Volume 3: Issue: 10
October 2003

Fiji Islands Weather Summary October 2003 Rainfall Outlook till January 2004

FIJI METEOROLOGICAL SERVICE

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In Brief

The amount of rainfall received in October was more than in September but still within the below average category. The only expectations being Nacocolevu, Monasavu and Vunisea which received average rainfall. Sixteen of nineteen reporting stations received below average rainfall with well below average recorded at Nadi Airport and across most of the Northern Division. Most of October's rainfall fell on the 19-20th. A new one-day record of 127.5mm was set at Navua and 'second highs' were recorded at Monasavu and Vatukoula also on the 19th.

The heavy rainfall received on the 19-20th brought some temporary relief; however this was short-lived and dry conditions returned by the end of the month. Drought conditions remain severe in the Northern Division with the rainfall in the last three months being the lowest on record for Matei, Taveuni and second lowest on record for Labasa Airport. Rainfall in the last three months has been within the lowest 10% on record in the Northern Division.

Ocean Equatorial surface and subsurface temperatures were warmer than average in October and this trend is likely to continue through the Southern Hemisphere summer. Rainfall in Fiji Islands in the next three months is expected to be below average to average. The amount of rainfall received in the coming months should increase compared the present period.

Night-time air temperatures were generally below average and Day-time around average across the country. A new Day-time high temperature was recorded at Rotuma. Relative Humidity was generally below average.

Total sunshine hours ranged from average to above average.

Weather Patterns

Fiji's weather in October was dominated by ridges of high pressure to the south of Fiji which also caused the predominant easterly trade winds during most of the month. There were two instances, between the 13-14th and 17-20th, when fronts traversed the country, bringing rainfall across the Group.

During the first four days of October, a ridge of high pressure dominated Fiji's weather. A front approached the Group from the southwest on the 5th and moved across the southern parts of the country by the 6th, causing brief showers about the southern coast of Viti Levu. As the front moved away to the southeast, the high pressure system again became the dominant weather feature until the 12th.

A second front approached the Group from the southwest on the 13th and moved across the country the next day before rapidly moving northeast on the 15th. Rainfall was received mostly about the southeastern parts of the larger islands. On the 15th, a third front developed over southern Fiji and moved over the Group on the 16th then remained until the 22nd, before moving towards the northeast of Vanua Levu. Rainfall received on the 19-20th was significant with very heavy falls being received in parts of the country. Flash flooding was reported in some areas.

On the 23rd a ridge moved up from the southwest and became the prominent weather feature until the end of the month. Easterlies remained the prevalent wind flow during this time.

Rotuma received rainfall on several occasions when the SPCZ moved closer to the island. This occurred mostly during the second half of the month, when the ridge of high pressure to the south was dominant over Fiji.

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TABLE 1: Rainfall from August to October 2003

Station	Actual Rainfall (mm)	Has rainfall in the last three months been below average, average or above average?	No. of Rain days in August (% of total rain)	No. of Rain days in September (% of total rain)	No. of Rain days in October (% of total rain)
Penang Mill	93.3	Below Average	05 (44)	02 (07)	02 (49)
Monasavu Dam	443.8	Below Average	12 (31)	05 (09)	16 (60)
Vatukoula Mine	127.6	Below Average	07 (44)	04 (04)	03 (52)
Rarawai Mill, Ba	136.5	Below Average	04 (52)	02 (02)	02 (46)
Yasawa-I-Rara	-		-	-	
Viwa Is.	134.5	Average	08 (71)	01 (01)	03 (28)
Lautoka Mill(Research)	216.5	Average	06 (62)	03 (03)	05 (35)
Nadi Airport	159.2	Below Average	06 (61)	02 (04)	03 (24)
Nacocolevu, Sigatoka	155.9*	Below Average	05 (35)	01 (03)	05 (62)
Tokotoko, Navua	316.2	Below Average	12 (27)	09 (15)	12 (58)
Laucala Bay, Suva	309.9	Below Average	21 (32)	07 (14)	13 (54)
Nausori Airport	246.6	Below Average	12 (34)	05 (13)	13 (53)
Nabouwalu	150.0	Below Average	13 (30)	10(28)	11 (42)
Labasa Airport	53.2	Well Below Average	03 (10)	02 (13)	09 (77)
Savusavu Airport	181.1	Below Average	09 (19)	09 (26)	08 (55)
Udu Point	-		-	-	
Matei Airport	96.5	Well Below Average	06 (08)	06 (54)	09 (38)
Lakeba Is.	114.5	Below Average	08 (48)	03 (05)	06 (47)
Matuku Is.	-		-		
Ono-I-Lau Is.	90.9*	Well Below Average	07 (40)	05 (16)	03 (44)
Vunisea, Kadavu	173.3	Below Average	10 (21)	04 (05)	09 (74)
Rotuma	663.8	Average	13 (48)	19 (19)	16 (33)

Rainfall in the last three months

Rainfall in October

Rainfall in October was below average (<80% of normal) across the country except for Nacocolevu (98%), Monasavu (86%) and Vunisea (89%). Well below average rainfall was received at Nadi Airport and across most of the Northern Division. Most of the rainfall received in October fell between the 19-20th. A new one-day record of 127.5mm was set in Navua and 'second highs' were recorded at Monasavu and Vatukoula also on the 19th.

Rainfall in the three-months from August to October

The Rainfall forecast for the period August to October in the July Fiji Islands Weather Summary was for rainfall to be below average to average. The confidence level of the forecast was low due to the forecast period including the transition period from Dry to Wet Season.

Of the nineteen sites that reported in time for this summary, three sites reported well below average, thirteen sites below average and three sites received average rainfall.

The three consecutive month rainfall (July-Sept 2003) for a number of sites was within the lowest 10% on record. Sites that fell into this category were Penang Mill (near Rakiraki), Nausori Airport, Navua, Labasa Airport, Matei Airport and Ono-I-Lau.

In the last three months (Aug-Oct) rainfall has remained in the lowest 10% for all the above sites except Nausori Airport. Two new sites can be added to the list at the end of October - Nabouwalu and Savusavu Airport. In the case of Matei, rainfall in the last three months was the lowest since records began (1957) and Labasa Airport has recorded the second lowest on record (lowest was 20.2mm in 1987).

Figure A

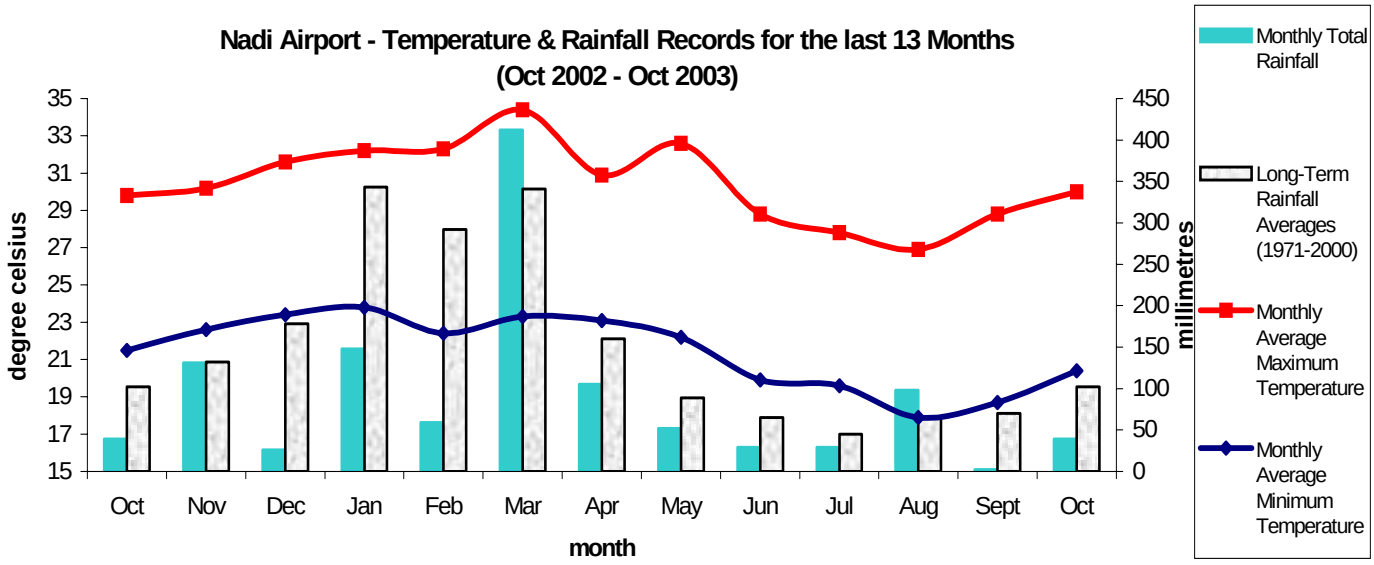


Figure B

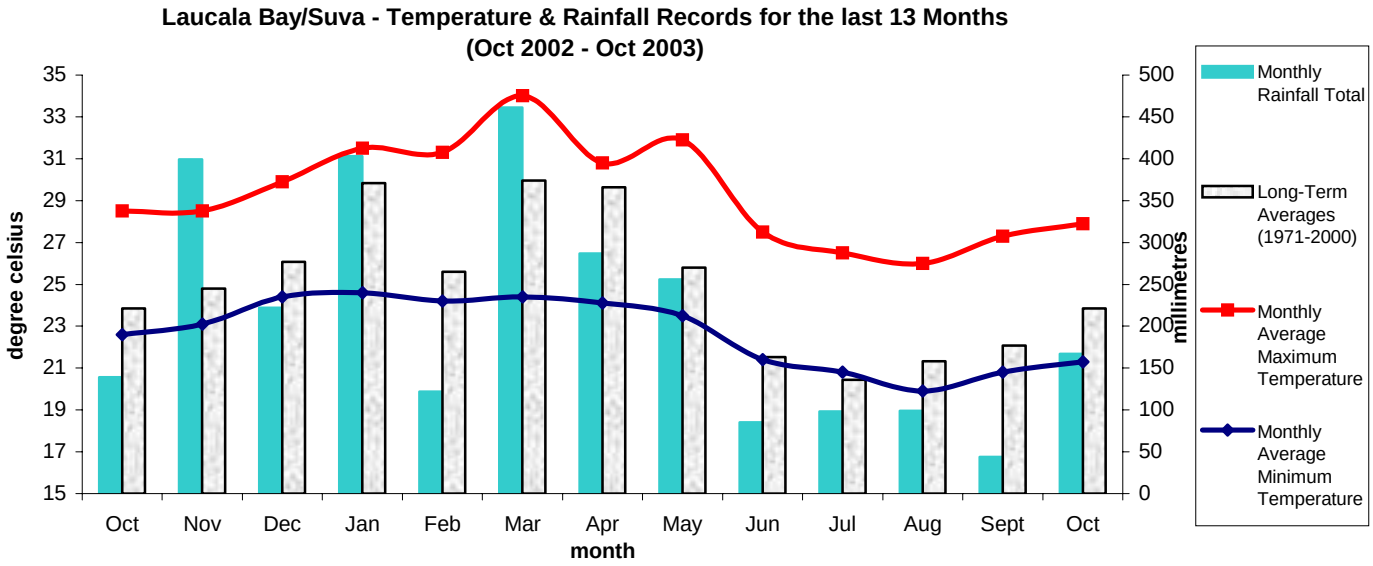
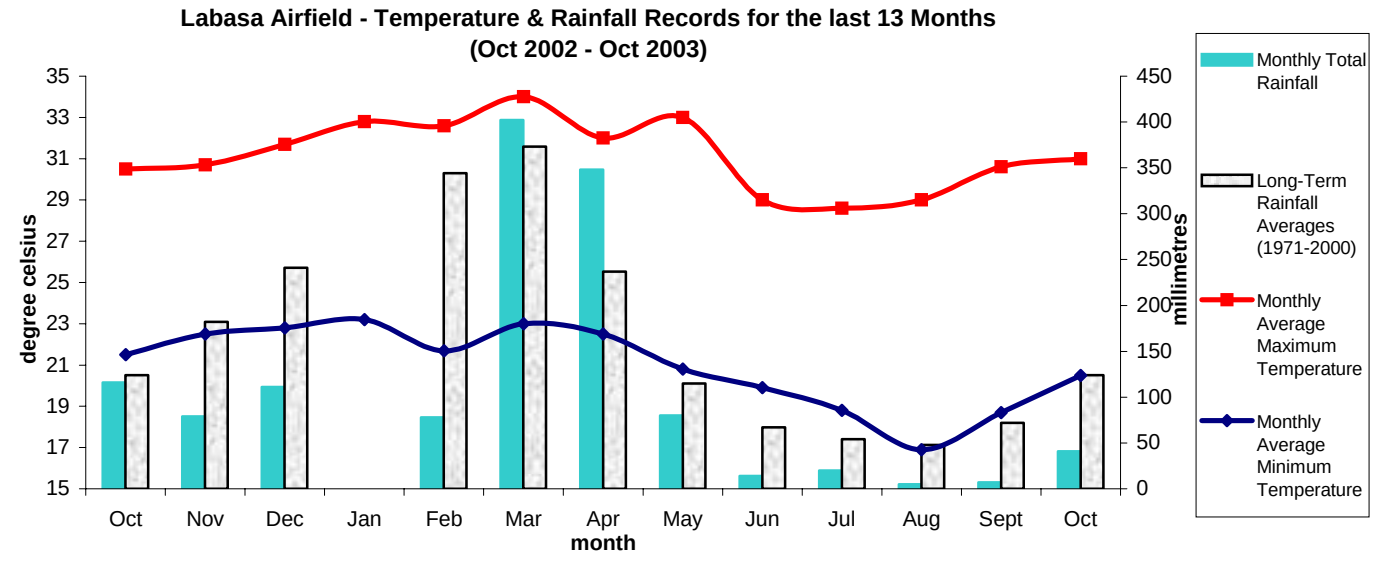


Figure C



Climate in October

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

Day-time temperatures were generally near average at most recording sites across the country except at Rotuma, Nabouwalu, Monasavu and Penang Mill where they were above average. The greatest positive departures from normal were recorded at Rotuma and Monasavu which recorded 0.8°C above normal. The greatest negative departures was recorded at Vatukoula which recorded 0.6 below normal.

Night-time temperatures were generally below average around the country. The greatest positive departures from normal were recorded at Savusavu Airfield, Vatukoula and Labasa Airfield which recorded 1.0 and 0.9 and 0.7°C respectively above normal. The greatest negative departures were at Penang Mill, Nacocolevu and Nausori Airport which recorded 1.5, 1.3 and 1.3°C respectively below normal.

Relative Humidity (RH) at 0900 am were below average at all recording sites except at Ono-I-Lau and Nacocolevu. The greatest positive departure was +4.0% observed at Ono-I-Lau. The greatest negative departure were –10.0% at Penang Mill, –9-3% at Lautoka Mill and –9.2% at Nadi Airport.

Soil Moisture and Runoffs

Soil moisture conditions were limiting to dry in the Western and Northern Divisions for the first two weeks of the month then excess to ample then moderate in the third week. Conditions returned to dry during the last week except for Monasavu where soil conditions were excessive to ample and then ample to moderate during the last week.

In the central division the soil conditions were generally limiting to dry over the first two weeks and then ample to moderate for the remainder of the month except for Nausori Airport where conditions were generally ample to moderate.

In the Eastern Division the conditions were limiting to dry at Ono-I-Lau, moderate to limiting at Lakeba. Vunisea experienced moderate to limiting conditions for the first two weeks and then ample to moderate conditions in the last fortnight.

Rotuma recorded ample to moderate conditions for the first three weeks then excessive to ample for the rest of the month.

Significant runoffs were recorded at Monasavu (198.7mm), Rotuma (77.1mm) and Navua (65.9mm).

Sunshine, Radiation & Winds

Total sunshine hours were average to above average. Nadi Airport recorded 113%, Laucala Bay/Suva, 123%, Nacocolevu 116% and Rotuma 108% of normal sunshine.

Global Solar Radiation recorded at Nadi Airport was 20.1MJ/ M^2 (93%) and 17.39MJ/M^2 (96%) at Laucala Bay.

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

Records set in October 2003

Element	Station	Observed (record)	On	Rank	Previous (record)	Year	Records Began
Rainfall	Tokotoko, Navua	127.5mm	19th	New One-day high	125.0mm	2000	1992
Max Temp	Rotuma	33.0	23rd	New High	32.8	1954	1933
Min Temp	Viwa	26.0	14th	Equal High		1999	1978

November to April 2003/04 Tropical Cyclone Season

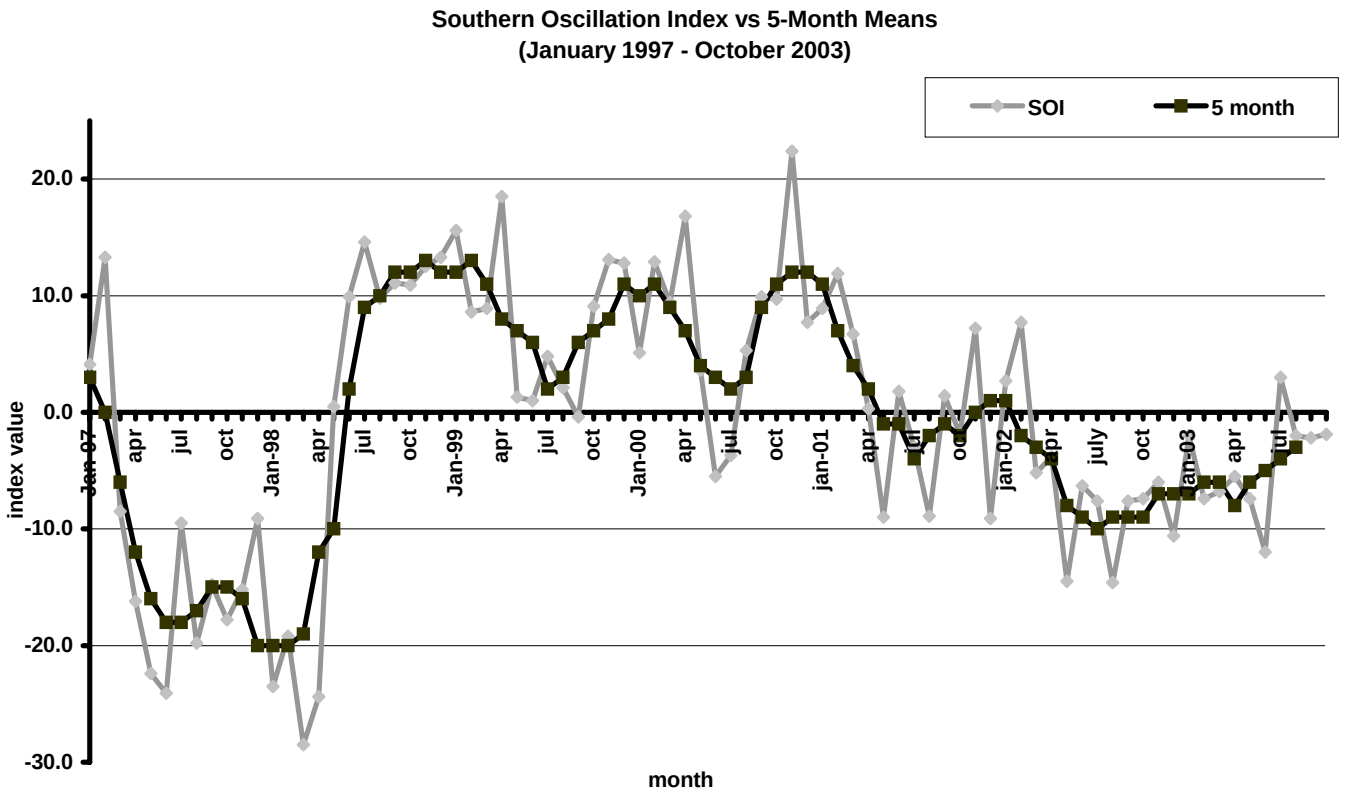
The South Pacific Tropical Cyclone Season officially began on 1st November and will continue till 30th April 2004.

Historical records of tropical cyclones affecting Fiji since the 1969/70 show that there have been two cyclones in the month of November. These were *Osea* in 1986, *Sina* in 1990.

The chances of a cyclone affecting Fiji this season is high especially with ocean and atmosphere conditions currently being on the *Warm* side of *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 January 2004

Southern Oscillation Index: The Southern Oscillation Index (SOI) for October was -1.9 (September was -2.2) with the five-month running mean of -3 centred on August (July was -4) (Figure D).

The tropical Pacific is currently in a Neutral state, although there has been some warming over the past one to two months with scattered patches of +1^{o}C anomalies. The ocean or coupled ocean/atmosphere forecast models model outputs are unanimously in favour of a continuation of a somewhat warm but Neutral situation during the next five months. By June 2004, 4 of the 9 models available have reached Warm (El Niño) with the other 5 showing Neutral. However, the March to June period is known as the "predictability barrier" and model skill is at its lowest predicting across this span of months. Users should exercise caution when interpreting forecasts for the middle of 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 below average to average for most of Fiji and average to above for 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 a 23-61% chance (depending on location) of receiving average rainfall in next three months. (Table. 2).

<u>Outlook for November 2003 to January 2004:</u>
Based on the model predictions and current climatic conditions, Fiji's rainfall is likely to be average to below average.

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

Preliminary Climatological Summary for October 2004

FIJI METEOROLOGICAL SERVICE DATE 03/11/2003

PRELIMINARY CLIMATOLOGICAL DATA FOR MONTH 10 , 2003 : SUMMARY FOR DAYS 1 TO 31

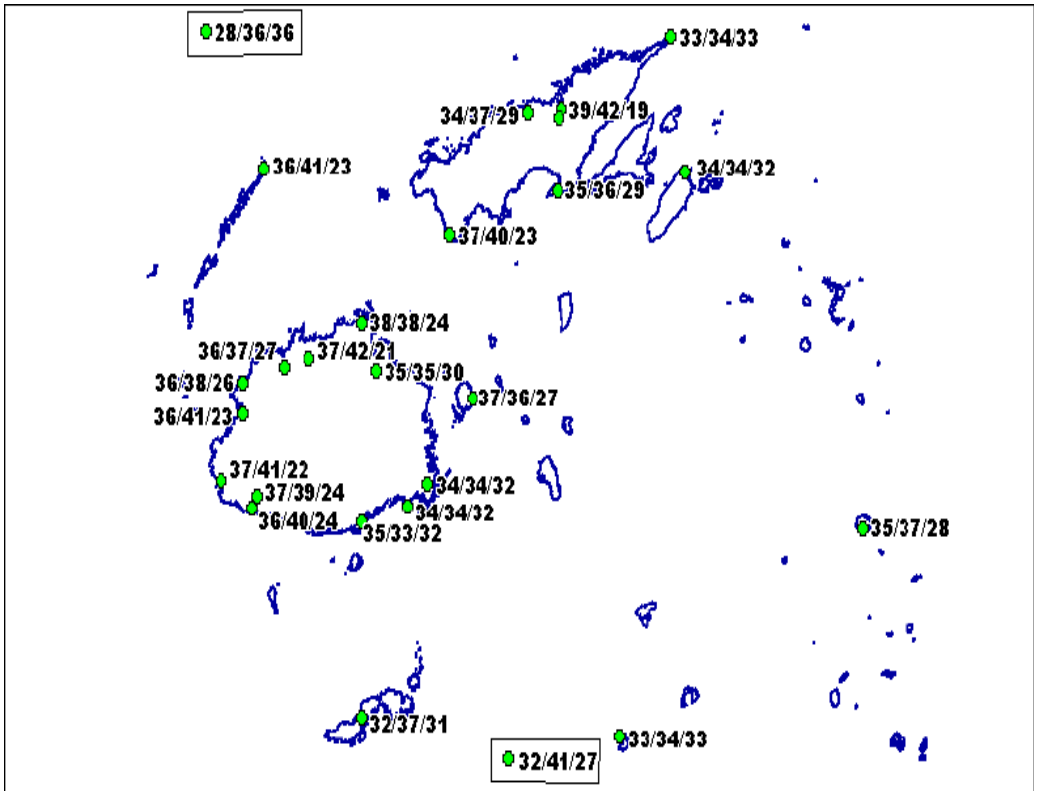
	RAINFALL					AIR TEMPERATURES								SUNSHINE	
	TOTAL		RAIN DAYS *	MAX. FALL		AVERAGE DAILY MAX.	#	AVERAGE DAILY MIN.	#	EXTREME MAX.		EXTREME MIN.		TOTAL HRS	*
	MM	%	+	MM	ON	C	C	C	C	C	ON	C	ON	HRS	%
NADI AIRPORT	39	38	3	29	19	30.0	-0.3	20.4	-0.1	32.1	1	16.9	2	266	113
SUVA/LAUCALA BAY	167	76	13	81	19	27.9	-0.3	21.3	-0.6	30.5	5	18.1	9	200	123
NACOCOLEVU	96	98	5	81	19	29.0	-0.1	18.4	-1.3	31.5	12	14.5	1	221	116
ROTUMA	220	65	16	48	25	30.5	0.8	24.3	0.1	33.0	23	22.5	3	211	108
VIWA	38	57	3	26	19	29.8	0.5	23.8	0.2	32.0	14	21.5	15		
*UDU POINT	faulty aws														
LABASA AIRFIELD	41	33	9	16	22	31.0	0.2	20.5	0.7	33.9	31	15.8	27		
NABOUWALU	64	37	11	26	20	28.3	0.6	22.8	0.2	31.6	21	20.9	6		
SAVUSAVU AIRFIELD	99	58	8	47	14	28.0	-0.2	22.9	1.0	32.7	14	20.5	11		
MATEI AIRFIELD	37	18	9	10	19	28.3	0.1	22.1	-0.4	31.0	21	18.9	2		
*YASAWA-I-RARA	faulty aws														
VATUKOULA	66	67	3	46	19	30.5	-0.6	20.0	0.9	33.1	13	15.7	31		
MONASAVU	267	86	16	122	19	23.6	0.8	15.5	-0.8	27.5	28	12.6	2		
NAUSORI AIRPORT	131	64	13	46	20	27.6	0.0	19.6	-1.3	30.2	6	16.0	2		
NAVUA/TOKOTOKO	185	66	12	128	19	26.8	-0.1	19.7	-1.0	29.5	13	16.0	2		
LAKEBA	53	43	6	26	20	27.8	0.1	21.1	-1.0	30.6	14	16.2	27		
*MATUKU	faulty aws														
VUNISEA	128	89	9	73	19	27.0	-0.1	20.8	-0.0	30.5	13	18.7	24		
ONO-I-LAU	40	44	3	28	20	26.2	-0.2	21.0	-0.4	28.6	5	18.0	15		
BA/RARAWAI MILL	63	59	2	32	20	31.1	-0.1	faulty		Min32.9	30				
LAUTOKA AES	76	75	5	47	19	29.6	0.1	21.0	-0.6	31.8	13	17.7	3		
PENANG MILL	46	40	2	39	20	29.6	0.7	20.7	-1.5	31.5	6	17.2	3		

	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	50	75	1	75	116	24	0	0	25.2	26.9	21.5	60	21.4	7.7	71	20.1
SUVA/LAUCALA BAY	43	75	6	47	14	4	44	2	24.6	25.2	21.9	74	23.7		54	17.3
NACOCOLEVU	45	75	8	53	34	9	2	1	23.7	26.2	22.8	74	25.2		61	22
ROTUMA	48	57	16	9	0	0	77	3	27.4	28.4	25.2	76	29.5	3.1	57	21
VIWA	51	75	1	75	120	24	0	0	26.8	27.0	22.9	70	24.8			
*UDU POINT	faulty aws															
LABASA AIRFIELD	47	75	1	75	105	24	0	0	25.7	27.7	22.4	62	22.9	0.1		
NABOUWALU	45	75	1	75	76	20	0	0	25.5	26.0	22.5	73	24.6	10.2		
SAVUSAVU AIRFIELD	43	75	1	58	49	13	0	0	25.5	25.7	22.4	74	24.6			
MATEI AIRFIELD	45	75	1	75	103	24	0	0	25.2	26.1	23.1	77	26.0			
*YASAWA-I-RARA	faulty aws															
VATUKOULA	50	75	1	74	90	18	0	0	25.3	27.7	21.2	55	20.2			
MONASAVU	32	31	31	31	0	0	199	4	19.6	20.0	17.7	79	18.4	4.5		
NAUSORI AIRPORT	42	57	13	46	0	0	30	1	23.6	25.2	21.6	72	23.1	5.1		
NAVUA/TOKOTOKO	42	75	9	46	10	5	66	2	23.3	24.6	21.5	75	23.3			
LAKEBA	43	75	26	75	25	6	0	0	24.4	25.8	22.1	71	23.7			
*MATUKU	faulty aws															
VUNISEA	42	75	16	43	9	3	37	1	23.9	24.8	21.3	73	22.6	7.6		
ONO-I-LAU	41	75	1	75	87	23	0	0	23.6	23.8	22.6	90	26.5			
BA/RARAWAI MILL	50	75	1	75	92	19	0	0		27.8	22.0	59	22.0			
LAUTOKA AES	50	75	1	67	87	18	0	0	25.3	27.1	21.6	60	21.6			
PENANG MILL	50	75	1	75	109	22	0	0	25.2	25.1	21.3	70	22.3			

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.

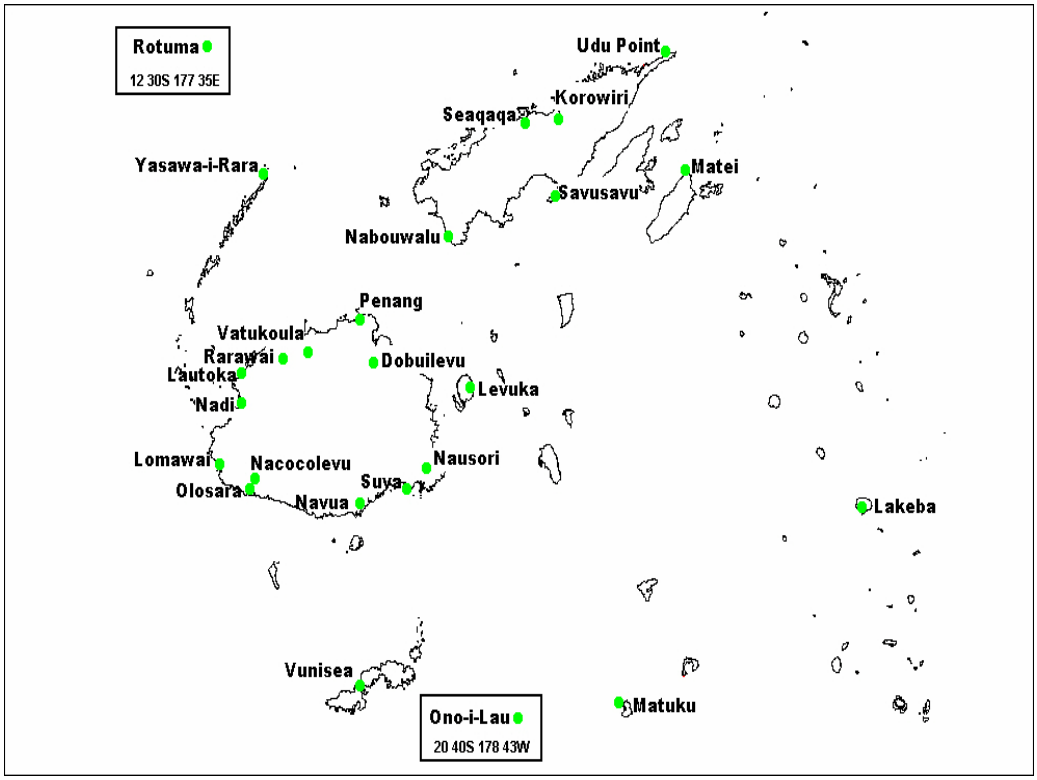
Three Month Rainfall Outlook Probabilities for October to December 2003

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	775	1035
Vatukoula	598	869
Rarawai	518	806
Penang	516	816
Lautoka	453	688
Nadi	503	685
Lomawai	471	664
Nacocolevu	461	627
Olosara	397	598
Yasawa	421	613
Central Division		
Navua	830	1106
Suva	713	935
Nausori	750	930
Eastern Division		
Levuka	519	704
Lakeba	458	588
Matuku	397	511
Ono-I-Lau	349	473
Vunisea	414	636
Northern Division		
Labasa Mill	652	838
Seaqaqa	752	924
Nabouwalu	621	856
Savusavu	574	793
Udu Point	667	925
Matei	773	1021
Rotuma	879	1085

TABLE 3: Monthly Rainfall Outlook Probabilities for November 2003 to January 2004

	November 2003		December 2003		January 2004		Nov 2003 to Jan 2004 combined	
Station Name	**Average***	**Probability#**	**Average***	**Probability#**	**Average***	**Probability#**	**Average***	**Probability#**
Western Division								
Dobuilevu	220	**40**	272	**30**	393	**57**	885	**30**
Vatukoula	150	**22**	239	**15**	398	**43**	787	**34**
Rarawai	144	**24**	226	**24**	402	**42**	642	**65**
Penang	160	**48**	264	**24**	396	**43**	820	**23**
Lautoka	137	**41**	193	**29**	371	**50**	701	**39**
Nadi	132	**38**	178	**32**	343	**57**	653	**41**
Lomawai	145	**42**	198	**19**	337	**31**	680	**31**
Olosara	123	**26**	158	**37**	283	**43**	564	**28**
Nacocolevu	136	**27**	190	**21**	276	**43**	602	**38**
Yasawa-I-Rara	129	**44**	152	**48**	235	**56**	516	**61**
Central Division								
Navua - Tamanoa	306	**65**	348	**25**	395	**42**	1049	**45**
Suva	245	**56**	277	**32**	371	**48**	896	**44**
Nausori	245	**56**	366	**11**	365	**45**	796	**45**
Eastern Division								
Lakeba	142	**37**	179	**32**	245	**66**	566	**44**
Ono-I-Lau	115	**35**	149	**27**	179	**48**	443	**35**
Northern Division								
Korowiri	189	**29**	264	**34**	395	**39**	848	**31**
Seaqaqa	209	**30**	304	**35**	419	**48**	932	**37**
Nabouwalu	174	**50**	255	**37**	312	**63**	741	**49**
Savusavu	188	**43**	258	**18**	275	**51**	721	**61**
Udu Point	203	**65**	263	**40**	313	**62**	779	**50**
Rotuma	282	**61**	285	**55**	355	**37**	922	**61**

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.

The probabilities in the three-month combined column are not an average of the three individual months. The model in this case has been re-run for three combined months. There is a higher degree of skill association with predicting rainfall for three combined months compared to three individual months.

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