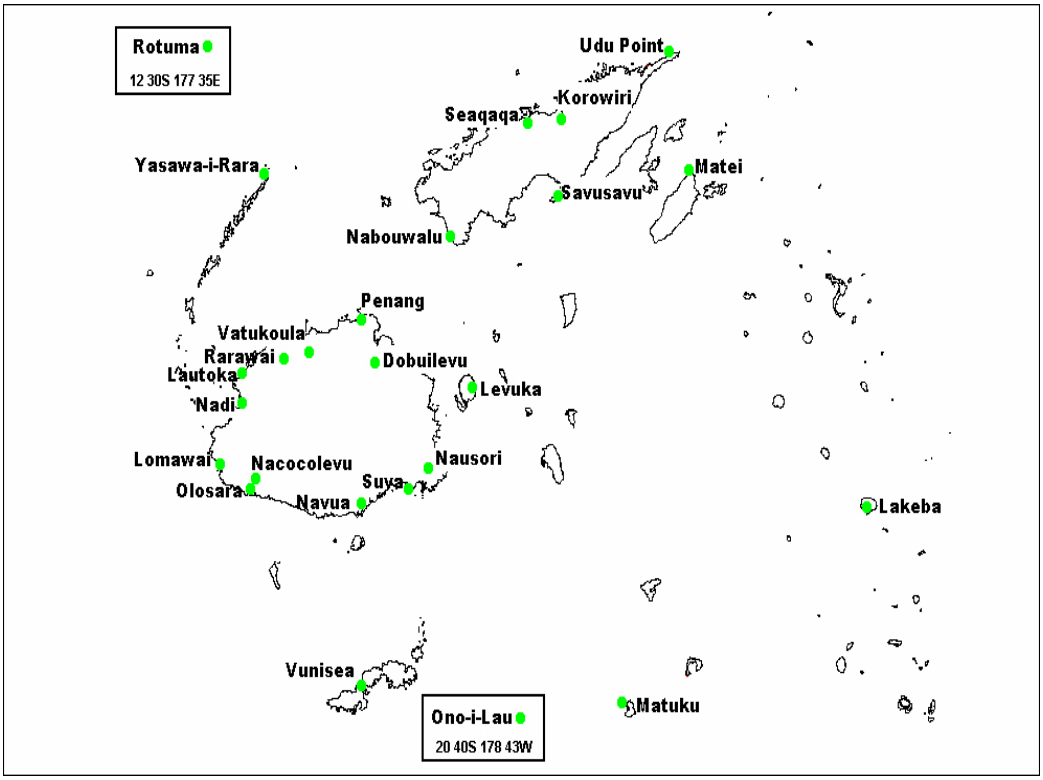
Three Month Rainfall Outlook Probabilities for July to September 2003

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	207	300
Vatukoula	124	212
Rarawai	132	231
Penang	153	234
Lautoka	120	223
Nadi	127	202
Lomawai	151	256
Nacocolevu	191	280
Olosara	199	308
Yasawa	121	202
Central Division		
Navua	512	700
Suva	384	512
Nausori	363	501
Eastern Division		
Levuka	283	417
Lakeba	174	294
Matuku	197	308
Ono-I-Lau	238	343
Vunisea	274	381
Northern Division		
Labasa Mill	116	201
Seaqaqa	118	241
Nabouwalu	212	369
Savusavu	249	336
Udu Point	212	351
Matei	292	421
Rotuma	575	808

TABLE 3: Monthly Rainfall Outlook Probabilities for July to September 2003

	July		August		September	
Station Name	**Average***	**Probability#**	**Average***	**Probability#**	**Average***	**Probability#**
Western Division						
Dobuilevu	56	**47**	80	**57**	119	**36**
Vatukoula	50	**40**	68	**41**	78	**33**
Rarawai	39	**65**	65	**31**	74	**30**
Penang	55	**50**	73	**23**	96	**44**
Lautoka	49	**51**	70	**35**	72	**33**
Nadi	45	**46**	65	**45**	70	**43**
Lomawai	62	**53**	79	**33**	71	**30**
Olosara	77	**43**	98	**31**	103	**32**
Nacocolevu	71	**61**	83	**30**	92	**33**
Yasawa-I-Rara	43	**39**	63	**24**	66	**44**
Central Division						
Navua - Tamanoa	186	**44**	202	**42**	229	**42**
Suva	136	**37**	158	**38**	177	**30**
Nausori	118	**43**	147	**47**	165	**46**
Eastern Division						
Lakeba	80	**37**	102	**40**	101	**49**
Ono-I-Lau	92	**19**	118	**21**	108	**37**
Northern Division						
Korowiri	52	**24**	52	**51**	75	**40**
Seaqaqa	52	**32**	56	**63**	82	**36**
Nabouwalu	92	**26**	105	**43**	113	**36**
Savusavu	96	**48**	116	**51**	133	**24**
Udu Point	89	**36**	85	**52**	113	**46**
Rotuma	233	**39**	210	**37**	238	**50**

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.