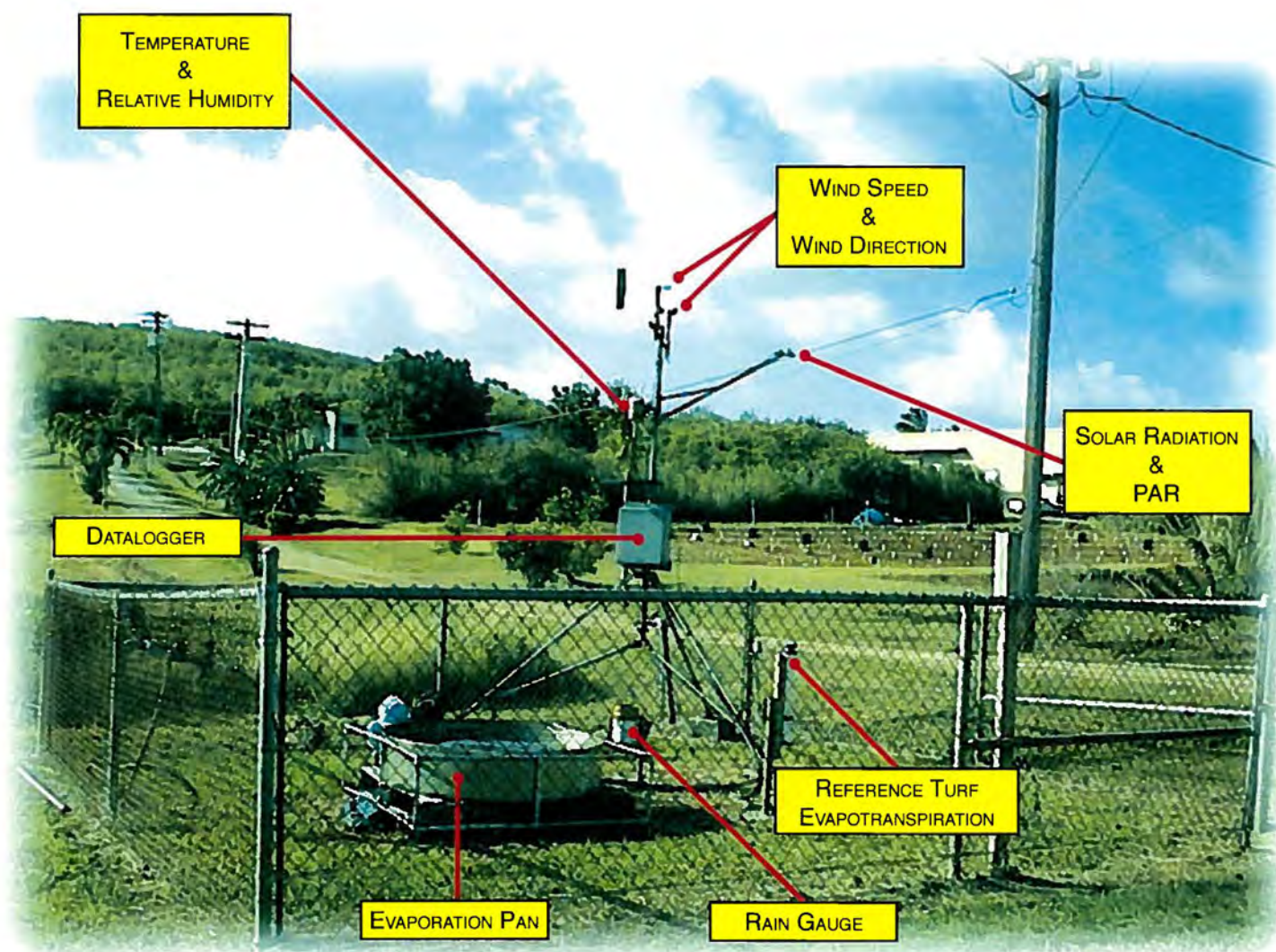


Guam Agricultural Climatic Data System

1999 Climatic Data and Summaries

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Guam Agricultural Climatic Data System: 1999 Climatic Data and Summaries

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Introduction

The Agricultural Engineering division of the College of Agriculture and Life Sciences at the University of Guam operates and maintains two agricultural weather stations, one located at the Yigo Agricultural Experimental Station and the other at the Inarajan Agricultural Experimental Station. These weather stations collect hourly and daily data on wind speed, wind direction, temperature, percentage of relative humidity, global solar radiation, photosynthetically active radiation (PAR), pan evaporation, and atmometer evaporation for potential use by researchers, extension agents, teachers, farmers, agricultural consultants, water resource managers, and others.

The Guam Agricultural Climatic Data System (GACDS) was developed so that all divisions within the College of Agriculture could obtain climatic data without having to make a special request. This data can be accessed using in-house network shareware. Also, this data is presented in such a way that daily, monthly (to date), and yearly (to date) data for a given weather parameter can be viewed without having to scroll the screen, and therefore can be printed onto a single page. Unlike many weather summaries, daily data for the entire year is included. This is because many of the requests we received for data before the creation of the GACDS was for data on specific days. Finally, analysis such as number of rain days for the month can be calculated in seconds because of the way these data are formatted. Hourly data, although collected, is not included in the GACDS, as this would make the summary too lengthy.

In a few instances data had to be estimated. Where estimates could not be made, a N/A (not available) is placed in the data cell. Also, at the beginning of 1999 there is missing data for the first few days in January. This is due to overhauls of both weather stations necessitated by Typhoon Paka, which struck Guam in December of 1998.

The GACDS (Guam Agricultural Climatic Data System)

The system comprises two agricultural weather stations and associated weather data storage, data retrieval, and data discrimination components. Automated weather stations specifically designed to gather agriculturally pertinent weather data information is the first step in the process. Next, the data is uploaded to a central location where quality control begins. Then, data is organized in a spread sheet program. The explanation of this four-step procedure follows.

Datalogger and Sensor Monitoring

Each weather station has a number of sensors for data collection. Sensor wiring terminates at, and is monitored by, a field datalogger (mini-computer) located at each weather station. Each sensor has its own program, which accommodates the electronic/mechanical features of the particular sensor. The sensor reading is placed in a location identified by this program.

Data Storage

The datalogger is programmable to store sensor readings as desired by the user. Typically, this program summarizes data into hourly and 24 hour averages and/or totals. This data remains in the datalogger until the storage space is full, at which time the oldest data is written over. The weather parameters on which data is stored in our weather stations are given in Table 1.

Uploading Data from Weather Station Dataloggers to Centrally Located Computer

The dataloggers can be accessed from a computer via a modem link and specialized communication program. Once a communications link is established, the user can monitor current sensor readings and/or upload data from the datalogger. The data collected is from the time of the last data collection, and is placed into a .dat file in comma delineated format.

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Formatting Data and Updating GACDS

From the *.dat file, data is transferred to a spreadsheet program and sorted. Here, data is checked for accuracy. Once the data has been checked, the data is put into a library. From the library file, data is transferred to the another preprogrammed spreadsheet, which formats the data into the GACDS format. This spreadsheet is then copied to the in-house shareware network. The GACDS format devotes one page per sensor, which includes the daily readings for the entire year to date. Each of these sensor pages gives the name of the sensor (function of the sensor), the units used, and whether the daily readings are averages or totals. This bulletin also includes yearly graphs of monthly data for each sensor. The GACDS also includes a Max and Min sheet, which lists the daily maximum and minimum readings of each sensor, along with time of occurrence, for the entire year to date. For the purpose of this bulletin, the yearly maximum and minimum graphs for some sensors are given without the accompanying daily data table.

Degree Days

Cooling and growing degree days were calculated using daily temperature data. Cooling degree days are important for determining the amount of energy needed to cool buildings. The following formula was used for calculations:

$$65^{\circ}\text{F} - (\text{Max T } [^{\circ}\text{F}] + \text{Min T } [^{\circ}\text{F}]) / 2$$

where: Max T is maximum daily temperature
Min T is minimum daily temperature

Values for Guam are always negative. Positive values would indicate heating degree days.

Growing degree days is an important temperature based heat energy index used for correlating crop and insect growth. We use a base of 50°F and 60°F. The following formulas were used for calculations:

$$\{(\text{Max T } [^{\circ}\text{F}] + \text{Min T } [^{\circ}\text{F}]) / 2\} - 50^{\circ}\text{F}$$

$$\{(\text{Max T } [^{\circ}\text{F}] + \text{Min T } [^{\circ}\text{F}]) / 2\} - 60^{\circ}\text{F}$$

where: Max T is maximum daily temperature
Min T is minimum daily temperature

Table 1: Daily Weather Data Parameters (Sensors read every 5 seconds)

Hourly and 24 Hour Output

Average Temperature
Average Humidity
Average PAR
Average Global Solar Radiation
Average Wind Speed
Average Wind Direction
Total Rainfall
Total Turf Grass Evaporation (ET Gage)
Total Pan Evaporation

Inarajan Weather Station

Daily and Monthly Total Rainfall (mm)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	0.0	0.0	0.0	0.3	6.1	8.9	29.7	5.0	12.7	2.3	0.0
2	N/A	4.3	0.0	0.0	0.0	0.0	0.5	11.2	27.0	2.8	8.1	7.9
3	N/A	1.3	0.0	0.0	0.0	0.0	8.1	2.3	0.0	8.1	4.6	3.6
4	N/A	0.0	0.0	0.0	7.4	0.0	1.5	12.2	0.0	0.0	5.6	23.9
5	N/A	1.5	2.0	0.0	4.1	2.5	4.3	0.0	5.0	0.3	4.1	1.3
6	N/A	0.0	0.0	0.0	3.6	15.0	0.8	0.0	19.3	8.9	2.0	0.5
7	N/A	0.0	0.0	1.0	0.0	7.1	38.6	1.0	34.3	1.0	7.4	0.0
8	10.2	0.0	1.5	1.8	0.0	44.7	8.9	12.4	8.1	1.8	68.8	1.3
9	4.1	4.8	0.0	0.0	2.0	0.8	17.0	6.9	17.3	0.0	32.8	3.8
10	0.3	1.0	0.0	0.0	2.8	5.1	6.6	0.0	47.5	0.3	7.1	0.5
11	0.0	4.1	4.3	0.0	0.3	0.3	31.5	11.4	1.3	12.2	24.6	0.0
12	0.0	113.8	9.9	0.0	0.8	3.0	3.6	0.0	0.0	16.0	0.8	1.8
13	19.8	1.3	0.0	0.5	0.3	6.4	9.1	1.3	6.6	27.7	0.0	1.5
14	18.0	65.3	0.5	2.8	0.0	21.1	0.3	0.8	36.1	3.8	0.0	0.0
15	1.0	45.7	0.0	0.0	2.3	12.2	1.3	2.0	8.4	0.5	0.0	5.3
16	0.0	4.6	0.0	2.8	4.8	3.6	5.8	6.1	1.5	21.1	0.0	0.3
17	1.0	0.0	0.0	0.0	0.5	2.0	2.3	0.3	22.6	0.0	0.0	0.0
18	1.0	0.0	0.3	0.0	3.3	0.0	1.8	10.4	0.0	9.9	0.0	0.0
19	6.4	0.0	0.0	7.9	10.9	10.9	0.8	0.0	29.2	8.1	3.3	0.0
20	3.6	0.0	0.0	0.0	14.2	0.3	8.1	1.3	0.0	12.4	0.0	0.0
21	30.0	0.0	0.0	0.8	1.5	0.8	6.6	0.3	0.0	12.2	1.5	0.0
22	1.0	0.3	0.0	8.1	0.0	1.8	2.0	2.3	3.0	25.1	6.6	0.0
23	0.0	1.0	0.0	0.0	8.9	1.0	8.4	0.0	4.6	14.7	4.6	0.0
24	0.0	0.5	1.0	17.8	0.0	14.2	23.1	0.3	0.0	3.3	0.5	0.5
25	0.5	1.0	3.6	6.1	1.3	4.1	9.9	2.5	34.8	0.0	0.0	0.5
26	0.0	1.0	3.8	10.2	9.4	13.7	6.4	0.5	0.0	0.0	0.0	0.8
27	0.0	1.3	0.8	0.3	1.3	3.3	0.3	0.0	0.0	0.5	7.6	0.0
28	0.0	0.5	0.0	2.0	5.8	0.0	12.2	19.0	10.7	7.9	3.6	10.2
29	0.0	0.0	0.3	0.5	0.3	0.0	33.0	0.5	0.0	1.8	1.8	0.0
30	2.0	0.0	0.0	2.3	2.5	0.8	2.8	0.3	0.0	3.0	0.8	0.8
31	0.5	0.0	0.0	0.0	6.4	0.0	3.6	5.0	0.0	0.5	0.0	0.0
Mo. Total	99.3	253.2	27.9	64.8	94.7	180.6	268.0	139.9	322.2	216.7	198.4	64.3

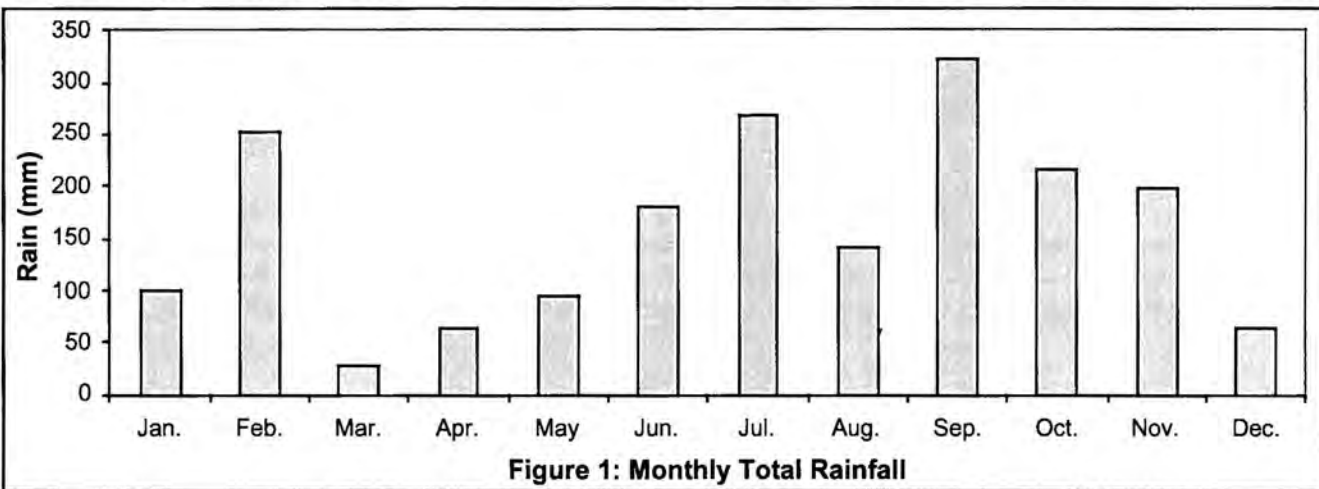
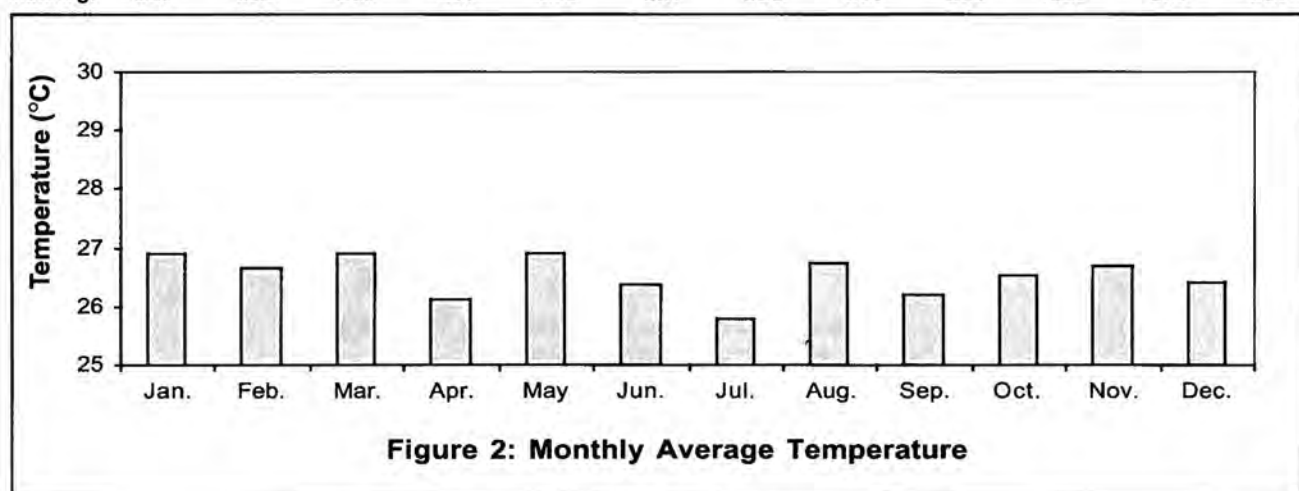


Figure 1: Monthly Total Rainfall

Inarajan Weather Station

Daily and Monthly Average Temperature (°C)

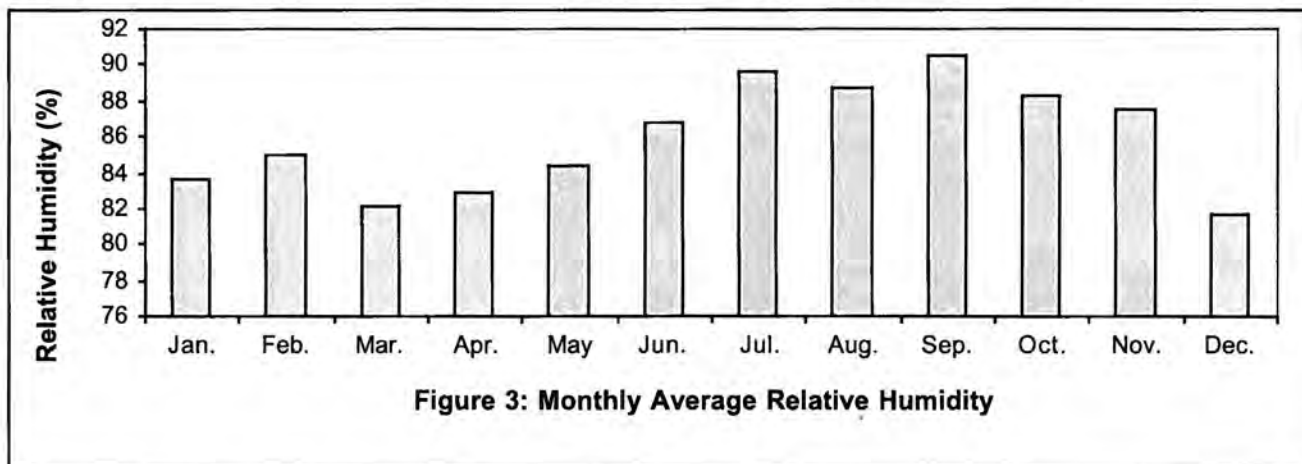
Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	27.1	26.5	27.2	26.2	26.4	24.7	24.8	25.9	26.5	27.3	27.2
2	N/A	26.1	26.5	27.2	25.9	27.0	25.5	25.0	24.2	26.1	26.6	26.2
3	N/A	26.7	26.6	27.2	25.6	27.0	24.7	25.1	26.6	25.3	25.7	26.9
4	N/A	26.9	26.5	27.1	26.0	27.4	27.0	25.2	25.1	25.9	26.3	25.0
5	N/A	26.4	26.4	27.1	26.2	27.0	27.0	25.3	27.3	26.1	26.4	26.8
6	N/A	27.1	26.4	27.2	25.8	25.8	25.9	25.4	24.8	26.5	27.2	27.0
7	N/A	27.2	26.4	26.5	27.2	26.8	24.9	26.3	24.5	27.4	27.0	26.9
8	26.8	26.6	26.0	27.0	27.3	23.8	25.5	26.1	23.9	26.8	24.3	27.0
9	26.7	26.5	26.4	27.1	27.1	25.2	24.4	25.3	23.9	26.3	24.6	26.8
10	26.8	27.1	26.5	27.2	26.9	25.9	25.2	27.0	23.2	26.8	24.7	27.0
11	26.5	26.9	26.2	27.1	27.5	27.2	24.8	25.3	26.2	26.3	25.5	27.2
12	26.6	24.2	26.0	27.1	27.6	27.1	26.3	26.6	25.7	25.1	26.5	26.6
13	26.2	26.1	26.7	27.1	27.6	26.2	25.9	26.4	25.5	25.8	27.2	26.7
14	25.5	26.0	26.7	26.7	27.5	25.7	27.2	26.9	24.0	26.5	26.7	26.8
15	26.4	25.8	26.7	27.0	27.2	25.8	26.7	26.9	24.8	26.8	25.9	25.8
16	27.1	26.5	26.7	26.8	27.4	27.4	25.7	26.5	24.9	24.4	25.6	26.7
17	27.0	27.1	26.8	27.1	27.3	27.3	26.3	26.6	24.6	27.0	25.9	26.7
18	27.4	26.8	26.9	27.0	27.3	27.2	26.3	25.7	25.7	26.4	26.2	26.7
19	26.8	26.1	27.0	26.4	26.8	26.8	26.3	26.5	24.1	25.3	26.5	26.7
20	26.8	25.9	26.9	27.0	26.4	26.8	25.3	25.7	27.2	26.4	25.9	26.7
21	26.5	25.9	26.8	26.3	27.4	27.2	25.1	25.6	26.8	26.2	25.7	26.6
22	27.0	26.9	27.0	25.7	27.4	27.3	26.4	27.2	25.0	25.3	26.0	26.3
23	27.2	27.2	27.1	27.1	26.9	27.2	26.1	27.8	26.3	24.9	26.5	26.1
24	27.3	27.0	27.0	25.4	27.3	26.6	25.7	27.8	25.8	26.4	27.0	26.4
25	26.9	27.1	26.8	25.8	26.9	26.3	26.1	27.6	24.8	27.1	27.2	26.4
26	26.9	27.0	26.2	25.2	27.1	26.8	26.9	28.1	26.7	27.2	27.1	26.6
27	27.0	26.5	27.0	26.4	27.3	24.5	27.0	28.1	26.3	27.3	26.8	26.7
28	27.1	26.4	26.9	26.1	26.7	26.7	25.4	25.0	26.9	26.3	26.8	25.7
29	27.2		26.9	26.1	26.8	25.8	25.3	25.3	27.2	27.3	27.2	26.6
30	26.5		27.1	25.7	27.3	25.2	25.0	26.9	26.2	27.1	27.2	26.2
31	26.7		27.2		25.2		25.0	26.1		27.1	27.2	26.5
Mo. Avg.	26.8	26.5	26.7	26.7	26.9	26.4	25.8	26.3	25.5	26.3	26.3	26.6



Inarajan Weather Station

Daily and Monthly Average Percent Relative Humidity (%)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	80.4	82.5	80.3	84.6	88.4	94.6	96.4	88.5	85.9	85.4	76.7
2	N/A	86.8	77.8	78.8	83.1	82.4	90.0	93.9	96.8	90.0	87.6	84.0
3	N/A	84.0	79.2	78.1	82.7	77.2	91.5	91.5	84.6	92.9	91.6	82.9
4	N/A	79.2	82.2	79.9	84.9	82.1	85.6	90.9	91.1	88.6	90.6	92.5
5	N/A	82.0	83.3	76.8	87.0	85.1	83.2	92.1	84.8	89.7	89.8	87.2
6	N/A	79.3	81.0	73.6	90.4	91.0	89.5	91.5	95.9	87.8	83.3	84.3
7	N/A	81.1	83.7	78.7	83.8	87.9	94.1	89.5	95.5	83.7	86.0	80.8
8	89.0	79.3	89.5	81.5	82.7	96.6	89.6	88.4	95.5	86.2	98.5	81.5
9	90.5	83.8	85.8	81.7	82.8	91.3	95.0	90.0	95.6	88.1	95.6	82.8
10	84.2	81.4	81.2	80.5	81.8	86.8	91.9	87.1	99.0	85.8	94.6	83.2
11	87.4	83.7	87.2	79.0	80.5	82.2	91.4	93.5	88.1	89.4	91.6	81.8
12	87.2	97.5	90.5	78.7	81.5	85.1	86.7	88.5	88.8	94.9	89.3	82.7
13	90.0	90.5	84.5	78.9	83.0	88.4	91.4	88.7	93.1	90.0	85.1	81.2
14	89.1	91.4	84.7	81.1	82.4	85.1	85.2	86.6	97.2	86.4	88.6	77.1
15	84.7	94.1	81.8	80.1	81.9	89.8	87.0	86.6	91.9	85.2	90.5	83.1
16	84.3	90.7	79.3	82.2	80.6	85.7	90.3	88.4	92.4	91.7	90.8	79.7
17	83.0	89.1	80.2	77.5	82.6	86.2	88.4	86.1	94.0	85.5	90.3	75.4
18	77.7	87.2	81.9	80.1	83.0	84.8	88.3	91.7	88.2	90.2	88.4	79.7
19	85.3	85.8	81.1	86.1	88.9	86.6	87.4	89.3	96.5	93.7	85.5	81.1
20	84.2	83.4	79.9	83.5	87.8	86.9	91.8	91.0	83.6	89.0	83.6	83.1
21	86.9	86.2	78.2	86.7	84.0	84.3	91.5	90.6	82.2	89.0	87.6	82.2
22	82.7	82.9	81.1	87.9	83.7	83.6	87.4	86.5	86.6	92.8	89.2	78.4
23	82.1	83.1	79.3	81.2	85.5	83.0	87.8	84.4	88.1	94.6	89.0	82.7
24	81.4	83.8	81.5	93.3	80.4	86.1	91.5	84.2	88.0	87.5	84.0	80.8
25	82.4	81.9	82.0	90.1	85.4	87.3	89.6	84.5	94.7	84.1	78.5	80.8
26	80.1	81.5	86.7	93.5	86.1	87.7	86.3	81.8	86.5	83.5	81.1	79.7
27	78.5	83.1	80.3	87.4	84.0	96.4	83.6	81.4	88.3	83.9	84.6	80.3
28	78.1	84.3	79.6	88.9	86.4	85.4	90.6	93.8	88.1	88.8	83.3	86.5
29	77.9		78.8	89.0	85.2	88.6	93.0	90.8	85.2	85.0	83.9	77.2
30	81.1		80.6	89.8	85.1	90.7	93.1	81.8	86.8	84.6	79.6	80.9
31	80.4		80.2		92.9		92.4	88.8		87.4		82.1
Mo. Avg.	83.7	84.9	82.1	82.8	84.3	86.8	89.7	88.7	90.5	88.3	87.6	81.7



Inarajan Weather Station

Daily and Monthly Average Photosynthetically Active Radiation (PAR) ($\mu\text{mol/s/m}^2$)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	476	478	503	579	489	395	336	447	497	384	314
2	N/A	403	527	555	563	508	463	279	263	406	356	315
3	N/A	492	548	546	589	559	311	210	578	310	239	357
4	N/A	513	474	514	576	559	529	386	203	508	372	161
5	N/A	339	525	562	549	468	539	365	472	474	323	272
6	N/A	521	536	577	557	151	469	385	295	481	312	294
7	N/A	509	534	492	543	487	269	503	203	450	322	323
8	332	522	362	537	583	195	526	428	128	485	65	329
9	452	460	513	548	572	450	250	298	263	486	234	330
10	437	450	581	546	551	575	285	470	230	474	282	329
11	432	461	553	547	561	558	318	289	438	424	270	339
12	474	112	464	559	569	549	520	436	446	308	319	325
13	399	347	549	582	531	511	295	496	327	326	386	309
14	126	412	580	459	567	490	529	511	121	345	290	345
15	398	251	575	413	578	346	527	427	385	434	397	205
16	439	389	573	574	554	538	471	483	427	172	380	322
17	410	503	571	555	551	544	472	523	369	388	393	330
18	440	534	560	498	559	531	415	347	483	283	387	333
19	392	536	556	583	474	483	320	464	126	199	348	313
20	437	552	560	447	518	524	382	350	502	383	303	320
21	342	522	574	400	518	499	297	262	520	183	398	312
22	457	469	563	453	542	538	358	489	342	167	332	336
23	453	537	568	594	520	543	272	479	427	163	359	300
24	473	469	563	297	552	355	309	468	503	371	336	341
25	387	533	565	429	527	371	370	486	192	429	355	334
26	477	526	503	368	430	448	451	482	469	429	329	320
27	491	509	564	469	548	145	389	497	527	406	327	341
28	488	461	573	479	491	533	262	178	496	280	344	173
29	505		595	445	462	437	357	382	497	407	335	354
30	490		542	481	539	357	366	452	476	375	315	289
31	497		546		235		275	378		345		343
Mo. Avg.	426	457	541	500	532	458	387	404	372	367	326	310

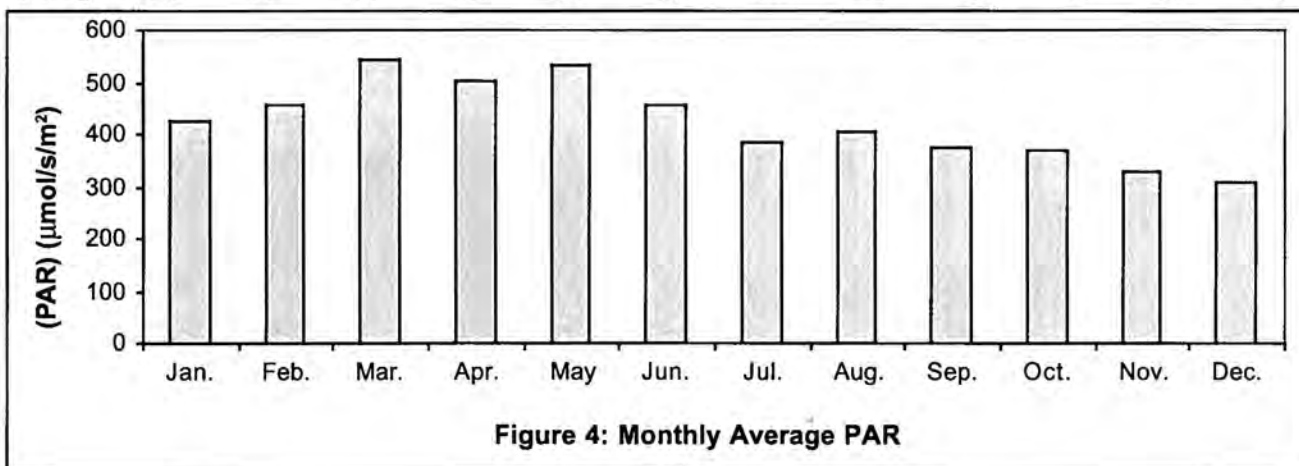


Figure 4: Monthly Average PAR

Inarajan Weather Station

Daily and Monthly Average Global Solar Radiation (W/m²)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	243	247	266	299	254	213	191	271	278	250	207
2	N/A	208	275	296	295	268	252	158	154	222	230	203
3	N/A	253	284	294	305	298	166	119	348	167	152	237
4	N/A	262	244	271	297	295	291	222	116	283	241	104
5	N/A	173	278	300	281	246	296	211	282	262	207	180
6	N/A	268	281	311	286	74	256	223	171	266	205	201
7	N/A	260	285	268	278	258	144	294	114	249	213	225
8	164	269	196	292	303	99	289	248	70	270	39	227
9	222	236	276	292	295	240	132	170	150	269	150	228
10	227	229	300	294	288	310	151	276	131	260	182	227
11	225	237	291	303	290	302	171	167	256	233	175	235
12	238	59	250	312	296	297	286	256	260	164	207	227
13	200	173	285	317	273	273	159	292	186	176	253	211
14	60	208	304	239	293	268	296	303	66	201	184	243
15	208	129	301	213	303	183	292	250	221	260	255	140
16	233	195	299	302	288	293	261	283	247	100	241	223
17	215	254	297	294	283	296	262	307	209	241	253	235
18	233	273	288	260	288	289	229	199	277	174	244	234
19	209	272	293	302	242	262	174	270	67	119	217	218
20	227	282	296	228	265	286	213	201	291	238	188	222
21	179	263	308	207	266	272	165	150	301	109	246	215
22	236	238	293	228	283	295	201	292	189	99	201	236
23	231	272	298	307	270	296	149	287	240	96	228	208
24	242	239	295	148	288	190	172	283	285	229	228	236
25	198	268	297	230	272	198	209	294	103	266	245	232
26	245	271	267	183	220	242	257	294	263	266	222	218
27	252	266	298	238	284	74	220	304	297	249	217	232
28	251	234	305	246	252	293	146	102	278	167	229	111
29	261		313	224	237	236	204	230	279	262	220	241
30	253		291	246	279	190	209	273	266	243	208	193
31	253		293		115		157	223		222		230
Mo. Avg.	219	233	285	264	275	246	214	238	213	214	211	212

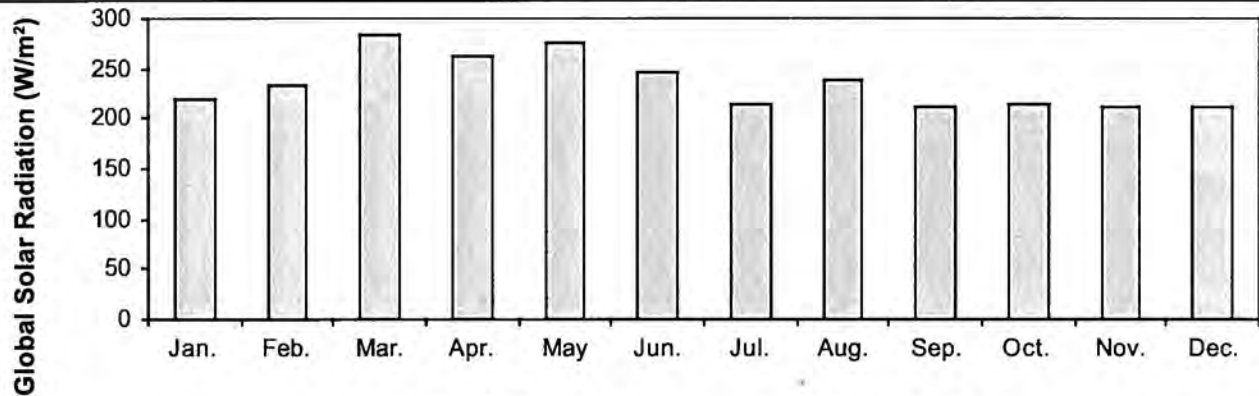


Figure 5: Monthly Average Global Solar Radiation

Inarajan Weather Station

Daily and Monthly Average Wind Speed (m/s)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	26	29	28	13	17	09	15	10	14	27	33
2	N/A	23	29	29	16	20	11	24	01	17	22	24
3	N/A	23	29	25	15	21	18	14	01	13	12	29
4	N/A	25	28	30	19	23	27	09	02	11	12	27
5	N/A	25	29	27	14	21	20	12	13	12	25	30
6	N/A	28	24	26	16	21	15	14	06	14	23	28
7	N/A	24	23	26	25	19	13	11	13	23	16	26
8	17	23	22	23	19	14	13	10	09	12	11	28
9	13	23	19	28	19	15	08	20	12	14	17	34
10	32	26	19	30	23	20	10	18	10	15	10	27
11	31	29	21	32	24	20	10	18	12	11	20	27
12	14	19	28	26	24	19	16	15	00	16	20	26
13	22	35	22	32	26	19	13	15	11	23	11	26
14	36	41	21	31	21	21	18	14	12	21	05	29
15	29	32	19	28	21	15	17	15	15	16	13	27
16	27	27	21	29	22	23	13	12	08	15	12	30
17	32	21	25	24	27	19	13	03	11	15	15	31
18	37	18	28	23	21	17	13	08	11	18	16	27
19	34	21	25	22	24	17	13	09	09	15	18	24
20	32	15	21	20	25	20	10	04	12	13	20	33
21	31	18	23	24	25	19	12	11	12	20	16	27
22	31	17	22	18	26	21	15	13	11	15	12	19
23	34	27	23	30	25	21	15	14	12	10	13	17
24	27	27	28	25	21	21	19	15	17	15	21	28
25	22	30	26	34	30	20	24	16	16	15	29	30
26	27	28	25	23	29	21	37	20	13	16	25	26
27	27	27	25	20	27	11	32	21	13	20	27	30
28	30	28	24	17	31	17	23	12	14	21	28	29
29	22		25	15	31	14	16	12	09	22	29	31
30	18		30	10	28	14	12	16	09	26	33	27
31	23		31		17		11	14		28		22
Mo. Avg.	27	25	25	25	23	19	16	14	10	17	19	28

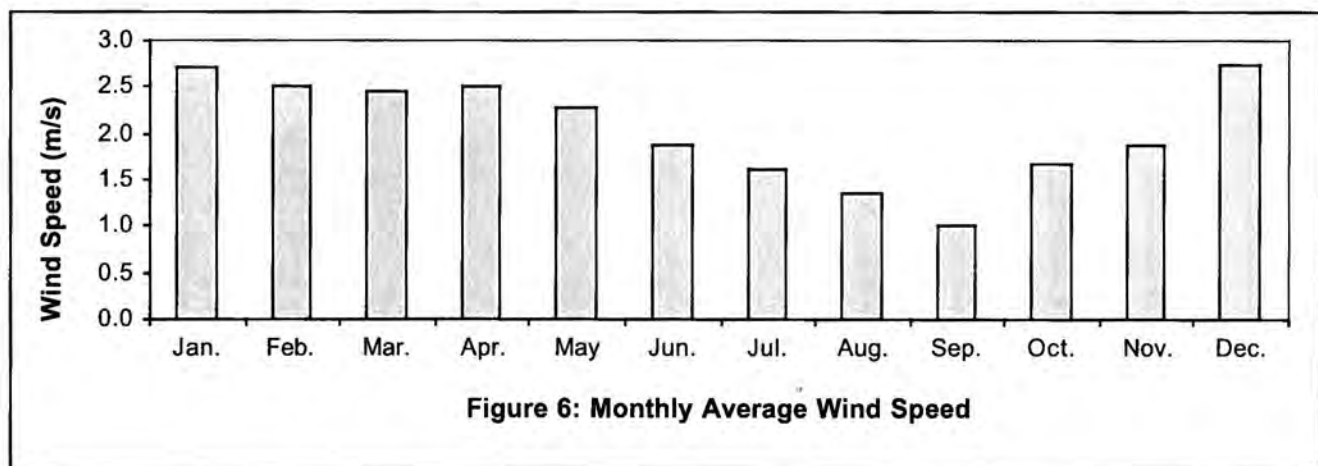


Figure 6: Monthly Average Wind Speed

Inarjan Weather Station

Daily and Monthly Average Wind Direction (0—360 Degrees from North)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	86	99	83	144	123	206	196	175	134	88	84
2	N/A	120	103	82	132	98	230	192	238	143	88	112
3	N/A	106	86	83	163	88	172	178	194	162	153	92
4	N/A	90	89	84	139	89	92	193	192	202	209	90
5	N/A	82	121	87	120	89	106	264	147	178	182	91
6	N/A	81	98	89	163	95	158	228	210	140	179	94
7	N/A	85	106	98	94	95	161	170	169	98	187	95
8	172	114	138	89	85	199	189	188	248	136	208	88
9	213	84	108	86	90	185	248	146	219	186	234	93
10	78	83	81	88	101	146	239	140	211	127	225	87
11	81	85	108	93	82	86	182	180	188	141	217	89
12	146	160	100	92	83	105	116	182	207	216	211	89
13	87	101	85	90	86	110	134	157	170	109	202	90
14	89	102	88	86	84	110	99	152	186	97	196	92
15	85	122	83	81	94	135	145	119	216	108	207	90
16	83	125	80	85	81	87	220	143	249	147	223	86
17	81	118	82	82	91	114	155	142	234	103	197	92
18	80	109	82	83	82	90	136	166	163	109	159	93
19	82	152	85	104	85	118	153	173	185	152	101	89
20	79	169	85	84	88	120	174	190	139	114	138	90
21	80	149	90	99	78	110	188	157	140	95	163	93
22	80	87	80	113	87	93	120	112	175	126	146	92
23	79	82	81	90	92	109	112	97	152	161	123	90
24	82	87	80	101	88	95	105	89	166	113	89	92
25	82	92	80	121	98	129	121	106	148	95	92	95
26	85	90	86	155	104	96	117	88	122	100	91	88
27	83	113	86	189	85	207	126	92	172	86	86	85
28	89	103	84	215	89	125	105	144	106	97	87	89
29	86		84	216	103	193	139	214	117	86	85	86
30	100		82	199	111	207	192	146	202	87	85	89
31	91		87		173		271	169		85		89
Mo. Avg.	96	106	91	108	103	122	158	158	181	127	155	91

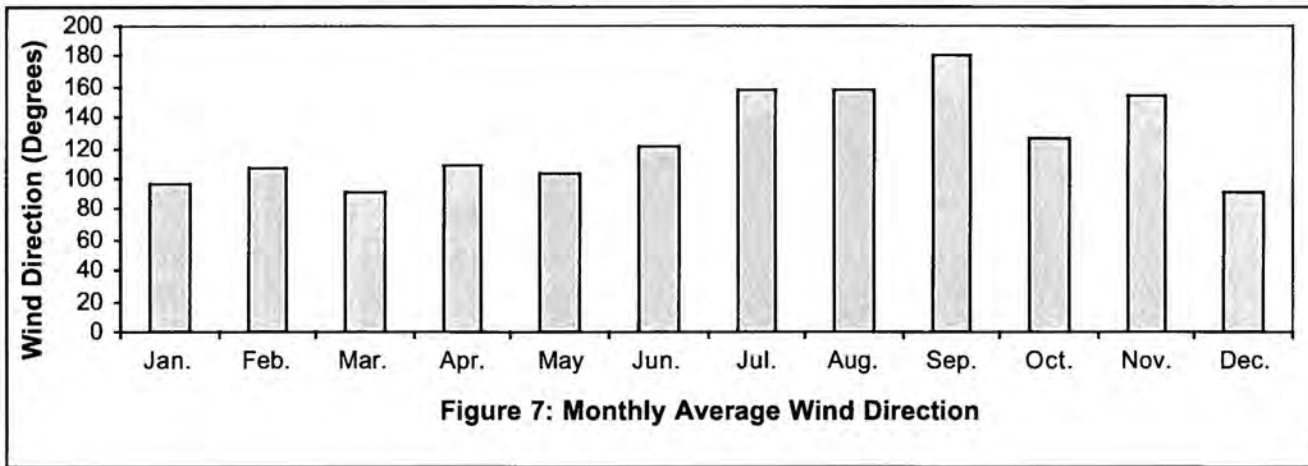


Figure 7: Monthly Average Wind Direction

Inarajan Weather Station

Daily and Monthly Total Atmometer Evaporation (ET Gage) (mm)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	4.6	4.6	5.1	5.3	3.0	2.0	1.5	4.1	4.6	3.8	4.1
2	N/A	3.8	5.3	5.6	4.8	4.8	4.1	1.0	1.0	2.8	2.0	2.9
3	N/A	3.8	5.3	5.6	5.3	5.3	1.8	1.5	4.1	2.3	1.8	4.5
4	N/A	5.1	4.6	5.1	4.8	5.3	4.3	3.3	2.0	4.3	4.1	0.3
5	N/A	2.8	4.6	5.8	4.1	3.6	5.3	3.8	5.3	4.6	2.3	2.8
6	N/A	4.8	5.1	5.8	3.3	0.5	3.8	3.3	2.3	4.6	3.3	4.1
7	N/A	4.8	5.1	4.8	4.8	3.6	2.0	5.1	1.0	4.1	4.1	4.6
8	1.5	4.8	3.3	5.1	5.3	1.0	4.8	4.1	0.8	4.3	0.3	4.8
9	3.3	3.3	4.6	5.1	4.8	3.6	1.3	2.5	1.5	4.8	2.0	3.8
10	3.6	4.1	5.6	5.3	4.3	4.8	2.5	4.8	1.3	4.6	2.0	4.3
11	4.1	3.3	4.1	5.8	5.1	5.3	2.8	1.3	4.1	3.0	2.3	4.8
12	4.1	0.3	2.3	5.6	5.3	5.1	4.6	4.6	4.6	2.0	3.3	4.1
13	2.5	2.5	5.1	5.6	4.8	4.3	2.0	4.6	2.0	1.8	4.8	4.1
14	0.8	2.0	5.1	3.8	5.3	4.1	4.6	5.1	0.5	3.0	3.6	5.1
15	3.8	1.5	5.3	4.3	4.8	2.3	4.8	4.3	3.3	4.6	4.3	1.8
16	4.1	2.8	5.6	4.8	5.1	5.1	4.3	4.1	3.8	1.3	4.3	3.3
17	3.3	4.1	5.3	5.6	4.3	4.8	4.1	5.6	1.5	4.3	4.3	5.1
18	4.6	4.6	5.1	5.3	4.8	4.8	3.6	2.3	4.6	2.8	4.6	4.8
19	2.0	4.6	5.3	4.6	4.5	4.3	3.0	4.3	0.5	0.5	3.3	4.6
20	3.3	5.1	5.6	4.6	N/A	4.1	2.8	3.0	5.3	3.3	4.1	4.6
21	2.5	4.3	5.6	3.3	4.6	4.6	2.5	2.5	5.6	1.3	4.1	4.3
22	4.3	4.3	5.3	3.3	4.5	4.8	3.3	4.6	3.6	0.8	3.3	5.1
23	4.1	4.3	5.8	5.6	3.8	4.8	2.3	5.1	3.6	1.3	3.0	4.3
24	4.3	4.1	5.1	1.3	5.3	2.0	1.0	4.8	4.6	3.8	3.5	4.6
25	3.8	4.6	5.1	2.8	4.1	3.3	2.3	5.1	0.8	4.8	4.8	4.3
26	4.6	4.8	3.3	1.0	2.8	3.3	3.3	4.8	4.8	5.1	3.6	4.6
27	4.6	4.3	5.3	3.8	4.6	0.8	3.6	5.3	4.8	4.6	3.8	4.6
28	4.8	3.8	5.6	3.8	3.6	5.3	1.5	0.5	4.6	2.5	4.4	1.8
29	5.1		5.6	3.8	3.8	3.8	2.0	3.6	4.6	4.3	3.7	5.3
30	4.1		5.1	3.3	5.1	3.3	3.0	5.1	5.1	3.3	3.5	3.8
31	4.6		5.6		1.0		2.0	3.8		3.6		4.8
Mo. Avg.	87.6	107.2	154.2	135.4	134.3	115.8	95.5	115.3	95.5	102.9	102.2	125.8

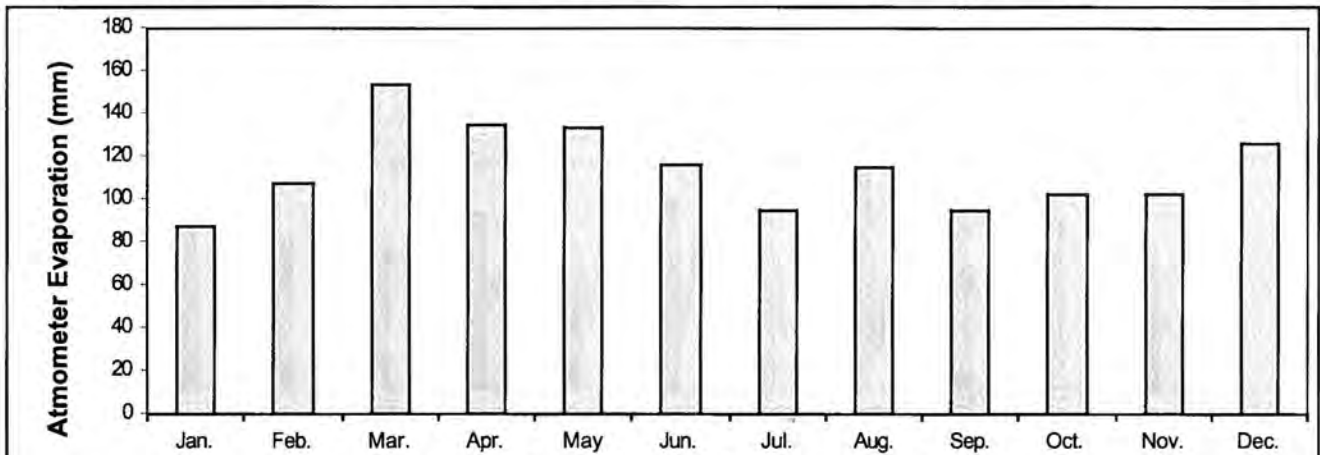
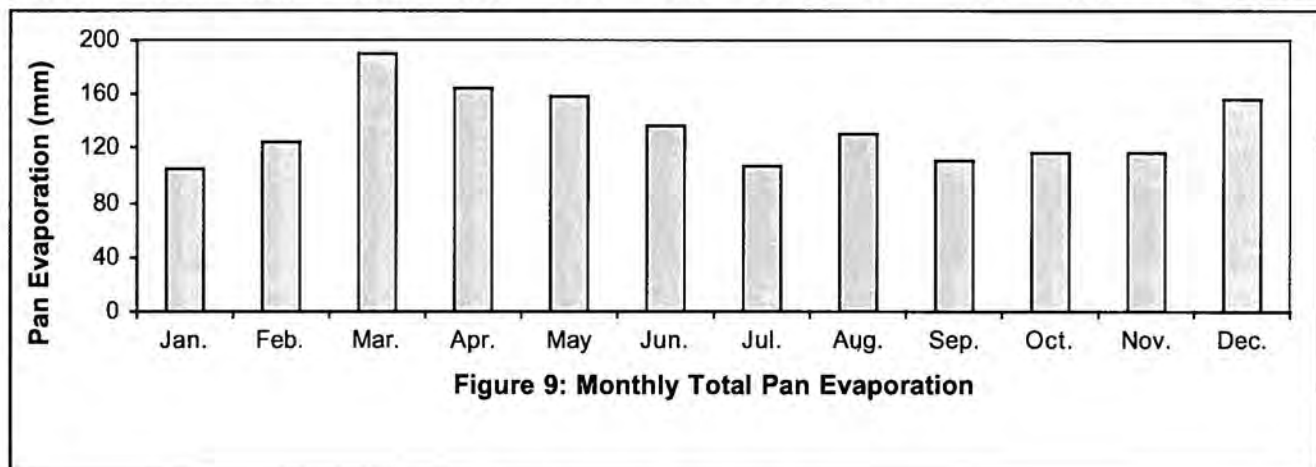


Figure 8: Monthly Total Atmometer Evaporation

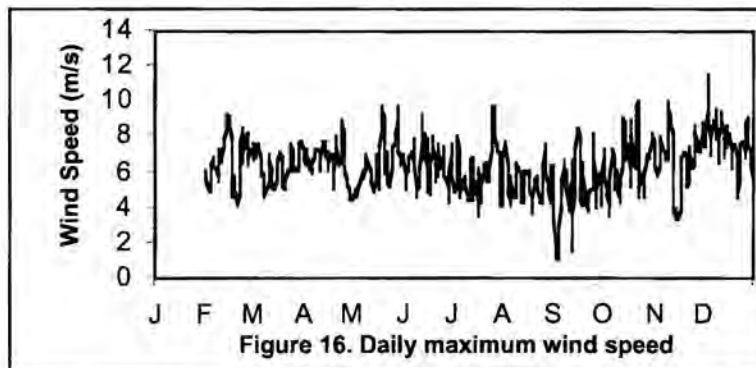
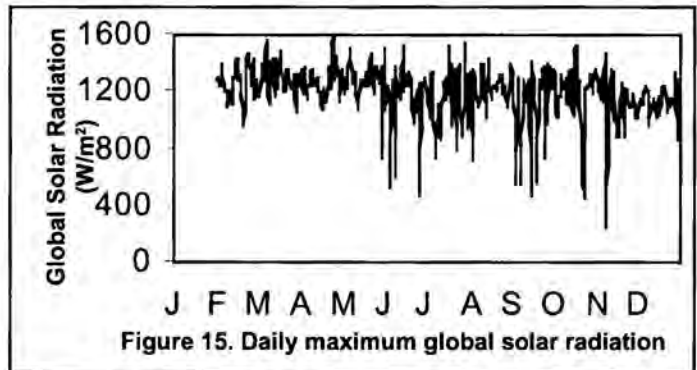
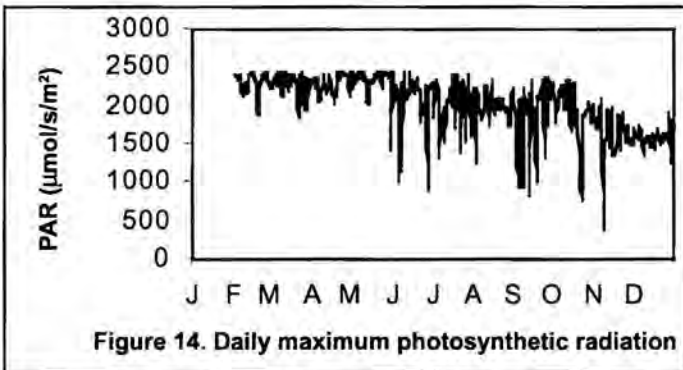
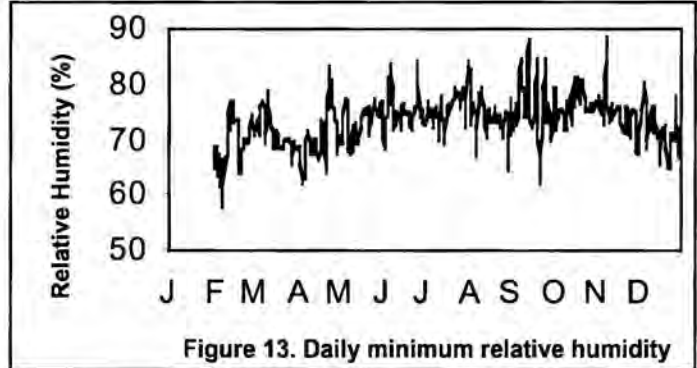
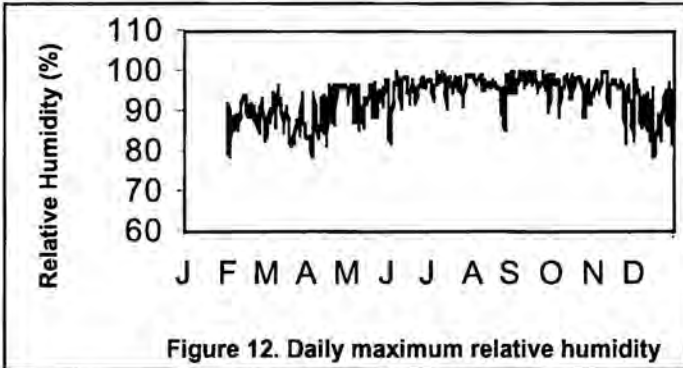
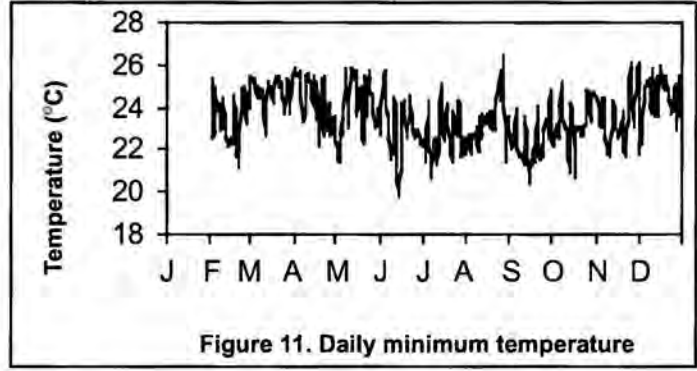
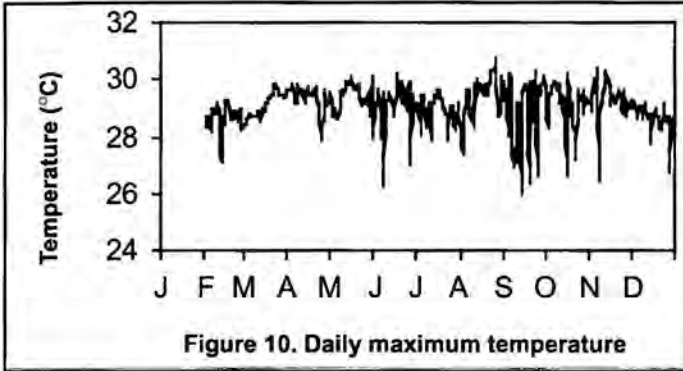
Inarajan Weather Station

Daily and Monthly Total Pan Evaporation (mm)

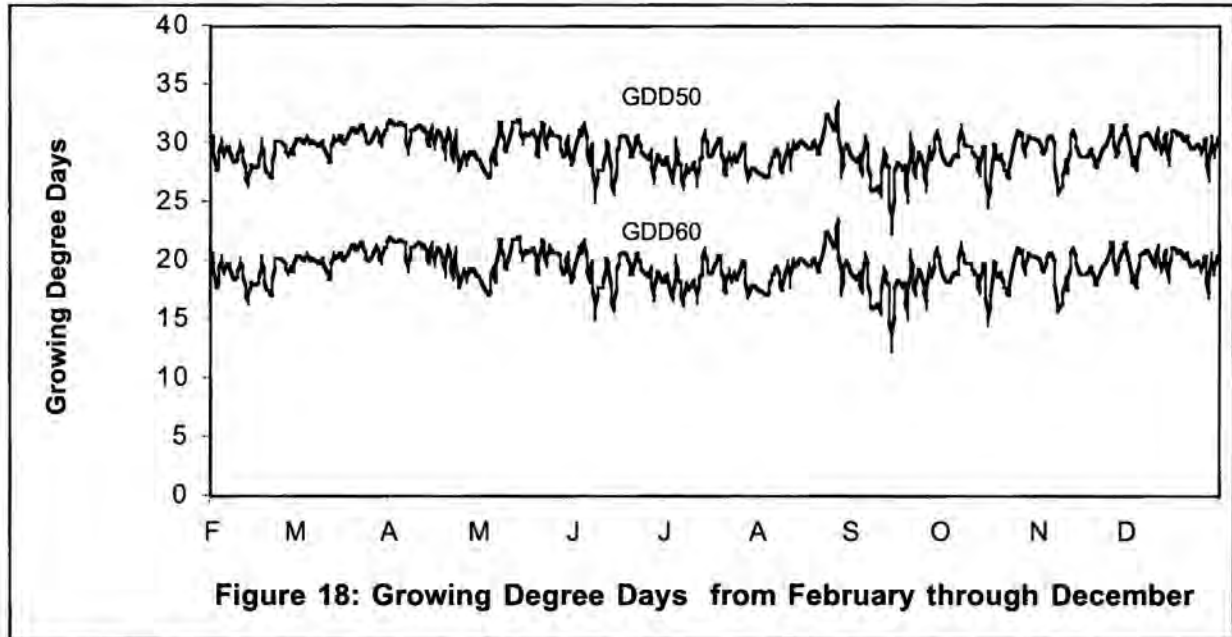
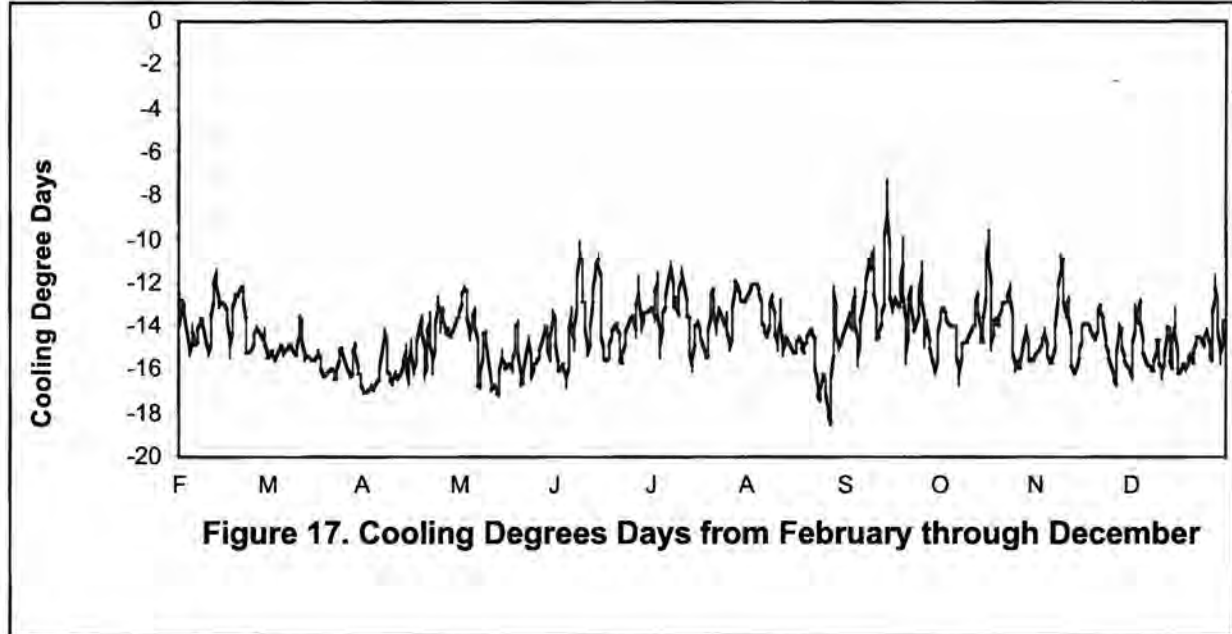
Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	5.6	6.2	6.9	6.0	3.5	1.8	2.7	4.7	5.3	5.0	4.9
2	N/A	3.6	6.6	7.2	5.4	5.7	4.2	1.2	1.2	2.8	3.9	3.4
3	N/A	4.8	6.6	7.1	5.8	6.5	2.7	1.2	4.7	2.7	1.5	5.3
4	N/A	5.3	5.9	6.9	4.7	6.2	5.0	5.5	2.3	4.7	4.2	0.3
5	N/A	3.5	5.9	6.8	4.1	4.1	5.7	3.9	6.2	5.3	3.7	3.2
6	N/A	5.8	6.1	7.5	4.3	0.6	4.6	3.6	3.1	4.5	4.4	4.7
7	N/A	5.2	5.7	5.2	6.2	4.1	2.4	5.9	1.2	4.5	4.0	5.3
8	1.8	5.8	3.0	5.7	6.0	1.8	4.1	4.7	0.9	4.5	0.3	5.5
9	3.1	3.4	5.5	6.2	5.4	3.0	1.2	2.9	1.8	5.5	2.4	4.4
10	4.0	5.2	6.2	6.9	6.1	5.6	2.9	4.3	1.5	4.6	2.4	4.6
11	4.3	4.9	4.8	6.7	6.2	6.2	2.8	1.5	4.7	3.3	2.7	5.5
12	4.1	0.3	3.5	7.2	5.7	5.5	5.6	4.8	5.3	2.5	4.3	4.5
13	2.7	3.1	5.8	7.0	6.1	4.2	2.5	4.5	2.4	2.1	5.0	4.8
14	2.2	2.4	5.9	5.5	5.6	5.5	4.9	5.6	0.6	3.3	2.9	5.9
15	4.5	1.8	6.4	5.2	6.6	2.3	5.1	5.0	3.8	5.5	3.9	2.2
16	4.7	2.6	7.2	6.0	4.4	5.9	4.1	4.3	4.4	1.5	5.0	3.8
17	4.4	3.8	6.6	6.9	5.8	5.3	4.1	6.5	1.8	5.0	4.2	6.7
18	6.2	5.1	6.6	5.8	5.5	5.9	3.7	2.7	5.3	3.2	4.6	5.6
19	4.0	5.3	6.7	5.4	N/A	4.2	3.5	5.0	0.6	0.6	3.3	5.4
20	4.3	5.7	7.2	5.0	4.9	5.7	3.2	3.5	6.2	3.6	4.2	6.2
21	3.2	5.0	6.9	3.9	5.4	5.2	2.9	2.7	6.5	1.5	4.7	5.0
22	5.0	4.3	6.7	3.7	6.1	5.3	3.8	5.3	4.1	1.3	3.8	6.0
23	5.3	6.5	7.0	7.7	4.6	6.7	2.7	5.4	4.4	2.0	3.5	5.7
24	5.2	5.1	7.1	2.0	6.1	3.2	1.2	5.6	4.9	4.9	4.9	6.7
25	3.7	5.3	6.2	3.1	5.2	3.9	2.7	5.1	0.9	6.4	5.7	5.0
26	5.3	5.6	4.5	1.2	3.4	4.7	3.8	6.5	5.6	6.0	4.3	6.7
27	5.9	5.1	6.4	4.4	5.6	0.5	5.4	6.1	5.6	4.7	4.6	5.3
28	5.9	4.5	7.2	4.3	4.4	5.4	1.8	0.6	5.3	2.7	5.2	2.4
29	5.5		6.6	3.5	5.1	5.1	2.4	4.1	5.3	4.8	4.4	8.0
30	4.5		6.4	3.5	5.1	3.8	3.4	5.1	5.9	4.3	4.2	5.6
31	4.7		6.9		1.8		2.4	4.1		3.7		6.9
Mo. Total	104.4	124.6	190.4	164.4	157.5	135.9	106.8	129.9	111.1	117.4	117.0	155.8



Inarajan Weather Station
Daily Maximum and Minimum Graphs for Specified Climatic Parameters)
February through December



Inarajan Weather Station
Degree Days Graphs with Tables

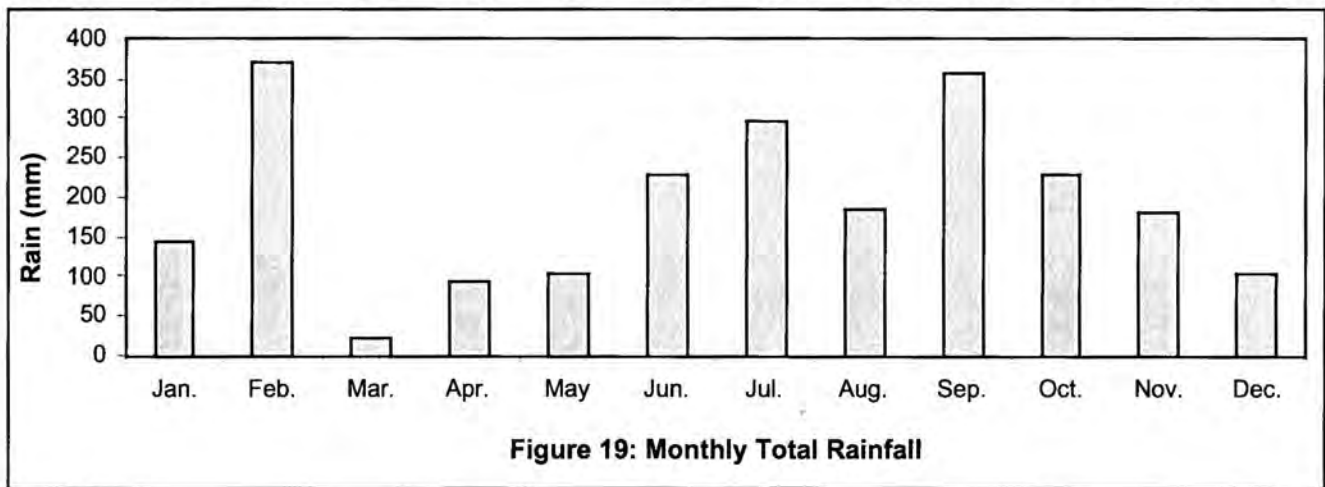


Degree Days	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cooling	390	479	461	468	423	419	449	391	439	435	462
Growing (50)	810	944	911	933	873	884	914	841	904	885	927
Growing (60)	530	634	611	623	573	574	604	541	594	585	598

Yigo Weather Station

Daily and Monthly Total Rainfall (mm)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	0.0	0.0	0.8	0.8	1.0	0.0	9.1	2.3	6.6	2.3	0.0
2	N/A	4.8	0.0	0.0	0.0	0.0	3.0	22.9	20.1	0.5	2.3	0.0
3	N/A	0.3	0.0	0.0	0.0	0.0	6.9	8.1	0.0	6.1	5.3	6.9
4	N/A	0.0	0.0	0.0	0.0	0.5	8.9	2.3	0.0	0.3	14.5	1.5
5	N/A	1.3	1.5	0.0	1.0	3.0	2.5	42.4	5.6	2.0	5.1	41.4
6	0.0	0.8	0.0	0.0	6.6	11.2	2.3	0.5	3.3	2.8	3.3	3.3
7	5.3	1.0	0.8	0.0	0.8	8.6	6.6	1.5	12.2	3.3	2.5	0.3
8	15.0	1.8	8.6	0.0	0.8	27.9	0.0	2.3	30.0	1.0	48.5	0.0
9	61.0	1.8	0.0	1.3	0.5	3.0	2.0	12.7	14.7	1.0	5.1	1.8
10	0.0	0.3	0.0	2.5	4.3	0.3	13.5	12.4	34.3	0.5	15.0	5.6
11	0.0	2.5	1.8	0.0	0.0	8.4	0.0	5.3	4.1	0.5	38.9	0.0
12	0.5	86.4	1.0	0.0	1.0	2.8	17.0	0.8	1.0	8.6	3.0	0.0
13	8.4	5.8	0.3	0.0	2.3	9.9	9.1	0.3	13.2	10.7	0.0	0.3
14	14.5	123.7	0.0	0.0	0.0	22.9	0.0	0.3	34.8	3.6	0.0	1.0
15	1.8	115.1	0.0	0.8	8.1	6.1	4.6	4.3	8.6	11.2	0.5	0.0
16	0.0	4.6	0.0	0.3	1.8	1.3	0.0	3.8	8.9	38.1	0.0	10.4
17	1.0	0.0	0.0	0.0	2.8	14.5	5.8	0.0	111.3	0.0	1.0	2.0
18	0.0	0.5	0.8	0.3	1.5	0.3	2.0	3.3	5.6	2.0	0.3	0.0
19	9.1	0.0	1.0	2.0	5.6	4.1	4.6	1.3	4.8	11.7	3.3	0.0
20	2.0	0.0	0.0	1.0	15.0	0.3	5.6	6.6	0.0	1.5	11.2	1.8
21	9.9	6.1	0.0	8.4	0.3	1.0	3.3	10.9	0.0	3.8	0.3	1.0
22	2.0	0.5	0.0	1.0	2.8	6.1	4.3	1.8	8.6	15.5	0.0	0.0
23	1.0	1.8	0.0	0.0	1.3	9.9	4.6	0.0	4.1	42.7	8.6	0.0
24	2.5	8.6	1.8	8.4	0.0	4.3	22.1	0.8	0.5	0.3	0.0	5.8
25	1.3	0.0	2.0	41.1	1.5	20.3	44.7	0.3	25.7	0.0	0.0	0.0
26	0.0	0.5	2.0	18.0	10.4	6.9	11.7	4.3	1.5	4.8	0.8	0.5
27	2.0	0.0	0.0	2.0	4.8	22.6	9.4	0.0	0.0	1.8	3.0	0.0
28	0.5	2.0	0.0	2.0	18.3	0.3	18.3	11.9	3.0	36.1	2.0	0.0
29	0.0		0.0	4.8	3.8	6.1	50.8	5.3	0.0	1.0	3.0	13.7
30	0.3		0.0	0.0	2.0	24.6	26.2	0.0	0.8	8.4	0.0	0.0
31	7.6		2.0		6.9		5.6	7.6		3.3		4.8
Mo. Total	145.8	370.1	23.6	94.7	104.9	228.1	295.4	183.1	358.9	229.6	179.8	102.1



Yigo Weather Station

Daily and Monthly Average Temperature (°C)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	25.1	25.9	26.4	25.7	26.2	25.2	25.1	25.9	25.8	26.8	26.7
2	N/A	24.1	25.9	26.6	24.9	26.1	25.6	24.6	24.7	26.2	26.2	26.6
3	N/A	24.6	25.9	26.4	24.8	25.7	24.7	24.6	25.7	25.1	25.5	25.4
4	N/A	24.8	26.0	26.5	25.8	26.3	26.4	25.0	25.5	25.4	25.5	26.2
5	N/A	24.6	25.8	26.4	25.3	26.2	26.1	25.1	26.6	25.5	25.7	24.6
6	26.0	25.2	25.5	26.1	25.8	25.4	25.6	25.8	25.1	26.1	26.2	26.1
7	26.1	25.0	25.4	26.3	26.3	26.3	24.6	25.9	24.5	26.3	26.1	26.3
8	25.5	24.3	25.0	26.3	25.9	24.1	25.6	26.1	24.2	26.0	24.1	26.2
9	24.5	24.8	25.6	26.4	25.9	24.5	24.7	25.1	24.4	25.7	24.5	26.2
10	24.4	25.2	25.1	26.2	26.2	25.6	24.2	26.2	23.5	26.1	24.5	26.1
11	24.8	25.2	25.5	26.5	26.6	26.1	24.8	25.6	25.4	26.0	24.6	26.4
12	24.8	22.9	26.0	26.3	26.8	26.6	25.7	26.4	25.8	25.4	25.4	26.4
13	24.6	24.4	26.0	26.7	26.7	25.7	25.6	26.5	25.4	25.6	26.0	26.1
14	24.6	24.8	26.1	26.3	26.4	25.2	26.5	26.5	23.5	25.5	25.9	26.0
15	25.0	24.4	25.9	26.4	26.1	25.7	25.9	26.3	24.4	25.5	25.4	26.0
16	25.8	25.1	25.9	26.3	26.3	26.6	25.6	26.1	24.1	23.8	25.1	25.1
17	25.8	25.4	26.3	26.4	26.3	26.2	25.4	26.0	24.5	26.0	25.6	26.0
18	26.2	25.1	26.3	26.1	26.3	26.4	25.9	25.8	24.9	26.2	25.5	26.1
19	25.3	24.4	26.2	25.9	26.3	26.3	25.4	25.9	24.1	24.8	25.5	25.8
20	25.5	24.4	26.0	26.0	26.0	26.0	25.0	25.5	26.2	25.9	25.1	25.2
21	25.4	24.1	26.0	25.2	26.7	26.3	25.1	25.0	26.1	25.3	25.1	25.8
22	25.7	24.5	26.0	25.9	26.4	26.1	25.2	26.3	24.7	24.9	25.8	25.7
23	25.9	25.0	26.2	26.4	26.2	25.9	25.5	26.8	26.2	25.1	25.9	25.2
24	25.7	25.0	26.4	25.0	26.4	25.7	24.8	26.7	25.4	26.0	26.3	24.9
25	25.4	25.2	25.8	24.7	26.2	25.9	25.6	26.8	24.6	25.8	26.5	25.3
26	25.4	25.8	26.0	25.0	26.4	26.3	26.6	26.9	25.8	26.0	26.4	25.7
27	25.4	26.1	26.4	25.6	26.5	24.0	26.0	27.1	25.9	26.3	25.9	25.9
28	25.5	25.8	25.9	25.7	25.5	25.9	24.8	25.3	26.2	25.3	26.0	25.9
29	24.8		26.1	25.1	26.2	25.1	24.8	25.2	26.5	26.5	26.6	25.1
30	24.0		26.7	25.4	26.8	24.5	24.9	26.0	25.9	26.6	26.7	25.8
31	24.5		26.5		25.0		25.4	25.3		26.3	26.6	24.9
Mo. Avg.	25.2	24.8	25.9	26.1	26.1	25.8	25.4	25.9	25.1	25.6	25.6	25.8

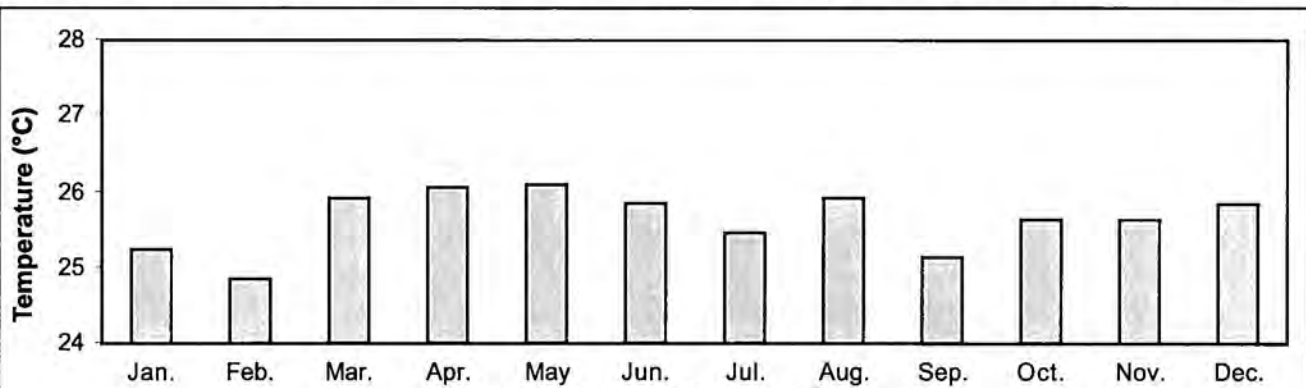
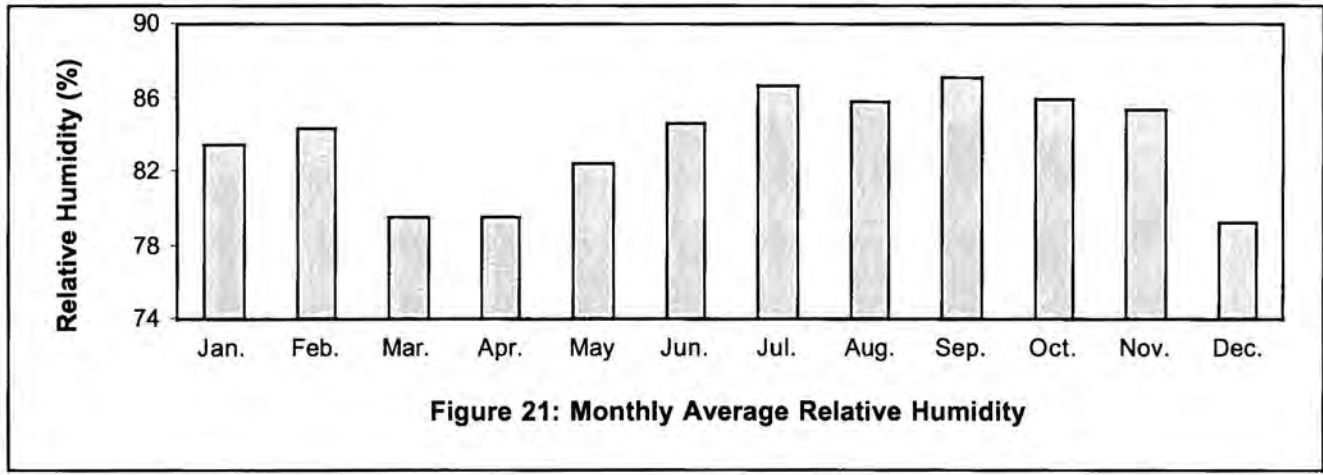


Figure 20: Monthly Average Temperature

Yigo Weather Station Average Daily Humidity Data

Daily and Monthly Average Percent Relative Humidity (%)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	78.9	78.4	77.5	82.3	83.7	86.4	90.4	84.7	84.9	82.1	71.9
2	N/A	87.4	74.1	74.9	82.4	79.6	84.9	90.7	90.5	85.2	83.8	81.3
3	N/A	84.0	75.3	74.4	82.0	78.0	87.2	90.1	84.4	88.3	88.2	81.1
4	N/A	79.6	78.0	75.5	80.2	81.6	83.9	88.1	85.5	87.4	89.5	89.2
5	N/A	80.7	79.1	72.0	84.8	83.0	83.6	88.4	82.6	87.2	88.1	84.9
6	78.5	78.9	79.2	71.5	86.0	87.3	86.3	85.3	90.0	85.3	82.7	80.6
7	84.4	82.4	82.4	71.6	82.6	84.2	90.8	85.6	91.1	83.4	85.6	77.3
8	89.2	81.6	89.3	76.7	83.2	90.3	84.8	84.3	90.7	83.8	94.8	79.4
9	93.2	82.5	85.4	79.2	82.9	89.4	87.8	86.2	88.7	86.0	91.9	79.7
10	90.5	81.0	83.3	79.5	78.8	84.2	91.8	85.5	92.8	83.6	90.9	80.0
11	88.0	82.8	85.1	74.7	79.1	82.1	87.6	88.5	86.5	85.3	91.7	79.7
12	89.2	95.3	84.7	74.1	79.4	82.2	84.4	84.2	85.2	88.5	89.9	78.7
13	91.0	89.4	81.9	73.4	82.0	84.8	88.1	82.6	89.4	85.7	87.0	78.1
14	85.4	88.4	81.8	75.7	81.4	82.6	82.7	82.1	93.8	85.2	87.3	73.1
15	84.3	91.2	79.5	76.0	81.8	86.3	85.3	83.9	88.5	85.6	86.9	79.1
16	83.8	89.7	77.0	77.4	79.0	83.7	85.9	85.1	90.2	88.7	88.7	75.2
17	81.6	88.3	77.1	73.2	81.1	86.0	88.0	84.1	90.7	85.1	86.6	70.7
18	75.3	86.4	78.6	77.8	82.2	82.9	85.1	85.7	86.4	86.8	85.8	76.9
19	85.3	84.5	78.9	81.9	85.1	83.0	87.2	87.7	91.4	91.5	85.4	82.3
20	83.2	82.2	77.9	82.8	84.8	83.8	87.8	87.5	82.8	86.3	83.2	80.5
21	84.5	87.4	75.3	88.3	81.5	84.0	86.9	90.3	79.5	88.1	85.1	78.6
22	82.0	86.8	79.4	83.3	82.3	83.5	87.3	85.2	83.8	90.3	84.6	77.2
23	80.8	84.9	77.0	77.6	83.2	83.9	84.9	83.5	84.1	87.2	87.1	83.3
24	81.1	85.2	78.5	89.1	77.3	84.5	90.4	83.6	84.9	84.0	80.9	79.7
25	81.9	81.3	81.1	89.4	82.4	83.3	85.4	83.0	90.4	84.9	75.7	78.0
26	79.4	79.7	80.6	89.4	83.7	84.4	82.2	82.0	85.6	85.0	78.8	76.2
27	78.3	78.9	76.8	87.3	82.0	92.7	83.0	80.4	84.4	83.6	82.6	77.7
28	77.8	81.6	77.9	85.9	85.7	84.2	87.9	88.3	85.7	88.3	81.1	83.5
29	79.0		76.2	90.5	82.5	87.3	90.4	86.3	83.4	83.5	80.4	75.2
30	82.3		75.9	86.6	82.2	90.8	87.9	82.2	84.8	82.3	74.5	84.9
31	81.4		78.0		89.8		88.6	88.7		84.5		82.3
Mo. Avg.	83.5	84.3	79.5	79.6	82.4	84.6	86.6	85.8	87.1	86.0	85.4	79.2



Yigo Weather Station

Daily and Monthly Average Photosynthetically Active Radiation (PAR) ($\mu\text{mol/s/m}^2$)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	464	428	475	517	549	416	385	458	394	362	320
2	N/A	330	465	526	518	492	388	293	280	343	354	309
3	N/A	419	518	516	536	526	339	207	419	323	247	311
4	N/A	415	461	484	551	454	481	429	215	341	352	170
5	N/A	369	450	547	525	510	521	316	402	362	298	298
6	420	478	411	545	574	202	416	477	311	348	248	305
7	395	426	406	531	482	424	219	467	153	373	245	341
8	280	491	356	428	493	205	500	502	224	389	71	330
9	205	428	457	533	500	377	292	329	213	384	201	343
10	386	425	482	553	516	502	204	425	204	356	263	307
11	412	433	378	526	494	536	263	264	436	318	234	336
12	325	72	474	562	519	524	498	471	430	256	286	302
13	266	267	502	566	487	479	279	532	203	249	339	315
14	143	312	477	421	436	450	526	538	69	288	297	348
15	337	197	543	445	529	390	501	409	295	370	322	205
16	415	342	546	530	519	517	548	494	189	166	239	353
17	442	359	530	525	524	533	373	500	286	391	374	359
18	398	398	518	408	577	566	433	466	366	280	338	339
19	378	491	472	469	457	508	303	354	141	124	280	282
20	397	536	510	366	419	471	369	395	412	351	235	337
21	405	474	523	274	496	464	309	306	480	154	371	298
22	434	443	535	395	485	506	280	480	361	130	323	373
23	436	385	508	490	454	476	270	462	385	307	288	341
24	442	386	542	308	555	372	220	460	435	365	336	358
25	374	469	508	308	421	439	407	474	182	379	343	340
26	414	497	528	386	487	428	496	483	469	350	364	331
27	416	455	532	414	494	167	395	503	433	338	306	331
28	402	397	496	418	457	514	273	238	392	249	317	256
29	465		559	291	452	339	401	390	456	329	336	309
30	429		554	503	559	227	367	480	424	334	325	242
31	402		575		270		386	347		268		304
Mo. Avg.	378	399	492	458	494	438	377	415	324	310	297	313

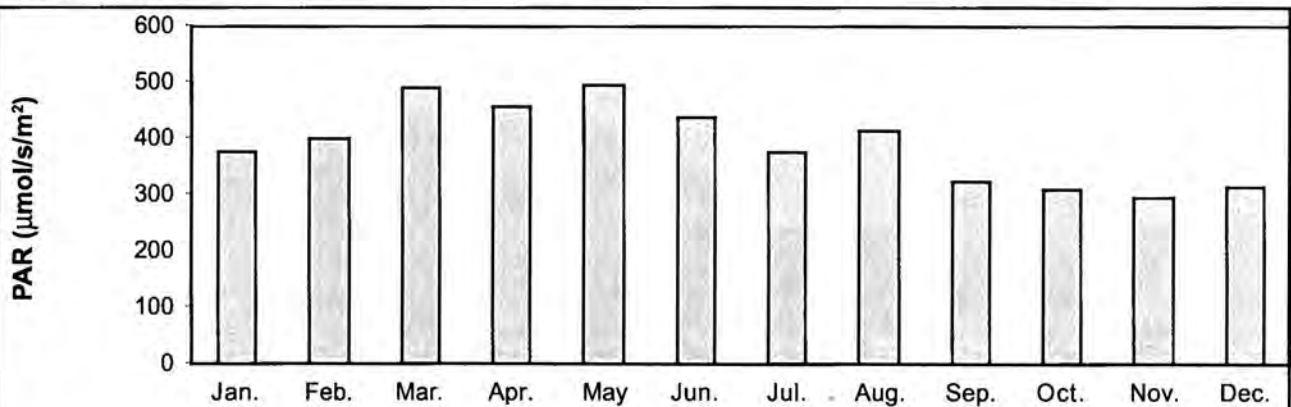


Figure 22: Monthly Average PAR

Yigo Weather Station

Daily and Monthly Average Global Solar Radiation (W/m^2)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	245	227	250	270	286	214	203	263	250	233	207
2	N/A	179	254	280	273	259	202	152	158	214	230	201
3	N/A	233	274	277	283	278	172	105	241	199	159	205
4	N/A	237	244	256	287	238	252	227	120	211	225	112
5	N/A	203	265	292	276	266	273	170	232	231	188	194
6	213	255	258	291	301	101	216	253	176	222	159	201
7	201	226	260	279	255	222	110	250	84	235	159	223
8	149	258	207	226	260	102	262	268	127	250	44	216
9	107	229	283	281	264	196	155	175	122	244	124	220
10	202	228	253	294	276	267	103	229	118	229	166	203
11	213	232	241	279	262	284	133	140	258	203	147	218
12	176	33	246	301	274	278	257	256	256	165	180	201
13	142	137	262	303	256	251	141	293	120	158	214	207
14	71	169	250	223	228	233	279	295	39	182	179	225
15	175	100	284	233	284	201	264	223	180	233	202	139
16	218	190	289	281	277	276	288	269	113	102	151	225
17	231	219	279	280	275	280	193	277	130	240	234	231
18	212	228	272	214	304	301	225	253	218	172	217	220
19	201	255	248	246	237	270	154	192	82	78	182	186
20	208	278	270	189	217	248	189	216	249	226	156	213
21	213	249	276	137	262	244	160	166	290	99	238	189
22	227	251	282	201	253	267	143	270	215	84	207	238
23	230	218	269	256	237	264	138	259	232	193	188	212
24	232	218	286	156	293	193	111	260	263	238	217	227
25	194	254	268	158	220	230	215	268	109	242	220	216
26	224	271	277	198	254	225	264	275	283	226	234	214
27	221	249	284	212	263	83	207	287	268	225	199	212
28	216	205	268	215	238	270	142	131	241	159	206	162
29	245		294	151	235	174	211	220	280	218	216	203
30	226		294	261	294	113	189	272	263	222	211	158
31	219		303		138		202	193		171		202
Mo. Avg.	199	216	267	241	260	230	196	227	191	198	190	203

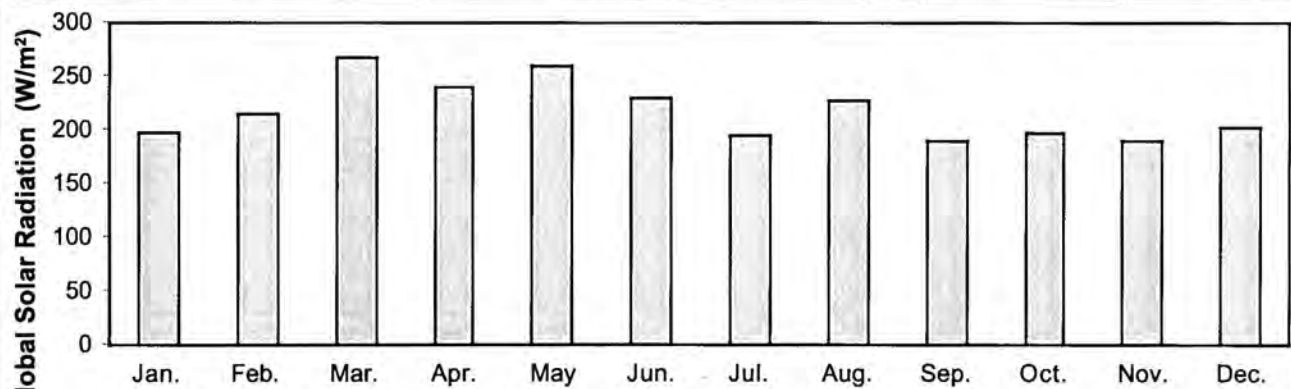
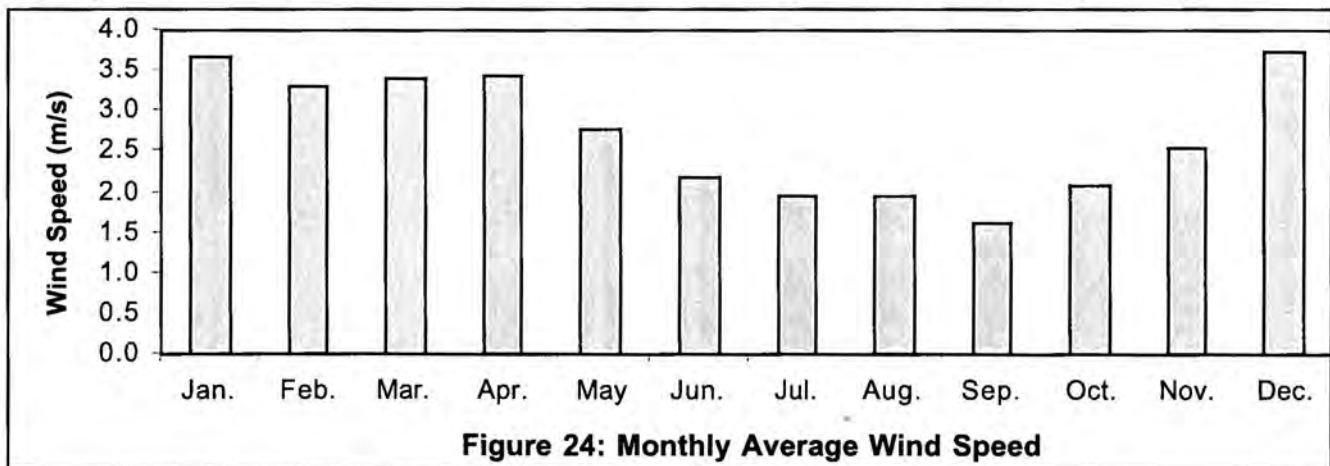


Figure 23: Monthly Average Global Solar Radiation

Yigo Weather Station

Daily and Monthly Average Wind Speed (m/s)

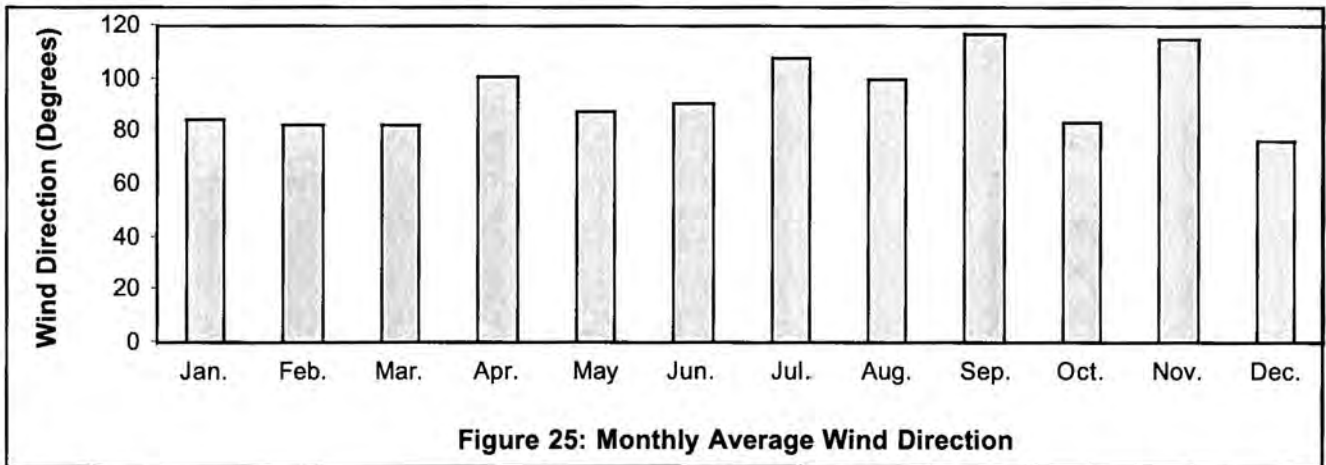
Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	3.8	4.3	4.3	1.7	2.4	1.5	2.4	1.8	1.9	4.0	4.8
2	N/A	2.2	4.3	4.6	2.0	2.1	1.4	3.8	1.3	2.1	3.2	3.3
3	N/A	2.2	4.5	3.6	1.7	2.1	2.1	2.4	1.2	2.0	1.6	3.7
4	N/A	2.8	4.5	3.9	1.8	2.6	3.1	1.4	1.9	0.9	2.2	3.9
5	N/A	3.5	3.5	4.1	1.8	2.6	2.4	0.9	1.9	1.2	4.6	4.7
6	4.3	4.3	2.9	3.5	1.8	2.7	1.9	1.7	1.4	1.7	4.0	3.9
7	3.5	3.3	2.6	3.4	2.5	2.5	1.4	1.6	2.1	2.2	2.8	3.7
8	2.8	2.7	2.2	3.3	2.2	1.4	1.1	1.3	1.2	1.6	1.5	4.1
9	1.5	3.0	1.9	4.0	2.6	1.7	0.9	2.9	1.6	1.5	1.7	4.3
10	1.1	3.6	2.1	4.0	3.3	2.0	0.8	2.5	1.4	1.9	1.5	4.0
11	1.4	4.1	2.7	3.5	3.4	2.4	1.6	2.2	2.2	1.4	2.6	3.8
12	1.7	2.3	3.3	3.0	3.4	2.5	1.9	2.1	1.0	1.7	2.8	3.9
13	2.9	4.4	3.4	4.2	3.6	2.3	2.1	2.0	2.2	2.8	1.7	3.7
14	4.4	4.8	2.9	4.5	2.4	2.5	2.1	2.0	1.7	2.2	0.9	4.0
15	4.3	4.2	2.5	4.3	2.6	1.6	1.7	2.2	2.1	2.0	1.1	3.7
16	4.3	3.6	3.0	4.1	2.8	2.8	1.2	2.1	0.8	1.8	0.7	4.5
17	5.4	2.7	3.9	3.6	2.9	2.2	1.5	1.5	1.0	1.9	1.4	4.3
18	6.1	2.1	4.5	3.3	2.8	2.3	2.1	1.9	1.2	2.6	1.5	3.1
19	5.5	2.4	3.5	2.8	3.6	2.1	2.1	1.2	1.0	1.9	2.2	2.9
20	5.1	1.5	2.9	2.7	3.2	2.1	1.6	1.2	2.1	1.8	1.8	4.3
21	4.8	2.0	2.6	2.6	3.6	2.1	1.4	1.2	1.8	2.3	1.6	3.4
22	4.8	2.0	3.0	2.4	3.4	2.1	1.8	1.8	1.4	1.9	1.8	2.3
23	5.3	3.6	3.3	3.3	2.4	2.3	1.7	1.8	1.9	1.7	2.1	2.1
24	4.1	3.8	4.3	3.5	2.4	2.1	2.0	2.0	1.9	2.0	3.2	3.2
25	3.2	4.5	3.8	4.4	3.1	2.8	3.2	2.2	1.9	1.4	3.2	3.5
26	3.5	4.6	3.8	3.8	3.4	3.1	4.2	2.9	1.7	1.8	3.4	3.8
27	3.9	4.4	3.6	3.0	3.7	1.2	3.8	2.9	1.4	2.6	3.8	4.4
28	3.7	4.4	3.1	2.1	3.6	2.0	2.6	1.9	2.1	2.6	4.0	4.1
29	2.5		3.5	1.5	3.4	1.3	2.6	1.1	1.9	3.0	4.5	4.5
30	2.0		4.8	1.5	3.1	1.3	1.4	1.7	1.1	3.7	5.0	3.1
31	2.9		4.4		2.1		1.8	1.7		4.2		2.9
Mo. Avg.	3.7	3.3	3.4	3.4	2.8	2.2	2.0	2.0	1.6	2.1	2.5	3.7



Yigo Weather Station

Daily and Monthly Average Wind Direction (0—360 Degrees from North)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	N/A	84	87	78	118	121	122	139	84	71	81	72
2	N/A	104	86	77	74	96	168	178	115	95	64	77
3	N/A	91	75	79	70	82	72	161	153	86	71	83
4	N/A	81	78	82	86	79	95	147	87	111	174	72
5	N/A	70	91	85	94	76	83	154	88	80	175	N/A
6	92	74	89	88	108	70	62	119	112	86	174	N/A
7	153	73	91	92	93	82	80	101	140	99	176	N/A
8	163	60	118	84	76	141	103	134	210	66	171	N/A
9	153	55	106	81	81	105	124	127	117	75	228	N/A
10	126	57	68	85	84	91	141	102	145	60	179	N/A
11	69	55	77	94	76	74	152	65	176	82	204	N/A
12	68	72	101	85	83	92	108	54	118	110	198	N/A
13	56	92	82	89	84	81	116	60	68	102	179	N/A
14	44	106	84	83	81	98	91	71	106	88	116	N/A
15	68	131	75	77	76	120	84	101	176	68	81	N/A
16	77	126	74	76	70	85	106	113	162	81	99	N/A
17	70	133	73	82	97	108	83	86	178	74	71	N/A
18	70	103	69	77	81	72	138	67	74	78	71	N/A
19	68	71	84	81	81	68	151	101	79	100	65	N/A
20	68	95	83	78	80	82	108	121	128	82	82	N/A
21	67	69	95	84	71	92	86	85	116	88	77	N/A
22	67	62	68	97	87	85	101	68	125	90	94	N/A
23	69	58	74	94	98	77	103	78	118	90	85	N/A
24	80	69	71	109	87	86	90	74	54	94	81	N/A
25	81	70	70	127	92	75	88	73	110	76	91	N/A
26	81	78	79	152	88	88	100	67	90	86	85	N/A
27	78	82	85	181	78	93	89	63	63	75	67	N/A
28	90	79	77	211	88	106	91	109	82	87	67	N/A
29	78		77	184	104	80	135	95	99	74	74	N/A
30	73		77	133	108	114	76	84	129	66	71	N/A
31	75		85		111		190	95		80		N/A
Mo. Avg.	84	82	82	101	87	91	108	100	117	84	115	76



Yigo Weather Station

Daily and Monthly Total Atmometer Evaporation (ET gage) (mm)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct	Nov.	Dec.
1	N/A	4.6	4.6	4.3	4.8	4.3	3.0	2.5	3.9	N/A	3.6	4.8
2	N/A	2.5	5.3	5.6	4.6	4.6	2.3	1.3	1.6	3.4	3.3	3.6
3	N/A	3.8	5.1	5.6	4.3	5.1	2.7	1.0	3.4	2.8	2.0	3.3
4	N/A	4.6	4.8	5.3	5.3	4.1	5.4	3.6	1.7	2.2	3.0	0.8
5	N/A	3.6	4.8	5.8	3.8	4.3	4.1	1.0	3.7	3.2	2.0	2.5
6	4.3	4.3	4.6	6.1	4.6	1.0	3.3	3.8	2.5	3.2	2.8	3.6
7	3.3	3.8	4.6	5.8	4.3	3.6	1.8	3.5	0.3	3.0	2.5	4.3
8	2.0	4.1	2.5	4.8	4.3	1.0	3.2	3.9	1.5	4.7	0.3	3.8
9	1.0	4.1	4.6	4.8	3.8	2.8	2.4	2.9	1.7	3.8	1.5	3.8
10	3.0	4.1	4.3	4.8	4.6	4.3	27.7	4.4	2.3	3.8	2.3	3.8
11	3.6	3.3	3.8	5.3	4.6	4.3	1.7	4.4	3.7	3.0	1.3	4.1
12	2.8	0.3	4.1	6.1	4.8	4.8	4.1	3.8	3.8	2.5	2.3	3.8
13	0.8	1.8	4.3	5.8	4.3	3.6	2.2	1.9	1.2	2.0	3.3	4.1
14	1.3	2.3	4.6	4.8	4.1	3.6	4.6	4.5	1.3	2.5	3.3	4.6
15	3.0	1.3	5.1	4.8	4.6	2.8	3.8	3.7	1.4	3.0	3.6	2.3
16	3.6	3.0	5.6	4.8	4.8	4.3	4.1	3.9	1.7	1.0	2.5	4.3
17	3.6	3.6	5.3	5.8	4.1	3.8	2.2	4.4	0.0	3.8	3.8	4.8
18	4.8	3.8	4.8	4.6	5.1	4.8	3.2	3.6	2.6	2.8	3.3	4.3
19	2.0	4.6	4.8	4.3	3.0	4.6	2.1	2.5	0.9	0.5	2.5	2.8
20	3.0	5.3	5.1	3.6	3.3	3.8	2.5	3.1	3.8	3.0	2.8	3.8
21	2.5	4.3	5.6	1.0	3.6	3.8	2.0	2.1	4.8	1.3	3.8	3.6
22	3.8	3.8	5.1	3.8	3.8	4.1	1.5	3.9	3.3	0.5	3.3	4.6
23	4.1	3.0	5.1	5.1	4.1	4.1	1.8	4.1	3.9	2.5	2.3	3.0
24	3.8	3.0	5.3	2.0	4.8	2.5	0.5	4.5	4.2	3.8	3.6	3.8
25	3.8	3.8	4.3	1.5	3.6	3.8	3.0	5.0	1.9	4.1	4.6	3.8
26	4.1	4.8	4.6	2.0	3.3	3.3	3.8	4.4	3.6	3.6	4.3	4.3
27	4.3	4.6	5.6	2.8	3.8	0.8	2.5	5.3	4.1	3.3	2.8	3.8
28	4.1	3.3	5.1	3.8	2.5	4.1	1.8	1.0	3.9	2.0	3.6	2.0
29	4.8		5.3	1.5	3.6	2.8	2.3	3.0	4.3	3.0	3.8	4.3
30	4.1		5.6	4.1	4.8	1.0	2.8	4.0	N/A	3.6	4.3	1.8
31	3.6		4.8		1.0		2.8	2.8		2.5		3.3
Mo. Total	85.1	99.3	149.1	130.8	126.0	105.7	111.3	103.7	77.1	84.8	88.4	111.5

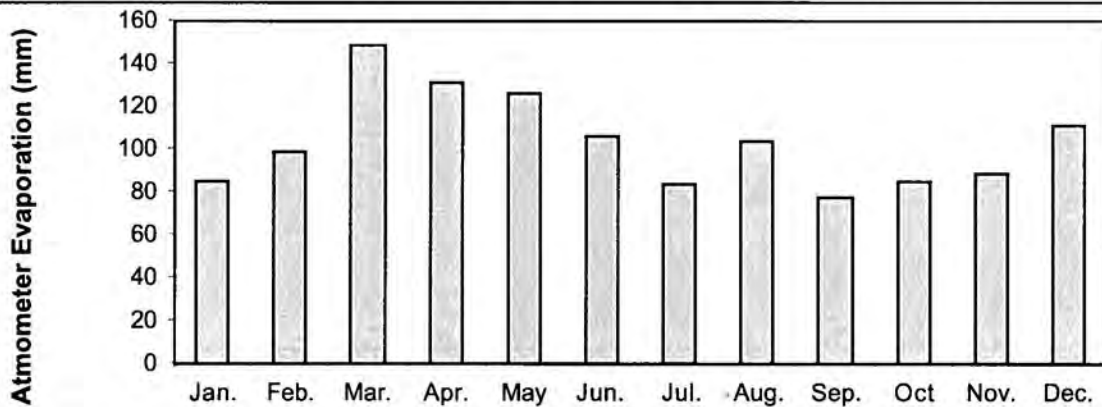


Figure 26: Monthly Total Atmometer Evaporation

Yigo Weather Station

Daily and Monthly Total Pan Evaporation (mm)

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct	Nov.	Dec.
1	N/A	5.3	5.8	6.5	5.4	5.0	3.2	4.1	4.6	N/A	4.8	6.2
2	N/A	2.3	6.3	7.3	5.4	5.4	3.5	1.5	1.8	4.1	4.8	3.6
3	N/A	4.7	6.7	7.1	5.3	6.0	3.2	1.1	4.1	3.4	2.4	5.2
4	N/A	4.8	6.3	7.1	6.0	4.8	6.5	4.1	2.0	2.7	4.6	0.9
5	N/A	4.8	6.1	7.9	4.3	6.3	4.8	2.1	4.4	3.8	3.0	3.6
6	5.9	5.7	5.3	7.1	5.7	2.1	3.9	4.5	2.9	3.9	3.7	4.7
7	4.3	4.4	5.1	6.6	5.2	4.8	2.1	4.2	0.4	3.6	2.6	5.7
8	2.3	5.7	2.8	5.9	5.0	3.1	3.8	4.7	1.8	5.6	0.3	3.4
9	1.2	4.3	4.9	6.4	4.8	3.4	2.8	3.5	2.1	4.6	1.5	5.4
10	3.5	5.3	4.9	7.2	5.3	5.1	0.6	5.2	2.7	4.1	3.6	4.8
11	4.1	5.0	5.1	6.5	4.2	6.3	2.0	5.3	4.5	3.2	1.8	5.2
12	3.2	0.9	5.1	7.3	6.6	5.6	4.9	4.5	4.5	2.2	3.9	3.5
13	0.4	2.9	5.4	7.8	6.2	5.1	2.6	2.2	1.4	3.2	3.3	5.0
14	2.9	2.7	5.4	6.7	4.3	5.3	5.5	5.3	1.5	3.1	2.9	3.8
15	3.2	1.5	6.2	5.6	6.6	3.2	4.5	4.4	1.7	4.6	4.1	2.9
16	4.8	3.5	6.7	5.6	6.2	5.9	4.9	4.6	2.0	2.8	2.8	6.5
17	5.5	4.2	7.2	7.6	5.3	5.2	2.6	5.3	0.0	3.9	4.3	6.6
18	6.5	4.4	6.7	5.6	6.4	7.1	3.8	4.3	3.1	3.4	4.4	5.0
19	4.0	5.4	5.9	5.4	4.8	6.0	2.5	2.9	1.0	1.1	2.9	4.1
20	3.8	5.5	5.9	4.3	4.9	5.0	2.6	3.7	4.6	3.2	2.9	5.4
21	2.9	4.7	6.3	2.1	5.8	4.8	2.5	2.5	5.7	1.7	4.0	5.0
22	5.4	4.4	6.7	4.0	5.7	6.1	2.3	4.6	3.9	1.2	3.8	4.5
23	5.8	5.1	6.5	6.4	4.4	5.7	2.2	4.9	4.7	3.6	3.0	3.9
24	5.2	3.9	7.0	2.0	6.5	3.5	0.6	5.4	5.0	4.2	5.0	5.5
25	4.2	5.0	6.1	2.0	4.4	5.3	3.5	5.9	2.2	4.7	4.9	5.4
26	4.9	5.6	6.1	4.1	5.2	5.2	4.4	5.2	4.3	4.2	4.8	5.5
27	5.2	6.0	6.5	3.5	5.3	0.9	2.9	6.3	4.9	5.0	4.3	6.1
28	5.9	4.5	5.9	3.8	2.9	4.8	2.1	1.2	4.7	3.0	5.0	2.4
29	5.6		6.9	2.2	4.9	3.2	2.7	3.6	5.2	4.2	4.4	5.9
30	4.4		6.5	4.7	6.1	1.2	3.8	4.8	N/A	5.1	6.3	2.3
31	4.9		7.2		1.9		3.7	3.3		4.2		4.1
Mo. Total	110.0	122.4	185.7	166.2	161.1	141.2	101.1	125.2	91.8	107.4	110.1	142.1

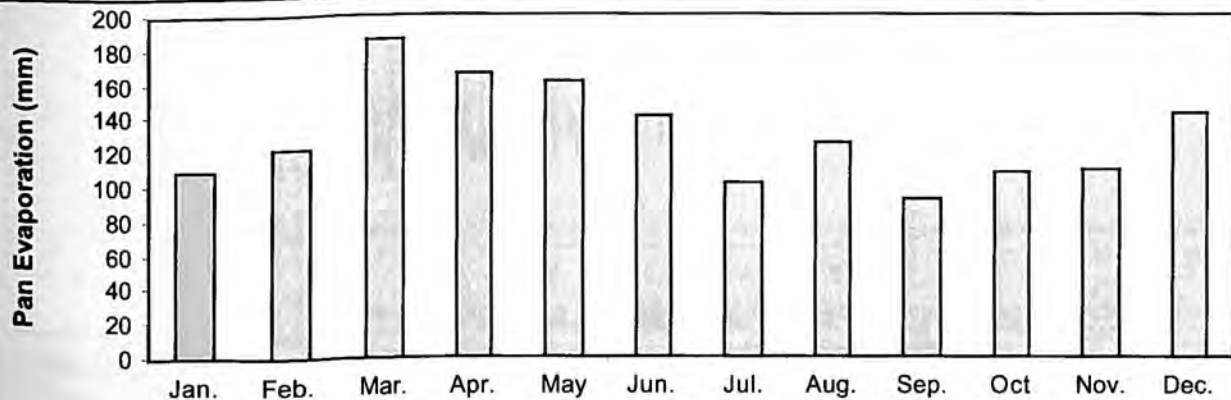
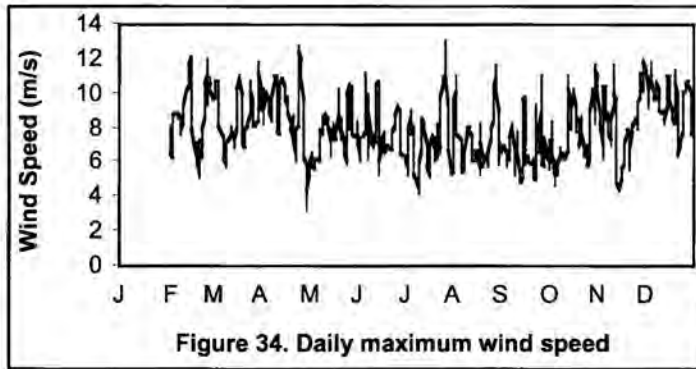
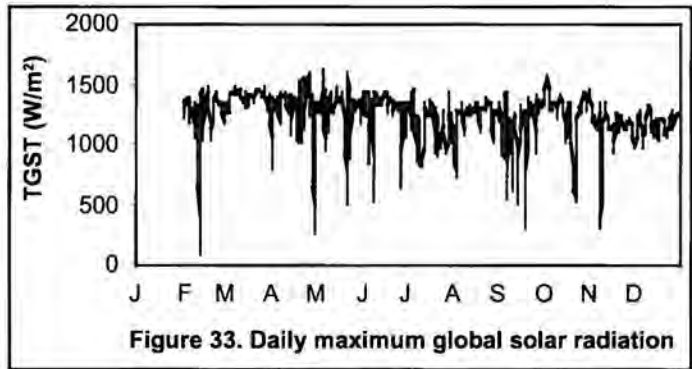
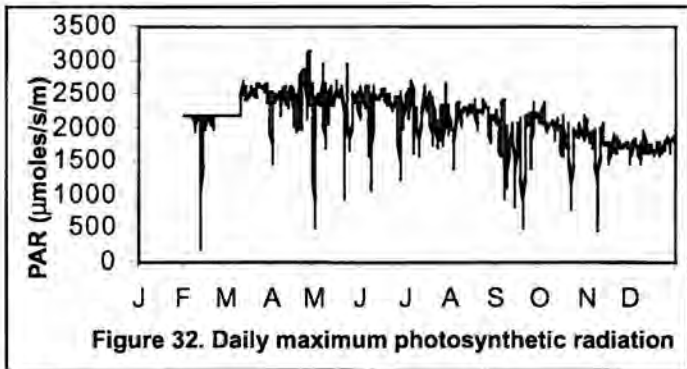
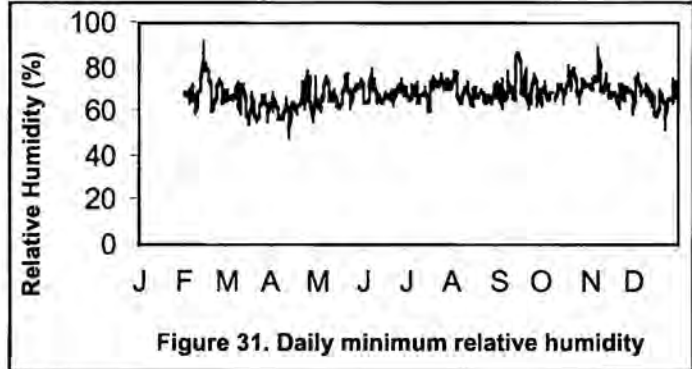
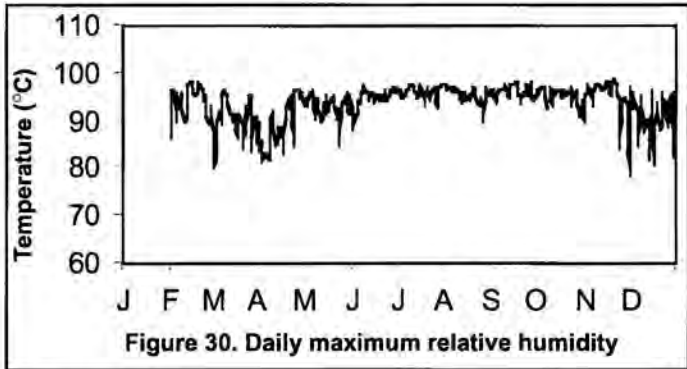
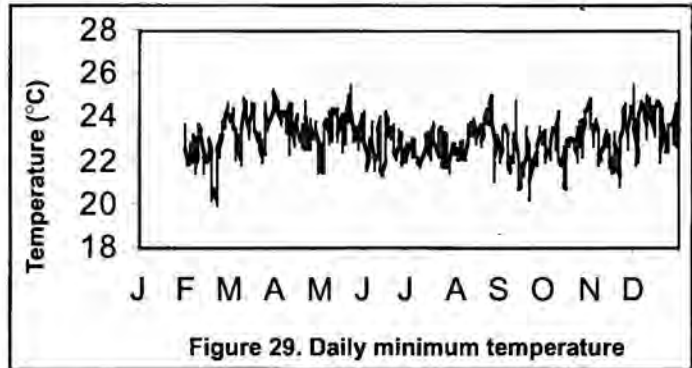
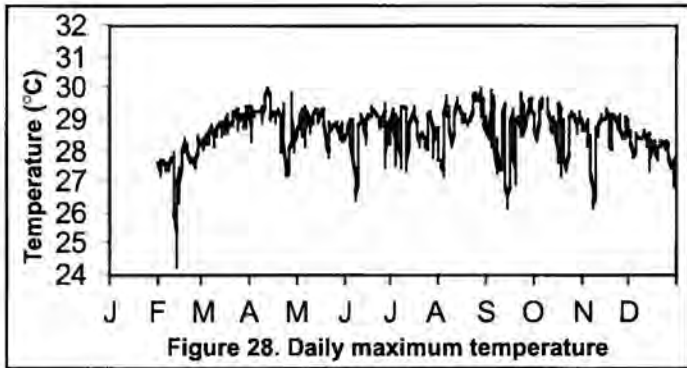


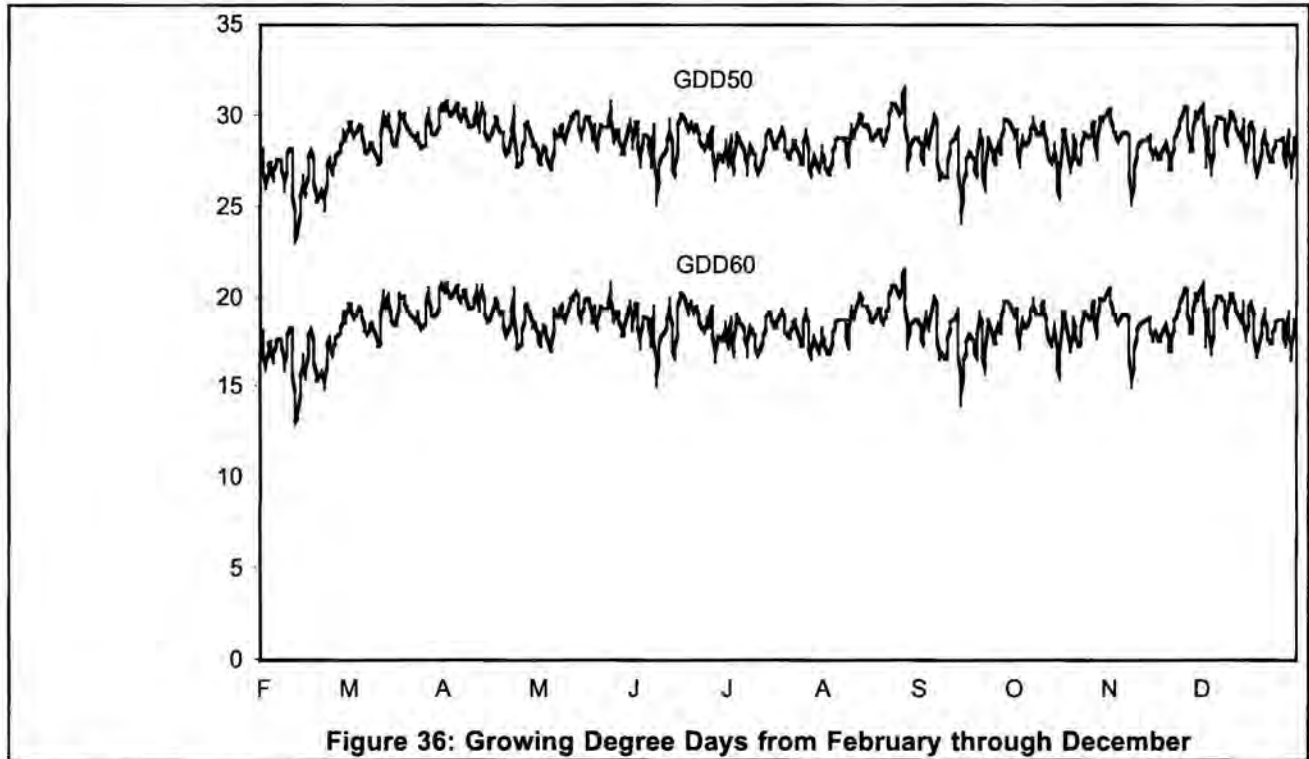
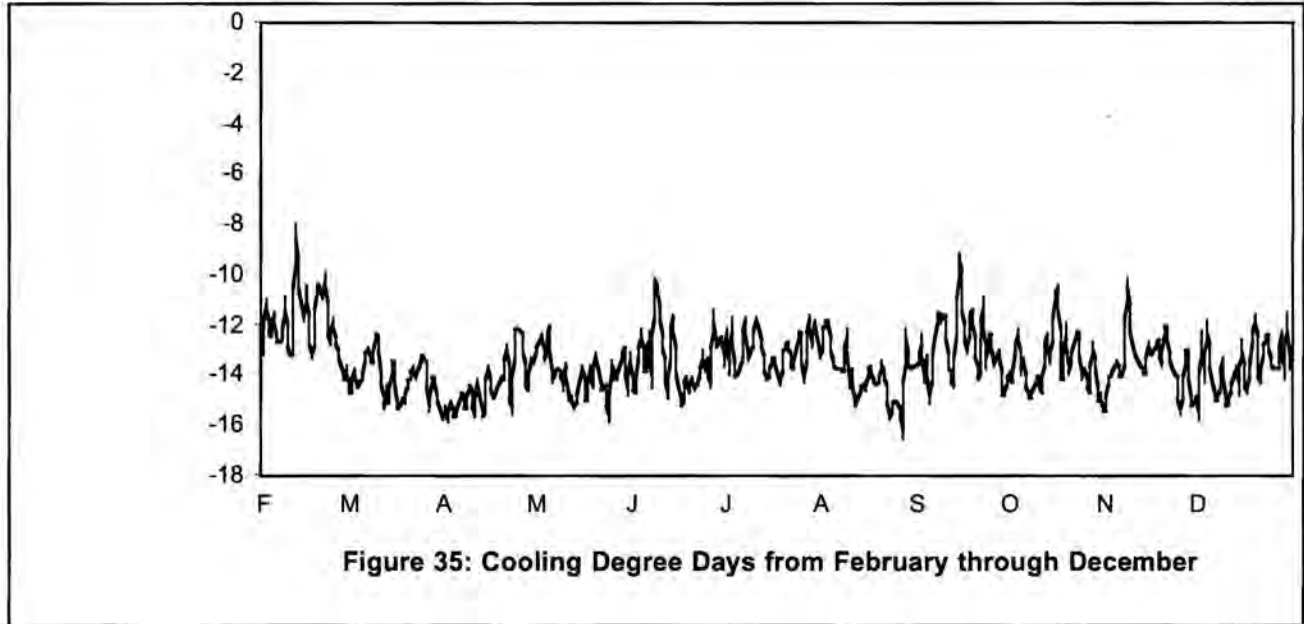
Figure 27: Monthly Total Pan Evaporation

Yigo Weather Station
Daily Maximum and Minimum Graphs for Specified Climatic Parameters
February through December



Yigo Weather Station

Degree Days Graphs with Tables



Degree Days	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cooling	334	437	432	434	403	405	431	387	422	405	424
Growing (50)	754	902	882	899	853	870	896	837	887	855	889
Growing (60)	474	592	582	589	553	560	586	537	577	555	579

APPENDIX

The following table lists missing data for the Inarajan and Yigo weather stations. There is no climatic data for early January due to typhoon Paka, which struck Guam in December of 1998. The minimum and maximum climatic data program was initiated as of February 1, 1999. Other missing data was caused by sensor malfunction.

Weather Station	Missing Data	Dates for Missing Data
Inarajan	All sensors ET gage Pan evaporation Daily maximum and minimum	Jan 1 — Jan 7 May 20 May 19 Jan 1 — Jan 31
Yigo	All sensors Wind direction ET gage Pan evaporation Daily maximum and minimum	Jan 1 — Jan 5 Dec 5 — Dec 31 Sep 30 — Oct 1 Sep 30 — Oct 1 Jan 1 — Jan 31



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