Volume 3: Issue: 9
September 2003

Fiji Islands Weather Summary September 2003
Rainfall Outlook till December 2003

FIJI METEOROLOGICAL SERVICE

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In Brief

Rainfall in September was well below average (<40% of normal) across the country except for Rotuma (52%). Greatest suppression was in the Western Division, Northern Vanua Levu and parts of the Eastern Division where rainfall received was less than 10% of normal.

With rainfall being well below average in the last month, Drought conditions have been enhanced and the area affected has expanded from the previous month. For six of the nineteen stations that reported in time for this summary, rainfall in the last three months was within the lowest ten-percent and in a couple of cases within the lowest five-percent on record.

Ocean and Atmosphere conditions are currently '*Neutral*' and have been '*Neutral'* for some time. The strong below average trend in rainfall is most likely due to the lag effect of the *El Niño* on Fiji's rainfall which can continue for a number of months after the *El Niño* has phased out.

Night-time air temperatures were generally below average and Day-time above average across the country. Relative Humidity was generally below average.

Total sunshine hours ranged from average to above average for the month of September.

Rainfall in the next three months is expected to be vary around average. The amount of rainfall received in the coming months should increase as we progress into the *Wet season* especially with the official Tropical Cyclone Season beginning in November.

Weather Patterns

September saw a marked reduction in rainfall over the entire country compared to the previous month. Transient sub-tropical high-pressure systems dominated the weather pattern for most of the month. Amid this, there were three occasions when a trough of low pressure or front affected the country.

In the first week, an eastward moving and persistent ridge of high pressure to the south of Fiji maintained a cool and dry southeasterlies over the group. No significant rainfall was recorded during this period. However, on the 6th, significant swells were experienced about the southern coastal areas of Viti Levu due to a slow-moving low pressure system situated to the south of the country.

On the 8th, a trough of low pressure developed to the west and moved over the group resulting in some showers over most areas till the 9th. The trough then moved east giving way to a ridge of high pressure on the 10th that resulted in fine weather across the country for the next four days.

A second trough developed to the northeast of Fiji on the 14th but weakened as it drifted over the country. It produced only scattered showers and was subsequently displaced by a ridge of high pressure. This ridge maintained cool and dry weather over the country for a week.

A weak cold front moved across the country on the 22nd producing a few showers about the southern parts of the group. Following the front was a ridge of high pressure, which became the prominent weather feature for the rest of the month.

Rotuma was mostly under influence of moist east to northeast wind flow with a few incidences of SPCZ affecting the Island's weather. This resulted in showers for most of September except for dry period later in the month.

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TABLE 1: Rainfall from July to September 2003

Station	Actual Rainfall (mm)	Has rainfall in the last three months been below average, average or above average?	No. of Rain days in July (% of total rain)	No. of Rain days in August (% of total rain)	No. of Rain days in September (% of total rain)
Penang Mill	72.4	Well Below Average	07 (35)	05 (57)	02 (08)
Monasavu Dam	372.5	Below Average	23 (53)	12 (37)	05 (10)
Vatukoula Mine	75.7	Below Average	06 (19)	07 (74)	04 (07)
Rarawai Mill, Ba	80.0	Below Average	03 (08)	04 (90)	02 (02)
Yasawa-I-Rara	-	-	-	-	-
Viwa Is.	104.4	Below Average	04 (08)	08 (91)	01 (01)
Lautoka Mill(Research)	153.1	Average	03 (08)	06 (88)	03 (04)
Nadi Airport	128.7	Average	04 (22)	06 (76)	02 (02)
Nacocolevu, Sigatoka	158.0	Below Average	09 (62)	05 (35)	01 (03)
Tokotoko, Navua	234.9	Well Below Average	17 (42)	12 (38)	09 (20)
Laucala Bay, Suva	240.3	Below Average	25 (41)	21 (41)	07 (18)
Nausori Airport	243.5	Below Average	23 (52)	12 (35)	05 (13)
Nabouwalu	153.9	Below Average	18 (44)	13 (29)	10(27)
Labasa Airport	32.2	Well Below Average	04 (62)	03 (17)	02 (21)
Savusavu Airport	149.7	Below Average	14 (45)	09 (23)	09 (23)
Udu Point	-	-	-	-	-
Matei Airport	117.9	Well Below Average	16 (50)	06 (06)	06 (44)
Lakeba Is.	192.9	Average	13 (68)	08 (29)	03 (03)
Matuku Is.			-	-	
Ono-I-Lau Is.	83.9	Well Below Average	08 (39)	07 (43)	05 (18)
Vunisea, Kadavu	180.1	Below Average	18 (75)	10 (20)	04 (05)
Rotuma	746.1	Average	25 (41)	13 (43)	19 (16)

Rainfall in the last three months

Rainfall in September

Rainfall in September was well below average (<40% of normal) across the country except for Rotuma (52%). Greatest suppression was in the Western Division, Northern Vanua Levu and parts of the Eastern Division where rainfall received was less than 10% of normal.

Rainfall in the three-months from July to September

The Rainfall forecast for the period July to September in the June Fiji Islands Weather Summary was for rainfall to vary around average. The skill level of the forecast was low due to the forecast period being in the Dry Season and September being transition month from the Dry to Wet Season.

Of the nineteen sites that reported in time for this summary, five sites reported well below average, ten sites below average and four sites average.

For the three consecutive months from July to September a number of sites when compared to three consecutive months for the same period in the past fall by definition into a state of Meteorological drought. Hazardous conditions are said to occur when at least the 3-month rainfall in an area falls below the ten-percentile value and a severe event falls below the five-percentile value.

A number of sites fall within the ten-percentile range. These are Penang Mill, Tokotoko, Navua, Nausori Airport, Labasa Airport, Matei Airport and Ono-I-Lau. Monasavu and Laucala Bay are almost within the above category.

Figure A

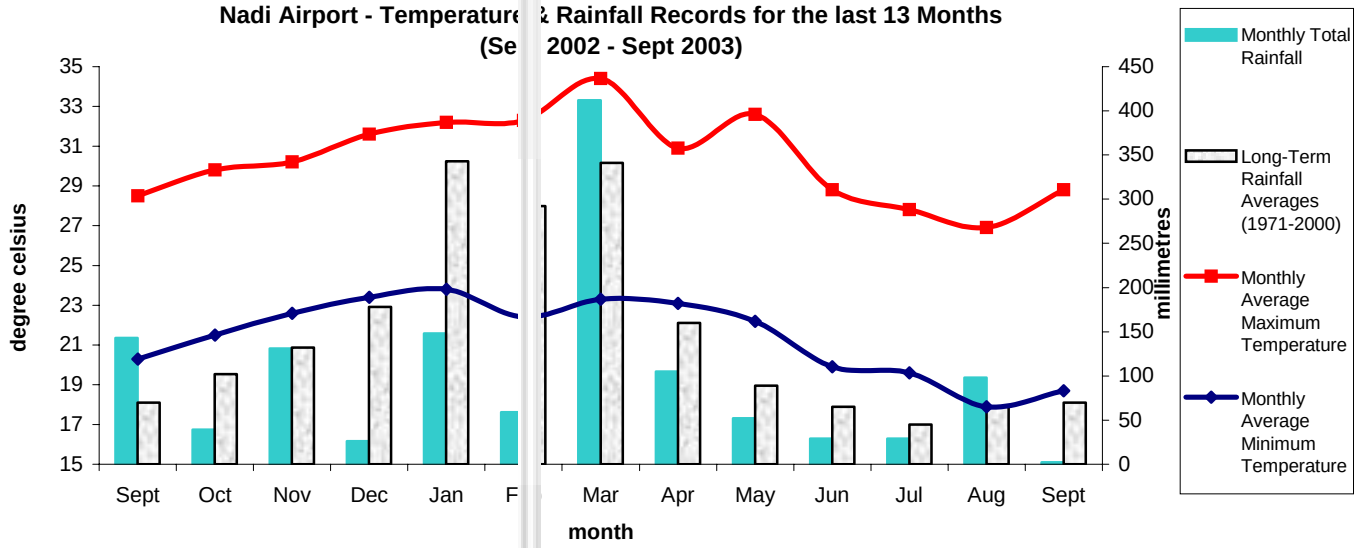


Figure B

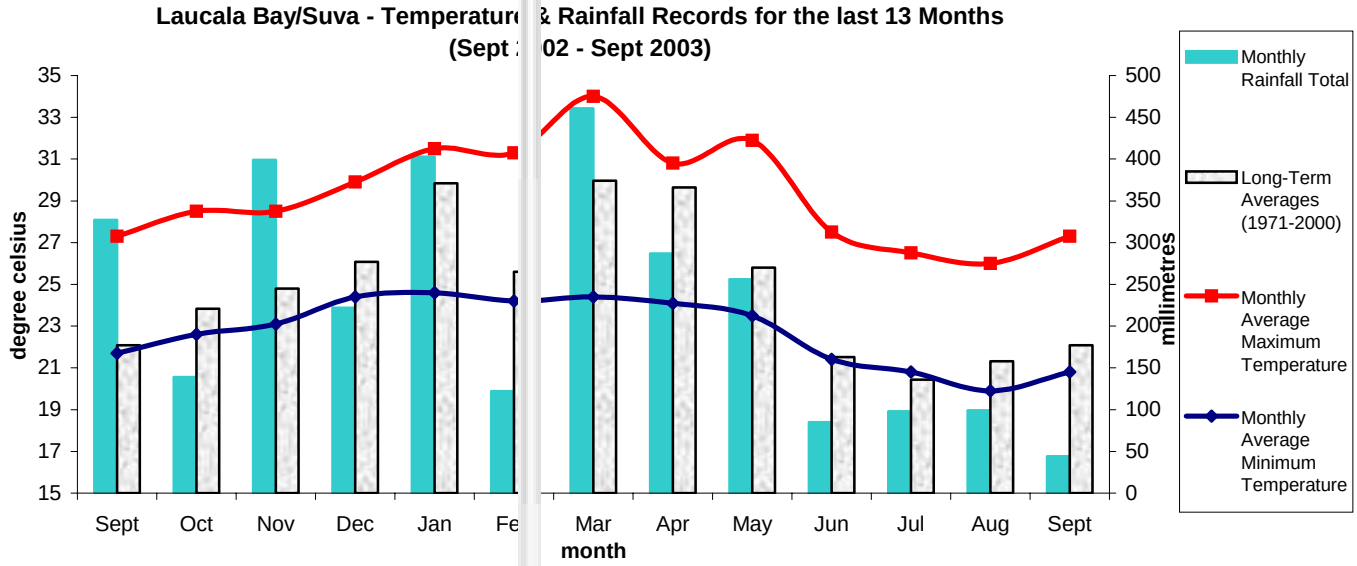
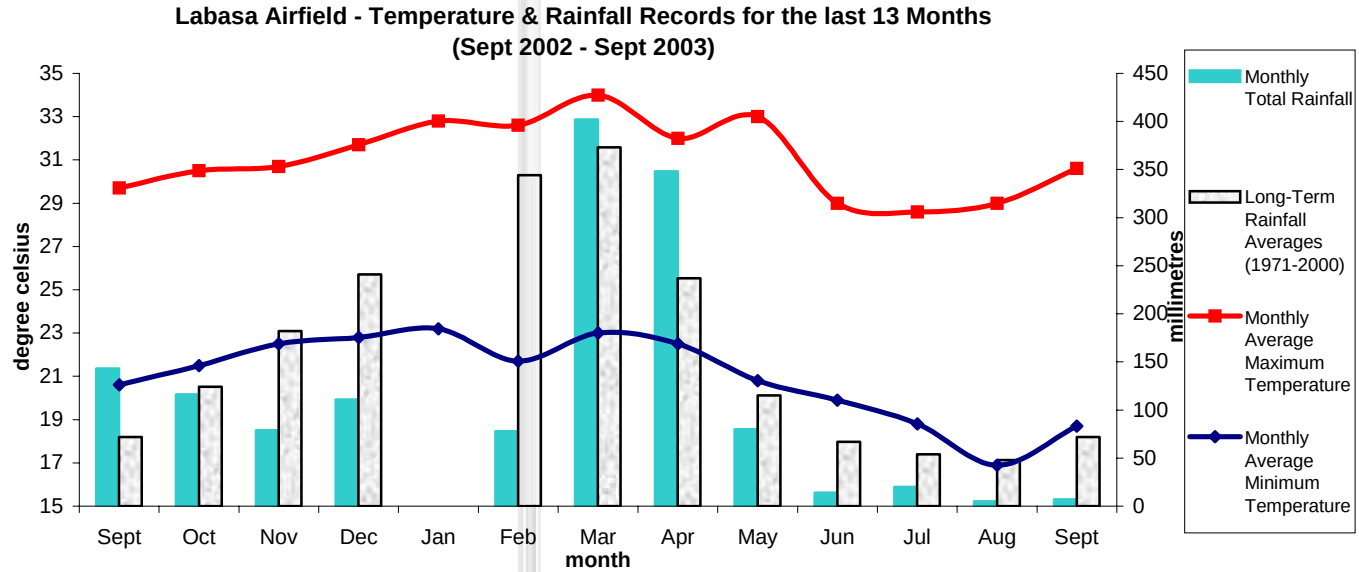


Figure C



Climate in September

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

Day-time temperatures were generally above average at most recording sites across the country except at Nadi Airport, Savusavu Airfield and Vatukoula where it was about average. The greatest positive departures from normal were recorded at Ono-I-Lau and Penang Mill which recorded 1.1 and 1.0°C respectively above normal. The greatest negative departures were at Nadi Airport and Vatukoula which recorded 0.5 and 0.3°C respectively below normal.

Night-time temperatures were generally below average. The greatest positive departures from normal were recorded at Savusavu Airfield, Rotuma and Vatukoula which recorded 1.0 and 0.5°C respectively above normal. The greatest negative departures were at Penang Mill, Nacocolevu and Tokotoko (Navua) which recorded 1.7, 1.5 and 1.3°C respectively below normal.

Relative Humidity (RH) at 0900hrs were generally below average at all recording sites except at Nadi Airport and Nacocolevu. The greatest positive departures was +11.3 % and 1.1% respectively. The greatest negative departure was –10.9% at Navua and –9-9% at Tokotoko (Navua).

Soil Moisture and Runoffs

Soil moisture conditions were limiting to dry in the Western, Northern and Eastern Division except for Nausori Airport in the Eastern Division ranged from ample to moderate in the first two weeks and then limiting to dry for the remaining part of the month.

Rotuma recorded excessive to ample for the first three weeks then moderate towards the end of the month.

The only runoff was recorded at Rotuma of 14.9mm.

Sunshine, Radiation & Winds

Total sunshine hours were average to above average. Nadi Airport recorded 112%, Laucala Bay/Suva, 130%, Nacocolevu 134% and Rotuma 123% of normal.

Global Solar Radiation recorded at Nadi Airport was 18.3MJ/Square metre (96%) and 14.9MJ/Square metre (100%) at Laucala Bay/Suva (of normal).

Average Wind speed was below average at Laucala Bay, Nausori Airport and Rotuma, around average at Nausori Airport and Vunisea while above average Nabouwalu.

Records set in September 2003

Element	Station	Observed (record)	On	Rank	Previous (record)	Year	Records Began
Rainfall	Nacocolevu	4.6mm		New Low	6.6mm	1987	1926
Rainfall	Viwa	1.2mm		New Low	7.6mm	1992	1978
Rainfall	Vatukoula	5.1mm		New Low	5.8mm	1988	1984
Rainfall	Tokotoko	47.3mm		New Low	68.3mm	1992	1992
Rainfall	Vunisea	8.2mm		New Low	21.0mm	1953	1943
Rainfall	Monasavu	38.1mm		Second Low	64.1mm		1980
Rainfall	Lakeba	6.2mm		Second Low	13.8mm		1924
Max Temp	Vatukoula	34.8	18th	New High	34.3	1990	1984
Min Temp	Penang Mill	12.4	3rd	New Low	12.5	1993	1930

November to April 2003/04 Tropical Cyclone Season

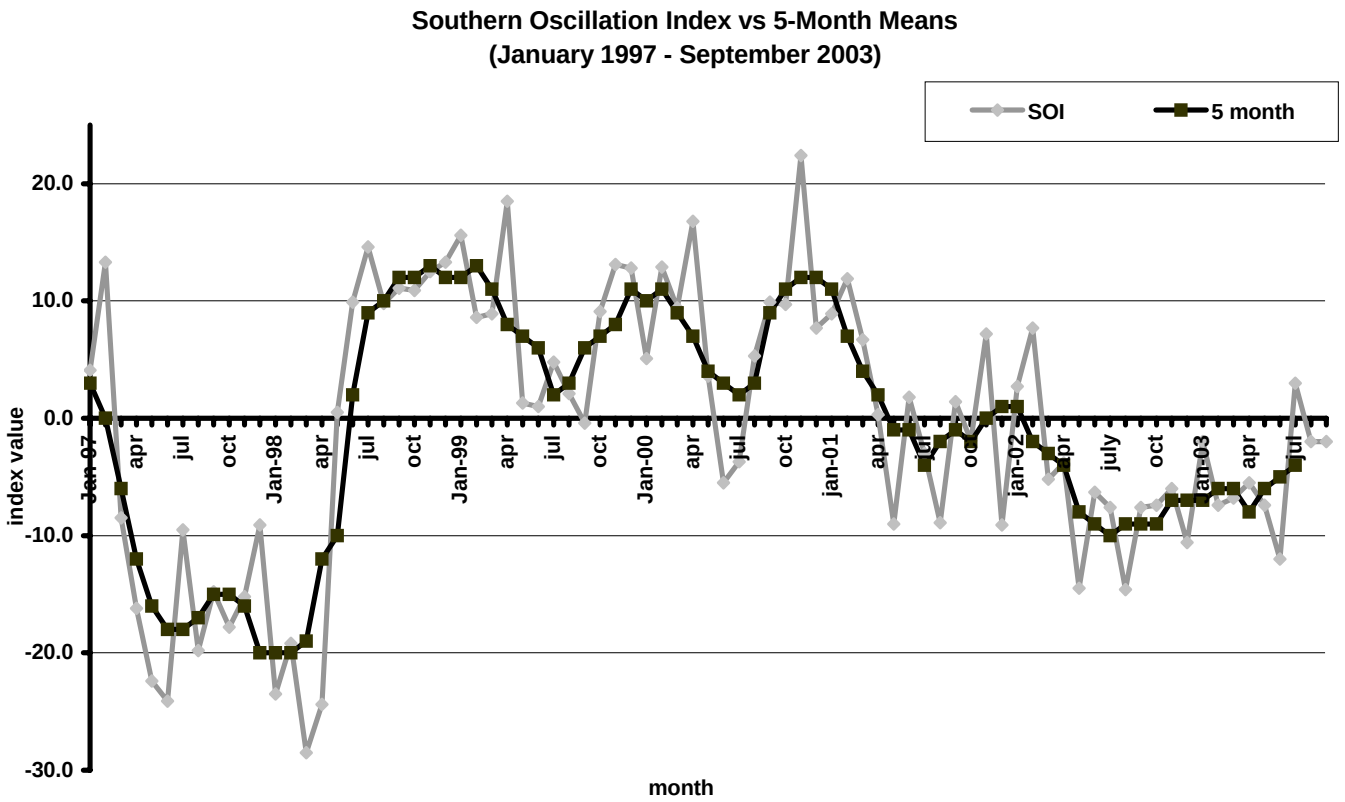
The South Pacific Tropical Cyclone Season officially begins on 1st November and will continue till 30th April 04.

Historical records of tropical cyclones affecting Fiji since the 1969/70 show that there have been three pre-season cyclones in the month of October . These were *Nora* in 1970, *Bebe* in 1972 and *Lusi* in 1997.

The chances of an early cyclone affecting Fiji this season are low especially with ocean and atmosphere conditions currently being *Neutral*. The average number of cyclones that affect Fiji in a season (including pre-season events) is 1 to 2. However, there have been as many as six (1996/97).

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 December 2003

Southern Oscillation Index: The Southern Oscillation Index (SOI) for September was -2.2 (August was -1.8) with the five-month running mean of -4 centred on July (June was –5) (Figure D).

Neutral El Niño-Southern Oscillation conditions continue in the tropical Pacific Ocean. Sea-surface temperatures across the equatorial Pacific are showing near normal values with only weak positive (warm) anomalies being recorded in the western and central tropical Pacific and weak negative (cool) anomalies in the far eastern Pacific. The other major indicators (subsurface temperature, SOI, cloud and wind) have generally been close to average over the past month. All computer predictions indicate that the current neutral conditions in the Pacific will continue throughout the Southern Hemisphere summer. The possibility of an El Niño or La Niña event remains low with nearly all models indicating neutral conditions to continue until at least May 2004.

(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 predicts rainfall to be generally around average for Fiji 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 variable rainfall across the country and across the next three months (Table. 2).

<u>Outlook for October to December 2003:</u>

Based on the model predictions and current climatic conditions, Fiji's rainfall is likely to vary around average with most of the rainfall expected in the later part of the Oct-Dec period.

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

Preliminary Climatological Summary for September 2003

PRELIMINARY CLIMATOLOGICAL DATA FOR MONTH 9 , 2003 : SUMMARY FOR DAYS 1 TO 30

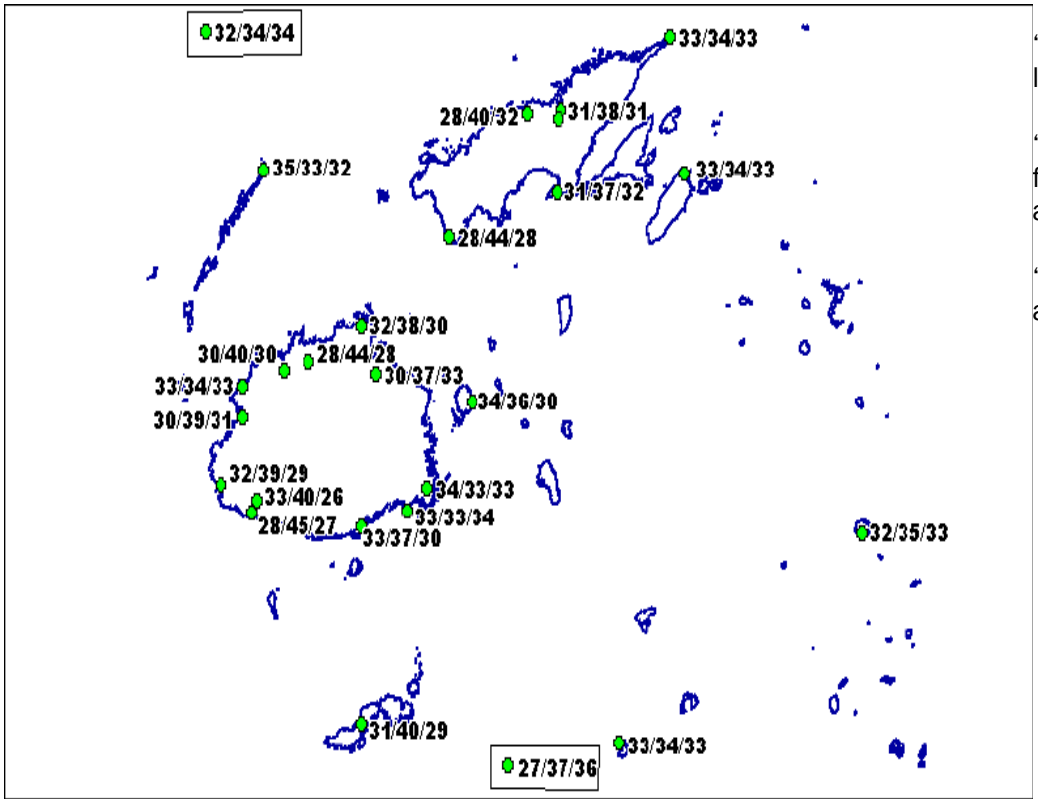
	RAINFALL					AIR TEMPERATURES								SUNSHINE	
	TOTAL		RAIN DAYS *	MAX. FALL		AVERAGE DAILY MAX.	#	MIN.	#	EXTREME MAX.		EXTREME MIN.		TOTAL HRS	*
	MM	%	+	MM	ON	C	C	C	C	C	ON	C	ON		
NADI AIRPORT	2	3	2	2	8	28.8	-0.5	18.7	-0.6	32.5	16	14.9	26	236	112
SUVA/LAUCALA BAY	44	25	7	18	30	27.3	0.1	20.8	-0.2	31.1	17	16.4	4	176	130
NACOCOLEVU	5	5	1	5	8	28.1	0.2	16.9	-1.5	32.0	16	11.5	1	230	134
ROTUMA	123	52	19	28	7	30.1	0.8	24.6	0.5	32.2	9	22.0	2	220	123
VIWA	1	2	1	1	7	28.9	0.7	22.9	0.2	32.5	21	20.1	3		
*UDU POINT	faulty aws														
LABASA AIRFIELD	7	9	2	5	15	30.6	0.5	18.7	-0.6	33.5	18	13.3	3		
NABOUWALU	42	37	10	20	9	27.3	0.5	22.1	0.1	31.3	21	19.7	2		
SAVUSAVU AIRFIELD	48	36	9	23	9	27.2	-0.2	22.2	1.0	31.8	16	18.0	3		
MATEI AIRFIELD	52	33	6	48	22	27.9	0.4	21.9	-0.1	30.2	16	18.0	2		
*YASAWA-I-RARA	faulty aws														
VATUKOULA	5	7	4	2	8	29.7	-0.3	18.8	0.5	34.8	18	15.5	4		
MONASAVU	38	16	5	20	22	22.2	0.4	14.7	-0.7	26.8	21	10.0	1		
NAUSORI AIRPORT	31	19	5	11	15	26.9	0.3	18.8	-1.2	29.8	16	14.2	2		
NAVUA/TOKOTOKO	47	20	9	23	22	26.3	0.3	18.6	-1.3	31.0	16	14.0	2		
LAKEBA	6	6	3	3	9	26.9	0.1	20.8	-0.6	29.7	17	14.5	2		
*MATUKU	faulty aws														
VUNISEA	8	6	4	4	18	26.4	0.3	19.4	-0.4	31.2	15	14.0	1		
ONO-I-LAU	15	14	5	9	15	26.5	1.1	20.5	0.1	29.6	21	17.8	1		
BA/RARAWAI MILL	2	2	2	1	8	30.5	0.1	17.4	-0.8	34.0	20	12.6	1		
LAUTOKA AES	6	8	3	3	22	28.5	-0.2	19.6	-1.1	31.6	22	15.9	25		
PENANG MILL	6	6	2	4	9	29.0	1.0	19.5	-1.7	32.0	16	12.4	2		

	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	44	75	1	75	130	30	0	0	23.7	25.0	20.6	66	21.0	5.9	68	18.3
SUVA/LAUCALA BAY	37	75	7	61	58	17	0	0	24.0	24.4	20.9	72	22.2		51	14.9
NACOCOLEVU	40	75	10	75	82	21	0	0	22.5	24.4	21.4	75	23.2		67	20
ROTUMA	44	27	30	27	0	0	15	1	27.3	28.1	24.7	75	28.6	4.3	64	21
VIWA	46	75	1	75	137	30	0	0	25.9	26.0	22.4	72	24.4			
*UDU POINT	faulty aws															
LABASA AIRFIELD	42	75	1	75	119	29	0	0	24.7	26.8	21.6	62	21.8			
NABOUWALU	40	75	1	75	78	21	0	0	24.7	25.1	21.7	74	23.5	11.2		
SAVUSAVU AIRFIELD	37	75	1	75	62	19	0	0	24.7	25.1	22.0	76	24.2			
MATEI AIRFIELD	40	75	1	61	82	21	0	0	24.9	25.7	22.0	72	23.7			
*YASAWA-I-RARA	faulty aws															
VATUKOULA	44	75	1	75	127	30	0	0	24.3	26.4	20.6	57	19.6			
MONASAVU	25	37	30	37	0	0	0	0	18.4	18.6	16.4	79	17.0			
NAUSORI AIRPORT	35	75	25	74	17	5	0	0	22.8	23.8	20.9	76	22.5	4.6		
NAVUA/TOKOTOKO	35	75	13	75	27	11	0	0	22.4	24.0	20.7	74	22.1			
LAKEBA	37	75	17	75	50	14	0	0	23.9	25.2	21.9	74	23.8	6.3		
*MATUKU	faulty aws															
VUNISEA	36	75	20	75	38	11	0	0	22.9	23.9	20.4	71	21.3	4.7		
ONO-I-LAU	36	75	1	75	93	28	0	0	23.5	23.4	21.6	85	24.6	9.0		
BA/RARAWAI MILL	43	75	1	75	127	30	0	0	24.0	26.1	20.7	60	20.3			
LAUTOKA AES	43	75	1	75	123	30	0	0	24.1	25.7	20.7	62	20.6			
PENANG MILL	43	75	1	75	123	29	0	0	24.3	24.0	20.3	70	21.0			

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.

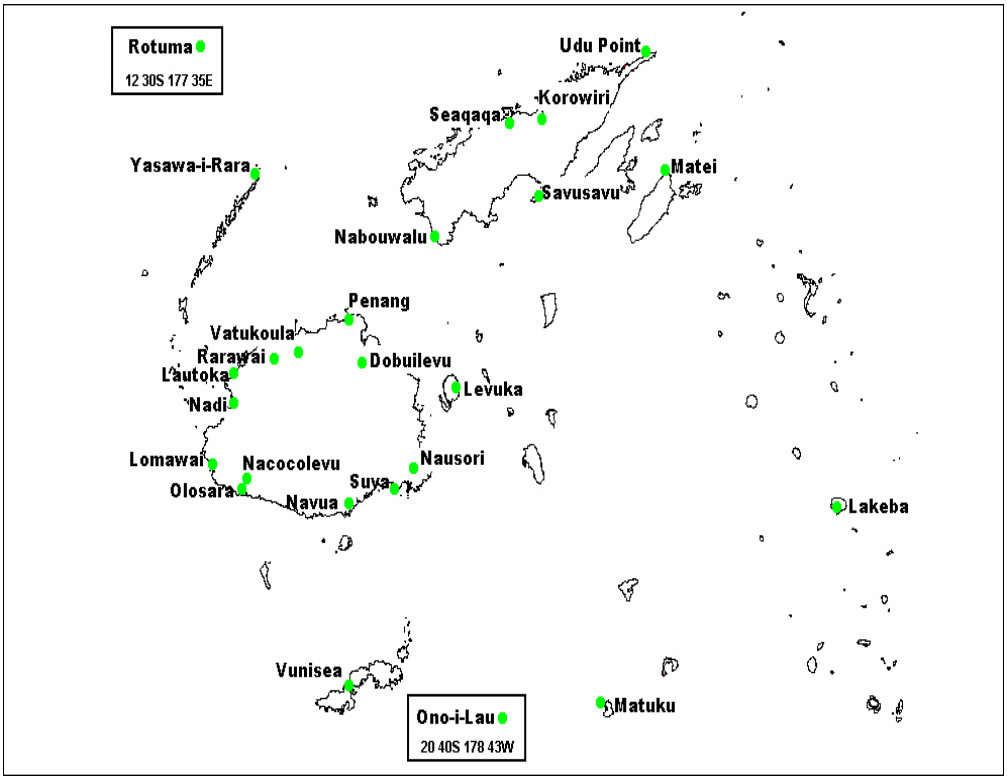
Three Month Rainfall Outlook Probabilities for October to December 2003

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	514	727
Vatukoula	312	510
Rarawai	312	250
Penang	322	537
Lautoka	267	452
Nadi	315	467
Lomawai	276	416
Nacocolevu	318	434
Olosara	253	391
Yasawa	249	434
Central Division		
Navua	733	1025
Suva	510	823
Nausori	552	750
Eastern Division		
Levuka	438	577
Lakeba	318	515
Matuku	242	448
Ono-I-Lau	210	417
Vunisea	302	483
Northern Division		
Labasa Mill	391	594
Seaqaqa	470	732
Nabouwalu	446	644
Savusavu	446	605
Udu Point	534	734
Matei	591	795
Rotuma	821	1052

TABLE 3: Monthly Rainfall Outlook Probabilities for October to December 2003

	October		November		December	
Station Name	**Average***	**Probability#**	**Average***	**Probability#**	**Average***	**Probability#**
Western Division						
Dobuilevu	153	**65**	220	**40**	272	**30**
Vatukoula	99	**50**	150	**22**	239	**15**
Rarawai	107	**41**	144	**24**	226	**24**
Penang	114	**44**	160	**48**	264	**24**
Lautoka	102	**47**	137	**41**	193	**29**
Nadi	102	**45**	132	**38**	178	**32**
Lomawai	71	**47**	145	**42**	198	**19**
Olosara	91	**40**	123	**26**	158	**37**
Nacocolevu	98	**52**	136	**27**	190	**21**
Yasawa-I-Rara	105	**32**	129	**44**	152	**48**
Central Division						
Navua - Tamanoa	280	**53**	306	**65**	348	**25**
Suva	221	**54**	245	**56**	277	**32**
Nausori	205	**49**	245	**56**	366	**11**
Eastern Division						
Lakeba	123	**54**	142	**37**	179	**32**
Ono-I-Lau	86	**58**	115	**35**	149	**27**
Northern Division						
Korowiri	127	**31**	189	**29**	264	**34**
Seaqaqa	142	**38**	209	**30**	304	**35**
Nabouwalu	170	**42**	174	**50**	255	**37**
Savusavu	171	**32**	188	**43**	258	**18**
Udu Point	165	**22**	203	**65**	263	**40**
Rotuma	340	**38**	282	**61**	285	**55**

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.