



# **CLIMATE IMPACT ASSESSMENT**

for  
**Philippine Agriculture  
(Rice and Corn)**



**Impact Assessment and Applications Section (IAAS)  
Climatology and Agrometeorology Division (CAD)**  
Philippine Atmospheric, Geophysical and Astronomical Services  
Administration (**PAGASA**)  
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# P R E F A C E

The Impact Assessment and Applications Section (IAAS) of Climatology and Agrometeorology Division (CAD) regularly issue this monthly/bulletin which will provide users such as food security managers, economic policy makers, agricultural statisticians and agricultural extension officials with qualitative information on the current and potential effects of climate and weather variability on rainfed crops, particularly rice and corn. This bulletin, entitled "Climate Impact Assessment for Agriculture in the Philippines", represents a method for converting meteorological data into economic information that can be used as supplement to information from other available sources.

For example, an agricultural statistician or economist involved in crop production and yield forecast problems can combine the assessment with analysis from area survey results, reports on the occurrence of pests and diseases, farmers' reports and other data sources.

The impact assessments are based on agroclimatic indices derived from historical rainfall data recorded for the period 1951 to the present. The indices, expressed in raw values percent of normals and percentile ranks, together with real time meteorological data (monthly rainfall, in percent of normal), percent of normal cumulative rainfall, as well as the occurrence of significant event such as typhoons, floods and droughts are the tools used in the assessment of crop performance. Crop reports from PAGASA field stations are also helpful.

The narrative impact assessment included in the bulletin depicts the regional performance of upland, 1st lowland and 2nd lowland palay; and dry and wet season corn crops, depending on the period or the season. Tabulated values of normal rainfall and generalized monsoon and yield moisture indices are provided for ready reference. Spatial analysis of rainfall, percent of normal rainfall and the generalized monsoon indices in percentile ranks are also presented on maps to help users visualize any unusual weather occurring during the period. The generalized monsoon indices in particular, are drought indicators; hence, the tables (see Appendices) together with the threshold values can be used in assessing drought impact, if there are any. It also helps assess any probable crop failure.

It is hoped therefore that this bulletin would help provide the decision-makers, planners and economist with timely and reliable early warning/information on climatic impact including the potential for subsistence food shortfalls, thereby enabling them to plan alternate cropping, if possible, food assistance strategies/mitigation measures to reduce the adverse impact of climate and eventually improve disaster preparedness.

Impact assessment for other principal crops such as sugarcane and coconut, for energy and for water resources management, are from time to time will be included in the forthcoming issues of this bulletin.

The IAAS of CAD will appreciate suggestions/comments from end-users and interested parties for the improvement of this bulletin.

## Definition of Terms

The Generalized Monsoon Index (GMI) helps determine the performance of the rains during the season and serves as a good indicator of potential irrigation supplies. It is a tool used to assess rainfed crops.

The GMI for the southwest monsoon (GMIs<sub>w</sub>) in an area during June to September is defined as follows:

$$GMIs_w = W_6P_6 + W_7P_7 + W_8P_8 + W_9P_9$$

The GMI for the northeast monsoon (GMIs<sub>e</sub>) in an area during October to January is defined as:

$$GMIs_e = W_{10}P_{10} + W_{11}P_{11} + W_{12}P_{12} + W_1P_1$$

where:

W = weight coefficient of monthly rainfall for the season;

P = rainfall amount in the *i*<sup>th</sup> month  
(i = 1 for January, 2 = for February, etc.)

The Yield Moisture Index (YMI) is a simple index that helps the users assess agroclimatic crop conditions during the crop season. The YMI for a particular crop is defined as follows:

$$YMI = \sum_{i=1}^n [P_i K_i]$$

where:

i = crop stage (1 = planting/transplanting, 2 = vegetative, 3 = flowering, 4 = maturity, etc.)

n = total no. of crop stages;

P = rainfall during the *i*<sup>th</sup> crop stage; and

K = appropriate crop coefficient for the *i*<sup>th</sup> crop stage.

Tentatively, the threshold values of categories of indices for interpretation being adopted for both YMI and GMI are as follows:

Percentile Rank	Interpretation
> 80	Potential for flood damage
41 - 80	Near normal to above-normal crop condition
21 - 40	Moderate drought impact with reduced yield
11 - 20	Drought impact with major yield losses
< 10	Severe drought impact with crop failure and potential food shortages

# AGROCLIMATIC / CROP ASSESSMENT FOR DECEMBER 2020

## OVERVIEW

Land preparation, planting and transplanting activities for December-planted lowland 2nd palay as well as dry season corn has started in Baguio, Batanes, Nueva Ecija, Romblon, Coron, Bohol, and Cagayan de Oro owing to the sufficient rainfall received during the month. Planting activities are hampered by inadequate rainfall in most parts of Ilocos Region, Zambales, Zamboanga del Sur, Davao Region, SOCCSKSARGEN and ARMM. Meanwhile, excess rainfall (most of which are brought about by Tropical Cyclone passage and the effect of Low Pressure Areas) has potentially damaged November-planted crops and hindered planting activities in Ilocos Region, Aparri, Tuguegarao, Aurora, most parts of Quezon Province, Calapan, most of Bicol Region, Puerto Princesa, San Jose, Masbate, Eastern Visayas, Negros Oriental, Cebu, Panay Island, Bukidnon, Zamboanga del Norte, Davao Region, and CARAGA.

The weather systems that affected the country during the month were the Northeast Monsoon (NE), low pressure areas (LPAs), localized thunderstorms, enhanced easterlies, tail-end of frontal system (shearline) and the passage of Tropical Storm (TS) "Vicky". TS "Vicky" crossed the Philippine landmass and brought moderate to heavy rains which caused flooding, landslides and other secondary damages over Region IV-B, V, VI, VII, VIII, IX, X, XII and CARAGA, as contained in the National Disaster Risk Reduction and Management Council (NDRRMC) situational reports.

### ***REGION I (Ilocos Region)***

Land preparation, planting and transplanting activities for lowland 2<sup>nd</sup> palay and dry season corn across the region during the month may be hampered due to minimal rainfall. For the same reason, the November-planted 2<sup>nd</sup> palay have likely suffered from moisture stress due to insufficient rainfall.

### ***CAR (Cordillera Autonomous Region)***

Land preparation, planting and transplanting activities for lowland 2<sup>nd</sup> palay and dry season corn is possible in Baguio due to sufficient rainfall. For the same reason, the November-planted 2<sup>nd</sup> palay and dry season corn are faring well.

### ***REGION II (Cagayan Valley)***

Persistent flooding due to heavy rains and dam water release hinders planting activities in Cagayan, particularly in Aparri and Tuguegarao. Meanwhile in Batanes, planting activities for 2<sup>nd</sup> palay and dry season corn were favored by adequate rainfall.

### ***REGION III (Central Luzon)***

In Zambales, November-planted 2<sup>nd</sup> palay and dry season corn have likely suffered from moisture stress due to insufficient rainfall. In contrast, the same crops in Aurora were most likely damaged by waterlogging due to excess rainfall. Meanwhile, in Nueva Ecija, rainfall is sufficient for land preparation, planting and transplanting activities for lowland 2<sup>nd</sup> palay and is adequate for the November-planted 2<sup>nd</sup> palay and dry season corn to remain in good condition.

### ***REGION IV-A (CALABARZON)***

In most parts of Quezon Province, the November-planted 2<sup>nd</sup> palay and dry season corn were most likely damaged by waterlogging due to excess rainfall. This also probably hindered further planting activities for 2<sup>nd</sup> palay and dry season corn during the month. Meanwhile, in Ambulong, the same crops remain in good condition due to sufficient rainfall.

**REGION IV-B (MIMAROPA)**

In Calapan, Oriental Mindoro and Puerto Princesa, Palawan, November-planted 2<sup>nd</sup> palay and dry season corn may have been damaged by waterlogging due to excess rainfall. In contrast, the same crops are possibly affected by waterlogging in San Jose, Occidental Mindoro. Meanwhile, planting activities related to the same crops may have just started in Romblon and Coron, Palawan, owing to sufficient rainfall.

**REGION V (Bicol Region)**

Most of Bicol Region received excess rainfall during the month which continued to hinder planting activities for 2<sup>nd</sup> palay and dry season corn. The same crops planted on November in Masbate may have been damaged by waterlogging due to above normal rainfall.

**REGION VI (Western Visayas)**

Above normal rainfall may have damaged the November-planted 2<sup>nd</sup> palay and dry season corn in Panay Island. For the same reason, planting activities for both crops may not be possible during the month.

**REGION VII (Central Visayas)**

In Negros Oriental and Cebu, crops may have suffered from waterlogging due to excess rainfall. Meanwhile in Daus, Bohol, crops remain in good condition owing to sufficient rainfall. This also makes it possible to continue with planting activities for 2<sup>nd</sup> palay and dry season corn.

**REGION VIII (Eastern Visayas)**

The entire Eastern Visayas received excess rainfall, potentially damaging the November-planted 2<sup>nd</sup> palay and dry season corn and preventing further planting activities during the month.

**REGION IX (Zamboanga Peninsula)**

Rainfall received in Zamboanga del Sur remains insufficient, thus further hindering the planting of 2<sup>nd</sup> palay and dry season corn. In contrast, Zamboanga del Norte received excess rainfall during the month which damaged November-planted crops and prevented planting activities.

**REGION X (Northern Mindanao)**

Land preparation, planting and transplanting activities for lowland 2<sup>nd</sup> palay and dry season corn in Misamis Oriental are ongoing owing to the sufficient rainfall received by the area during the month. However, in Bukidnon, November-planted dry season corn may have been damage by waterlogging due to excess rainfall.

**REGION XI (Davao Region)**

The excess rainfall received by the Davao Region due to the passage of TS Vicky further hinders the planting activities for 2<sup>nd</sup> palay and dry season corn.

**REGION XII (SOCCSKSARGEN)**

Rainfall received in the region remains insufficient, thus further hindering the planting activities for 2<sup>nd</sup> palay and dry season corn.

**REGION XIII (CARAGA Region)**

The excess rainfall received by CARAGA due to the passage of TS Vicky most likely damaged the November-planted 2<sup>nd</sup> palay and dry season corn and hindered further planting activities.

**ARMM****(Autonomous Region of Muslim Mindanao)**

Rainfall received in the region is insufficient which hinders the planting activities for 2<sup>nd</sup> palay and dry season corn.

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**Table 1.0 GENERALIZED NORTHEAST MONSOON INDICES**  
In Millimeters and Percentile Rank (October 2020 to January 2021)

STATIONS	OCTOBER		NOVEMBER		DECEMBER		JANUARY	
	GMI	%RANK	GMI	%RANK	GMI	%RANK	GMI	%RANK
<b>CAR (Cordillera Autonomous Reg.)</b>								
Baguio	195	59	235	59	243	61		
<b>Region I (Ilocos Reg.)</b>								
Dagupan	137	63	157	61	158	61		
Sinait	65	59	69	56	70	56		
Laoag	31	37	36	32	36	32		
<b>Region II (Cagayan Valley)</b>								
Aparri	164	88	318	90	426	95		
Basco	100	51	150	44	204	46		
Tuguegarao	168	80	300	88	363	93		
<b>Region III (Central Luzon)</b>								
Iba	379	93	404	93	406	93		
Munoz	206	93	238	93	259	93		
Baler	226	93	343	85	516	93		
Casiguran	231	93	442	90	731	90		
<b>Region IV-A (CALABARZON)</b>								
Ambulong	226	90	328	93	367	93		
Infanta	199	80	380	68	514	71		
Tayabas	369	98	560	95	645	98		
<b>Region IV-B (MIMAROPA)</b>								
Calapan	332	98	402	90	504	93		
Coron	0	2	37	12	48	12		
Cuyo	415	95	430	95	458	95		
Puerto Princesa	77	63	105	41	141	56		
Romblon	232	95	305	88	332	88		
San Jose	351	93	371	93	404	93		
<b>Region V (Bicol Reg.)</b>								
Daet	210	98	412	93	625	85		
Legaspi	175	98	309	93	515	90		
Masbate	110	93	156	78	229	73		
Virac Synop	198	90	318	80	506	85		
<b>Region VI (Western Visayas)</b>								
Roxas	203	98	247	80	314	85		
<b>Region VII (Central Visayas)</b>								
Mactan	91	80	110	56	168	71		
Dumaguete	54	61	81	54	159	80		
Dauis	71	80	104	54	144	63		
<b>Region VIII (Eastern Visayas)</b>								
Catarman	132	98	292	90	466	76		
Catbalogan	180	95	247	93	402	90		
Tacloban	47	61	115	51	218	37		
<b>Region IX (Western Mindanao)</b>								
Dipolog	111	83	214	63	347	78		
Zamboanga	103	71	133	73	149	78		
<b>Region X (Northern Mindanao)</b>								
El Salvador	109	98	122	85	160	83		
Malaybalay	115	51	160	46	208	71		
<b>Region XI (Davao Reg.)</b>								
Davao	90	83	111	76	186	90		
<b>Region XII (SOCSARGEN)</b>								
General Santos	28	54	44	46	62	59		
<b>Region XIII (CARAGA)</b>								
Surigao	52	90	137	51	304	71		
Hinatuan	30	41	148	66	377	85		
<b>ARMM (Autonomous reg. of Muslim Mindanao)</b>								
Cotabato	74	39	113	34	133	39		

**Table 2.0 CUMULATIVE YIELD MOISTURE INDICES FOR  
LOWLAND 2<sup>ND</sup> PALAY in Millimeters and Percentile Rank.  
(November 2020 to February 2021)**

STATIONS	NOVEMBER		DECEMBER		JANUARY		FEBRUARY	
	YMI	%RANK	YMI	%RANK	YMI	%RANK	YMI	%RANK
<b>CAR (Cordillera Autonomous Reg.)</b>								
Baguio	141	85	291	95				
<b>Region I (Ilocos Reg.)</b>								
Dagupan	69	124	85	68				
Laoag	19	141	21	56				
Sinit	16	141	18	61				
<b>Region III (Central Luzon)</b>								
Iba	89	120	110	80				
Munoz	112	117	264	93				
Casiguran	748	12	1693	83				
<b>Region IV-A (CALABARZON)</b>								
Ambulong	361	73	503	98				
Tayabas	677	41	1351	85				
Infanta	642	12	1387	66				
Alabat	719	15	1404	78				
<b>Region IV-B (MIMAROPA)</b>								
Calapan	250	46	583	68				
Coron	72	122	186	61				
Cuyo	53	71	165	59				
<b>Region V (Bicol Reg.)</b>								
Daet	716	49	1391	83				
Legaspi	474	5	1104	68				
Virac	425	7	1063	83				
<b>Region VIII (Eastern Visayas)</b>								
Catarman	569	10	1118	59				
Catbalogan	237	5	781	76				
<b>Region XIII (CARAGA)</b>								
Hinatuan	417	22	1142	83				
Surigao	301	27	1020	68				

**Table 3.0 CUMULATIVE YIELD MOISTURE INDICES FOR DRY SEASON CORN in Millimeters and Percentile Rank. (November 2020 to January 2021)**

STATIONS	NOVEMBER		DECEMBER		JANUARY	
	YMI	%RANK	YMI	%RANK	YMI	%RANK
<b>Region II (Cagayan Valley)</b>						
Tuguegarao	357	93	774	98		
<b>Region IV-A (CALABARZON)</b>						
Tayabas	518	85	1263	83		
<b>Region IV-B (MIMAROPA)</b>						
Calapan	112	34	294	37		
Romblon	198	71	399	51		
Puerto Princesa	77	37	332	66		
<b>Region V (Bicol Region)</b>						
Masbate	126	54	400	51		
<b>Region VI (Western Visayas)</b>						
Roxas	120	39	439	59		
<b>Region VII (Central Visayas)</b>						
Mactan	51	32	327	80		
Dumaguete	72	41	400	88		
<b>Region IX (Western Mindanao)</b>						
Zamboanga	80	54	176	71		
<b>Region X (Northern Mindanao)</b>						
El Salvador	34	29	214	63		
Malaybalay	121	61	400	85		

**TABLE 4.0 CUMULATIVE YIELD MOISTURE INDICES FOR  
LOW LAND PALAY in Millimeters and Percentile Rank.  
(December 2020 to March 2021)**

STATIONS	DECEMBER		JANUARY		FEBRUARY		MARCH	
	YMI	%RANK	YMI	%RANK	YMI	%RANK	YMI	%RANK
<b>CAR (Cordillera Autonomous Reg.)</b>								
Baguio	134	95						
<b>Region I (Ilocos Reg.)</b>								
Dagupan	14	66						
Sinait	2	51						
Laoag	2	51						
<b>Region II (Cagayan Valley)</b>								
Aparri	486	95						
Basco	198	73						
Tuguegarao	338	93						
<b>Region III (Central Luzon)</b>								
Iba	19	66						
Munoz	136	93						
Baler	670	88						
Casiguran	846	78						
<b>Region IV-A (CALABARZON)</b>								
Ambulong	127	68						
Infanta	667	66						
Tayabas	603	83						
Alabat	613	68						
<b>Region IV-B (MIMAROPA)</b>								
Calapan	298	76						
Coron	101	68						
Cuyo	100	71						
Puerto Princesa	206	78						
Romblon	163	46						
San Jose	37	56						
<b>Region V (Bicol Reg.)</b>								
Daet	605	68						
Legaspi	564	71						
Masbate	222	51						
Virac	571	83						
<b>Region VI (Western Visayas)</b>								
Roxas	258	80						
<b>Region VII (Central Visayas)</b>								
Dumaguete	265	93						
Mactan, Cebu	153	63						
Dausi	223	88						
<b>Region VIII (Eastern Visayas)</b>								
Catarman	492	49						
Catbalogan	487	88						
Tacloban	291	39						
<b>Region IX (Western Mindanao)</b>								
Dipolog	453	90						
Zamboanga	78	71						
<b>Region X (Northern Mindanao)</b>								
El Salvador	153	80						
Malaybalay	226	85						
<b>Region XI (Davao Reg.)</b>								
Davao	211	85						
<b>Region XII (SOCSARGEN)</b>								
General Santos	78	78						
<b>Region XIII (CARAGA)</b>								
Surigao	644	83						
Hinatuan	649	80						
Butuan	297	83						
<b>ARMM (Autonomous reg. of Muslim Mindanao)</b>								
Cotabato	91	61						

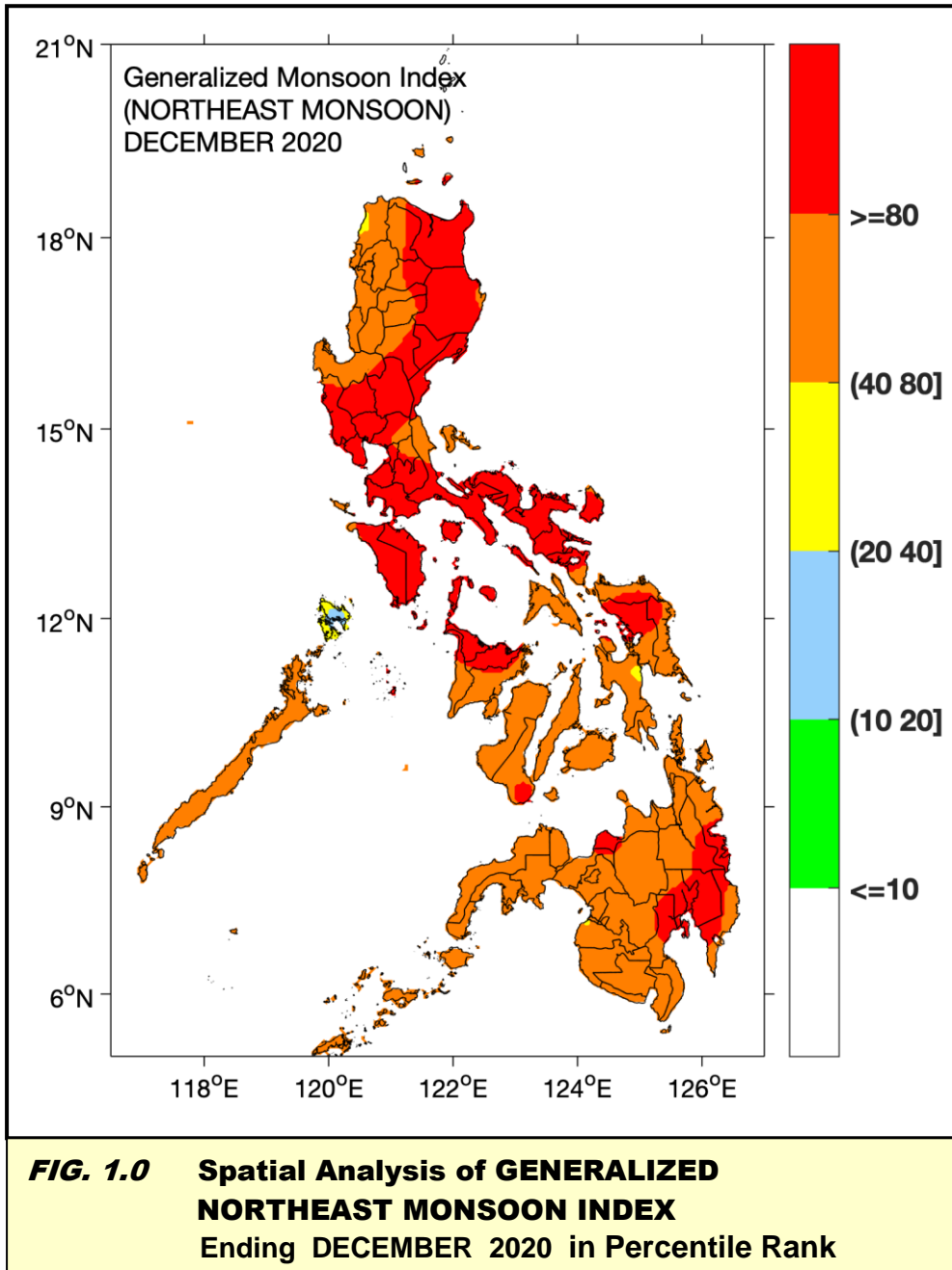


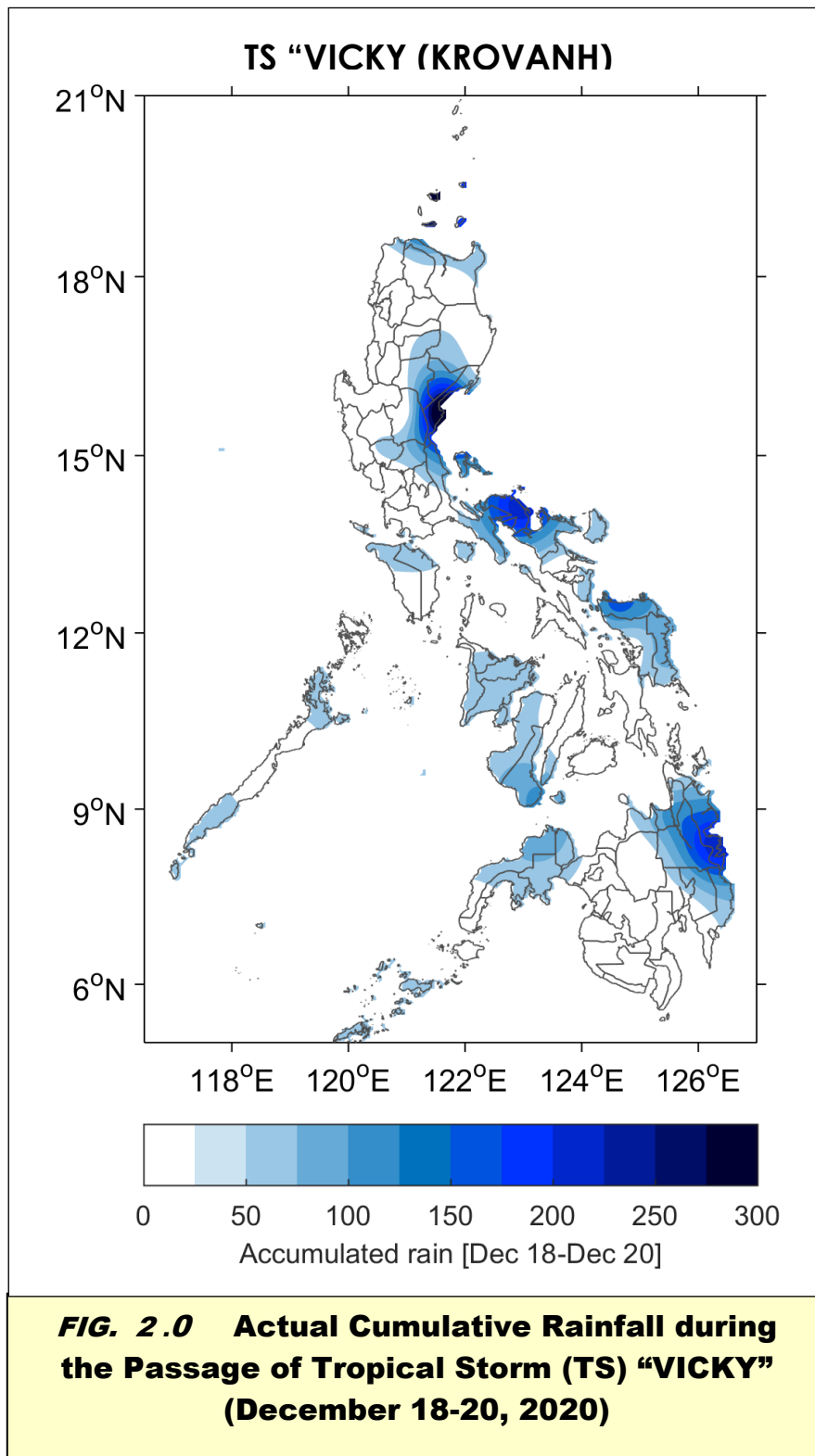
**TABLE 5.0 CUMULATIVE YIELD MOISTURE INDICES FOR DRY SEASON CORN in Millimeters and Percentile Rank. (December 2020 to February 2021)**

STATIONS	DECEMBER		JANUARY		FEBRUARY	
	YMI	%RANK	YMI	%RANK	YMI	%RANK
<b>CAR (Cordillera Autonomous Reg.)</b>						
Baguio	102	95				
<b>Region I (Ilocos Reg.)</b>						
Dagupan	11	66				
Sinait	1	51				
Laoag	2	51				
<b>Region II (Cagayan Valley)</b>						
Aparri	372	95				
Basco	151	73				
Tuguegarao	258	93				
<b>Region III (Central Luzon)</b>						
Iba	14	66				
Munoz	104	93				
Baler	512	88				
Casiguran	647	78				
<b>Region IV-A (CALABARZON)</b>						
Ambulong	97	66				
Infanta	510	66				
Tayabas	461	83				
Alabat	469	71				
<b>Region IV-B (MIMAROPA)</b>						
Calapan	228	76				
Coron	78	71				
Cuyo	77	71				
Puerto Princesa	158	76				
Romblon	125	46				
San Jose	29	56				
<b>Region V (Bicol Reg.)</b>						
Daet	462	68				
Legaspi	431	71				
Masbate	170	51				
Virac	436	83				
<b>Region VI (Western Visayas)</b>						
Roxas	197	80				
<b>Region VII (Central Visayas)</b>						
Dumaguete	171	88				
Mactan, Cebu	203	93				
Dauis	117	63				
<b>Region VIII (Eastern Visayas)</b>						
Catarman	376	49				
Catbalogan	372	88				
Tacloban	223	39				
<b>Region IX (Western Mindanao)</b>						
Dipolog	347	90				
Zamboanga	59	71				
<b>Region X (Northern Mindanao)</b>						
El Salvador	111	80				
Malaybalay	172	85				
<b>Region XI (Davao Reg.)</b>						
Davao	161	88				
<b>Region XII (SOCSARGEN)</b>						
General Santos	60	78				
<b>Region XIII (CARAGA)</b>						
Surigao	492	83				
Hinatuan	496	80				
Butuan	227	83				
<b>ARMM (Autonomous reg. of Muslim Mindanao)</b>						
Cotabato	70	61				

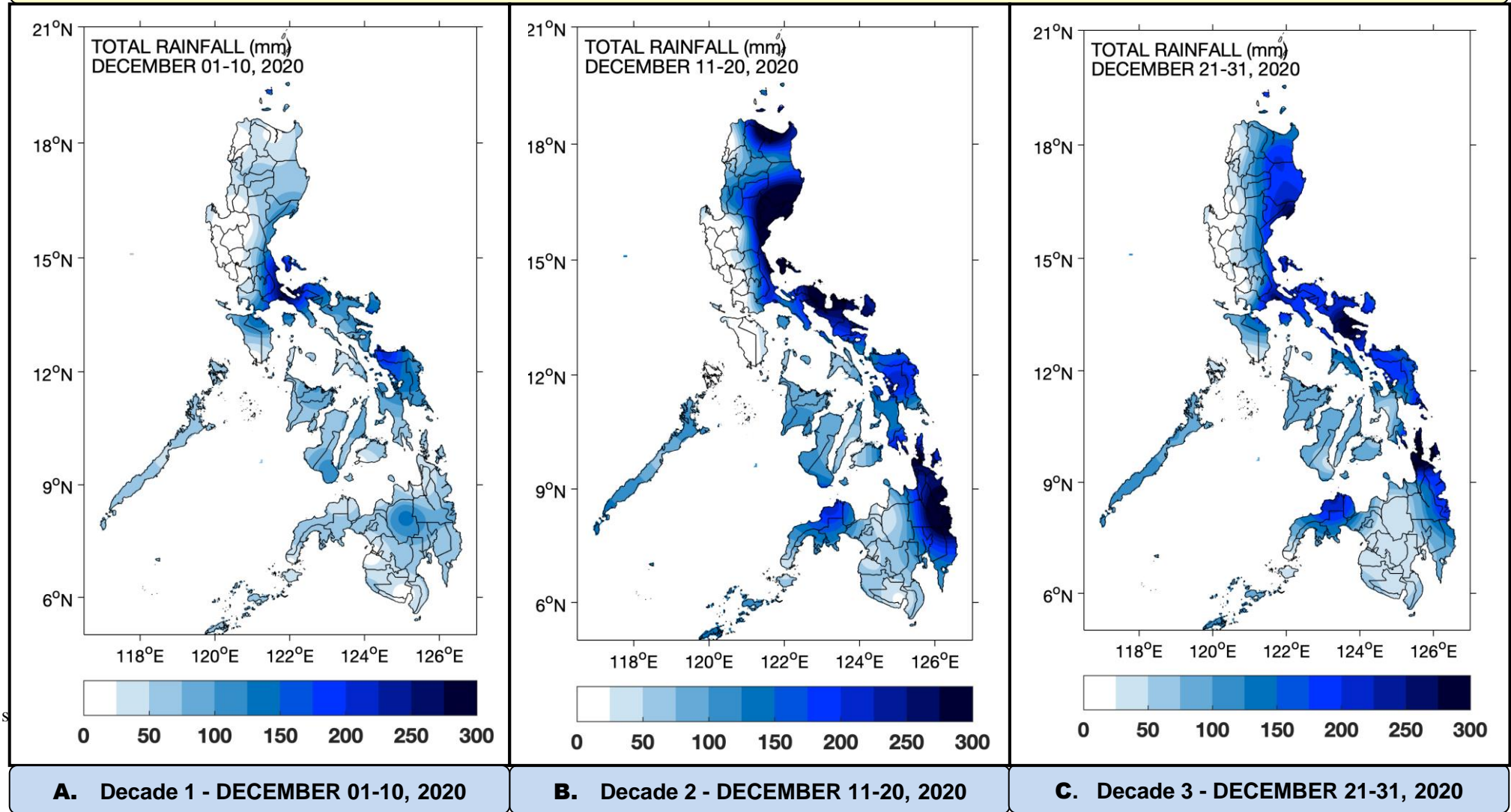
**TABLE 6.0 DECADAL AND CUMULATIVE DECADAL RAINFALL**  
**For the month of DECEMBER 2020**  
**[actual values (in mm) and percent of normal]**

	<i>REGION</i>	<i>DECADE</i>	<i>ACTUAL DEC.</i>	<i>% Normal of Actual</i>	<i>CUMULATIVE JAN- DEC.</i>	<i>% Normal Cumulative</i>
<b>R01</b>	Ilocos Region	34	6.3	102	1609.5	62
		35	52.3	615	1661.8	63
		36	19.5	248	1681.3	64
<b>CAR</b>	CAR	34	21.3	81	1806.5	74
		35	152.8	511	1959.3	79
		36	88.9	339	2048.2	82
<b>R02</b>	Cagayan Valley	34	61.9	79	2555.3	104
		35	322.4	357	2877.7	113
		36	187.1	251	3064.8	117
<b>R03</b>	Central Luzon	34	36.6	94	2272.9	89
		35	125.8	211	2398.7	91
		36	77.0	201	2475.7	93
<b>R04-A</b>	CALABARZON	34	168.5	119	2911.6	111
		35	167.4	140	3079.0	112
		36	155.6	122	3234.6	113
<b>R04-B</b>	MIMAROPA	34	59.4	146	1822.7	97
		35	31.3	91	1854.0	97
		36	71.2	214	1925.3	99
<b>NCR</b>	NCR	34	62.8	200	2086.5	90
		35	63.9	186	2150.4	91
		36	70.5	187	2220.9	93
<b>R05</b>	Bicol Region	34	125.3	68	2839.3	106
		35	235.9	158	3075.1	109
		36	218.2	135	3293.3	110
<b>R06</b>	Western Visayas	34	88.5	180	2084.5	110
		35	87.3	259	2171.8	112
		36	72.7	193	2244.5	114
<b>R07</b>	Central Visayas	34	83.4	186	1650.0	114
		35	102.6	261	1752.6	118
		36	85.3	188	1837.8	120
<b>R08</b>	Eastern Visayas	34	138.1	107	2833.5	116
		35	186.8	157	3020.3	117
		36	152.9	119	3173.2	118
<b>R09</b>	Zamboanga Peninsula	34	36.5	81	1778.5	100
		35	138.6	284	1917.2	105
		36	126.3	236	2043.5	109
<b>R10</b>	Northern Mindanao	34	75.7	186	1977.5	98
		35	98.3	212	2075.8	100
		36	77.8	160	2153.6	101
<b>R11</b>	Davao Region	34	73.0	142	1928.2	97
		35	164.0	263	2092.2	102
		36	67.8	112	2160.0	102
<b>R12</b>	SOCCSKSARGEN	34	25.7	132	1184.1	83
		35	46.0	206	1230.2	85
		36	33.4	120	1263.6	86
	CARAGA	34	69.5	68	2806.8	101
		35	283.4	219	3090.2	106
		36	180.3	147	3270.5	108
	ARMM	34	25.4	131	1390.4	90
		35	44.3	181	1434.7	91
		36	33.6	130	1468.2	92

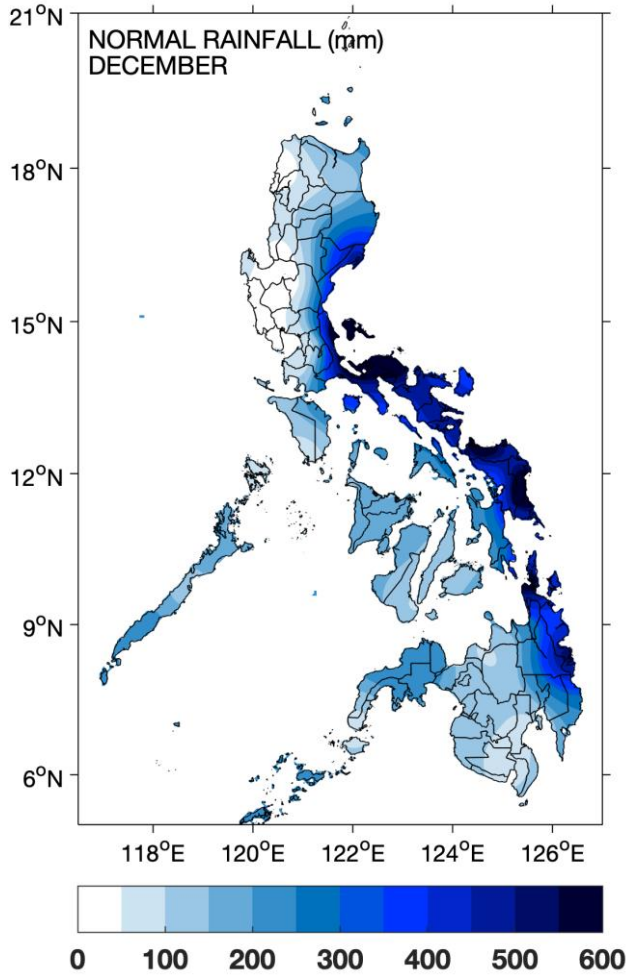




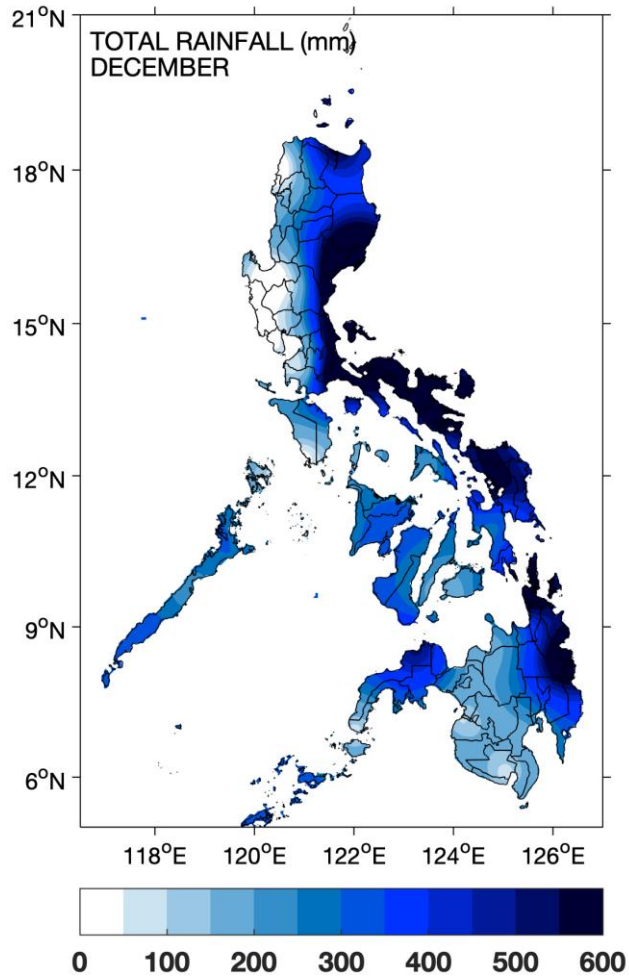
**FIG 3.0 TEN DAYS ACTUAL RAINFALL DISTRIBUTION IN THE PHILIPPINES for the month of DECEMBER 2020**



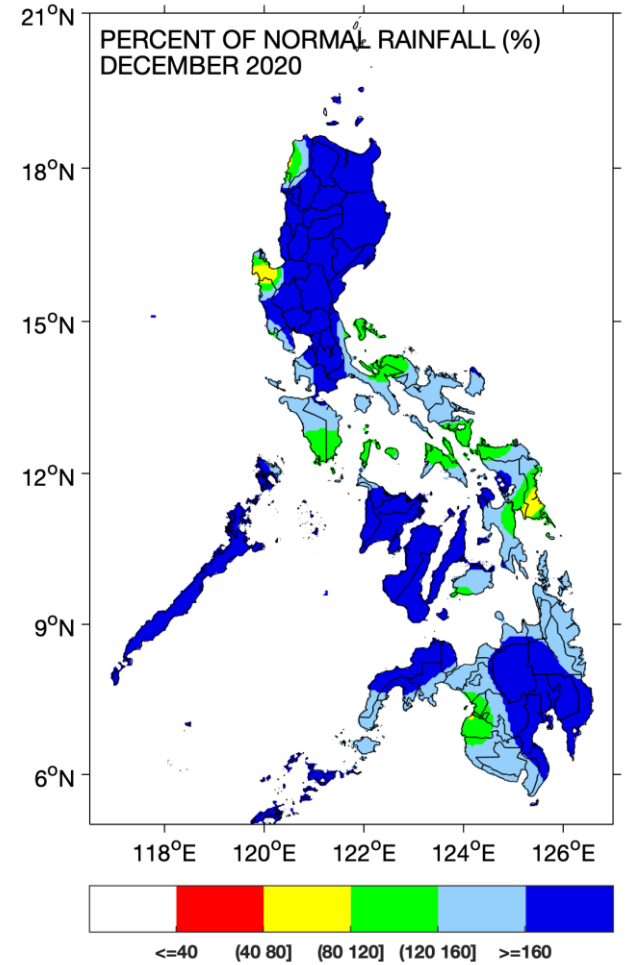
**FIG. 4.0 RAINFALL IN THE PHILIPPINES for the month of DECEMBER 2020**



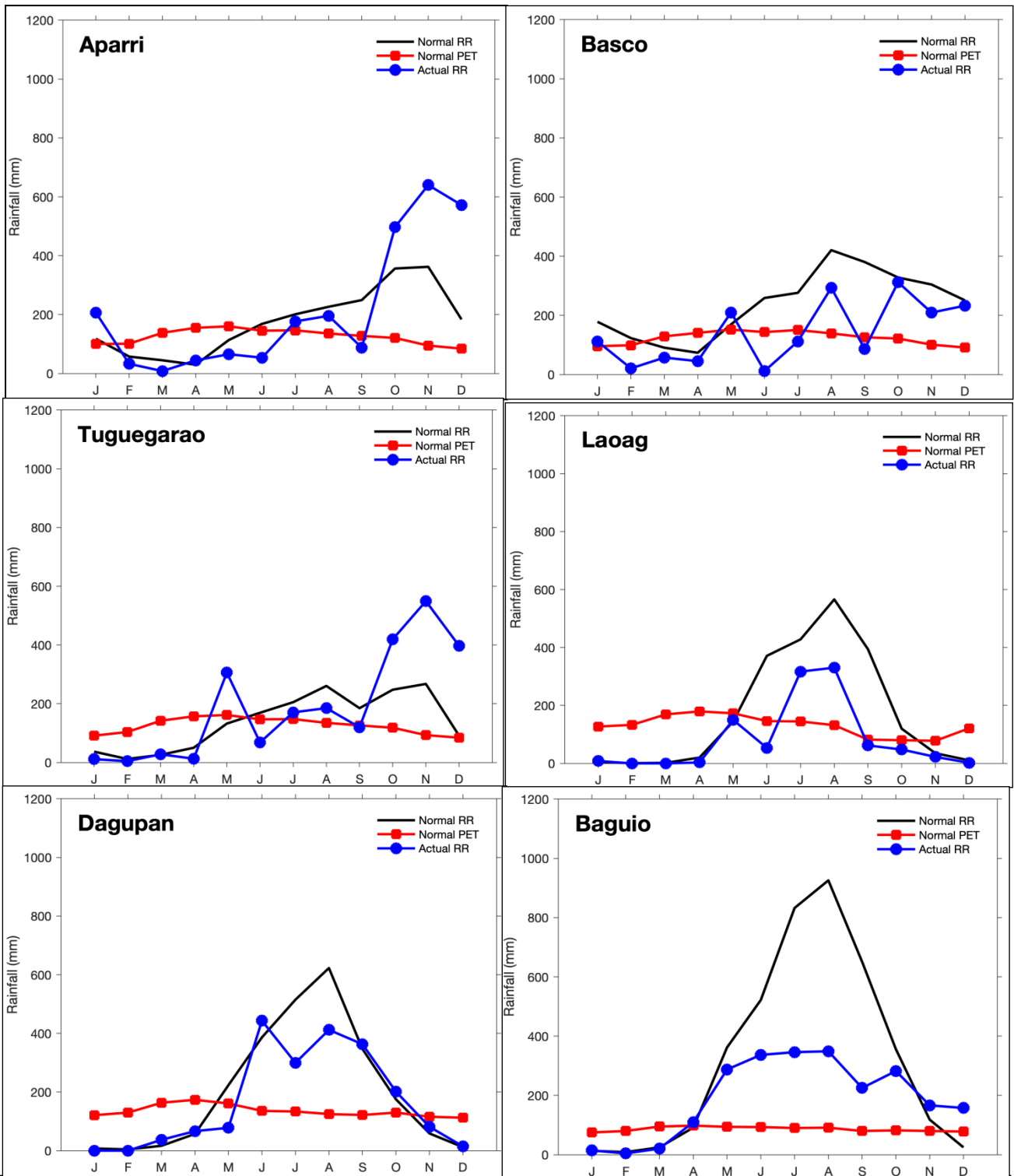
**A. Normal Rainfall (mm)**



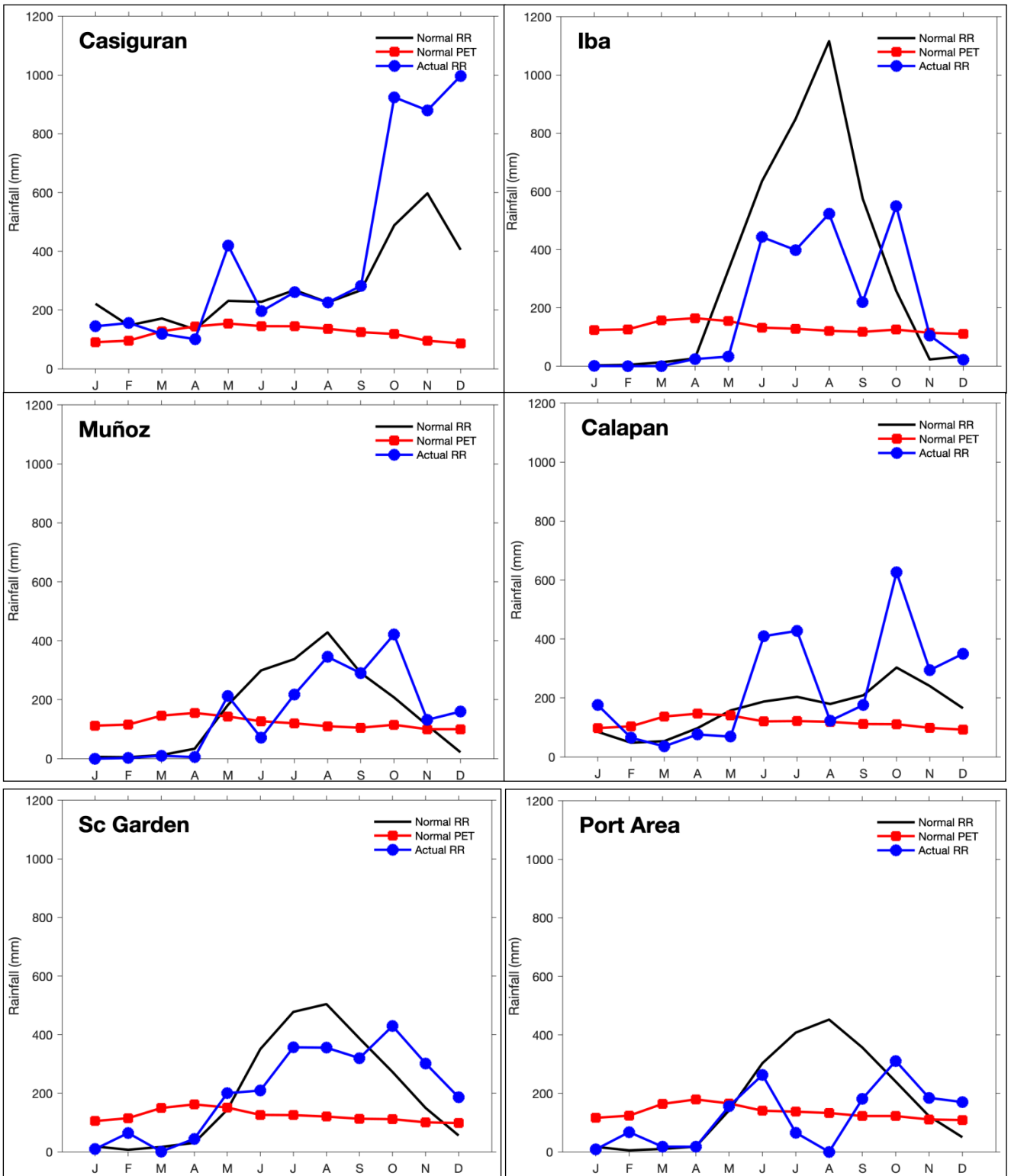
**B. Actual Rainfall (mm)**



**C. Percent of Normal Rainfall ( % )**

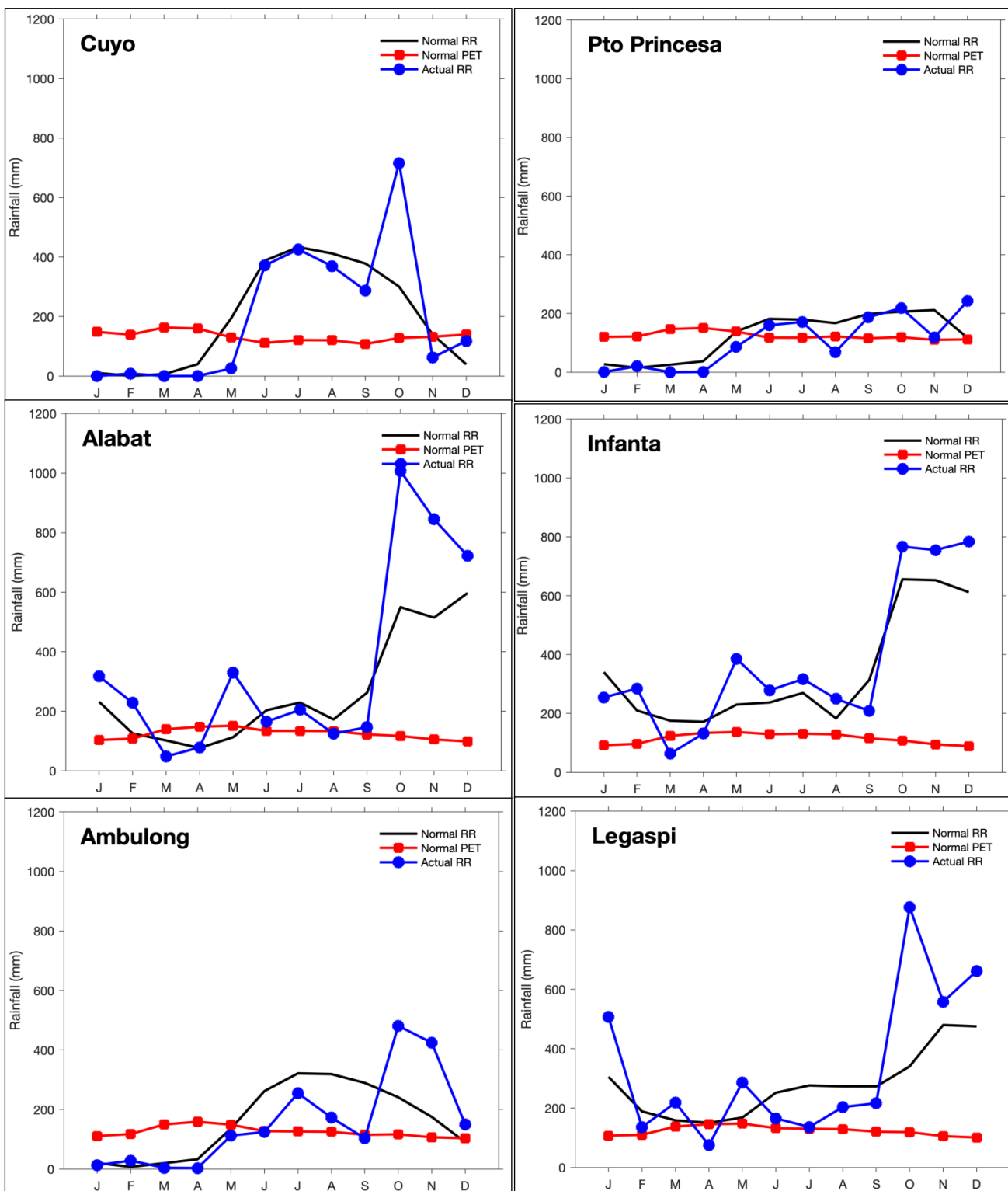


**Fig. 5.a Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Aparri, Basco, Tuguegarao, Laoag, Dagupan, and Baguio.**

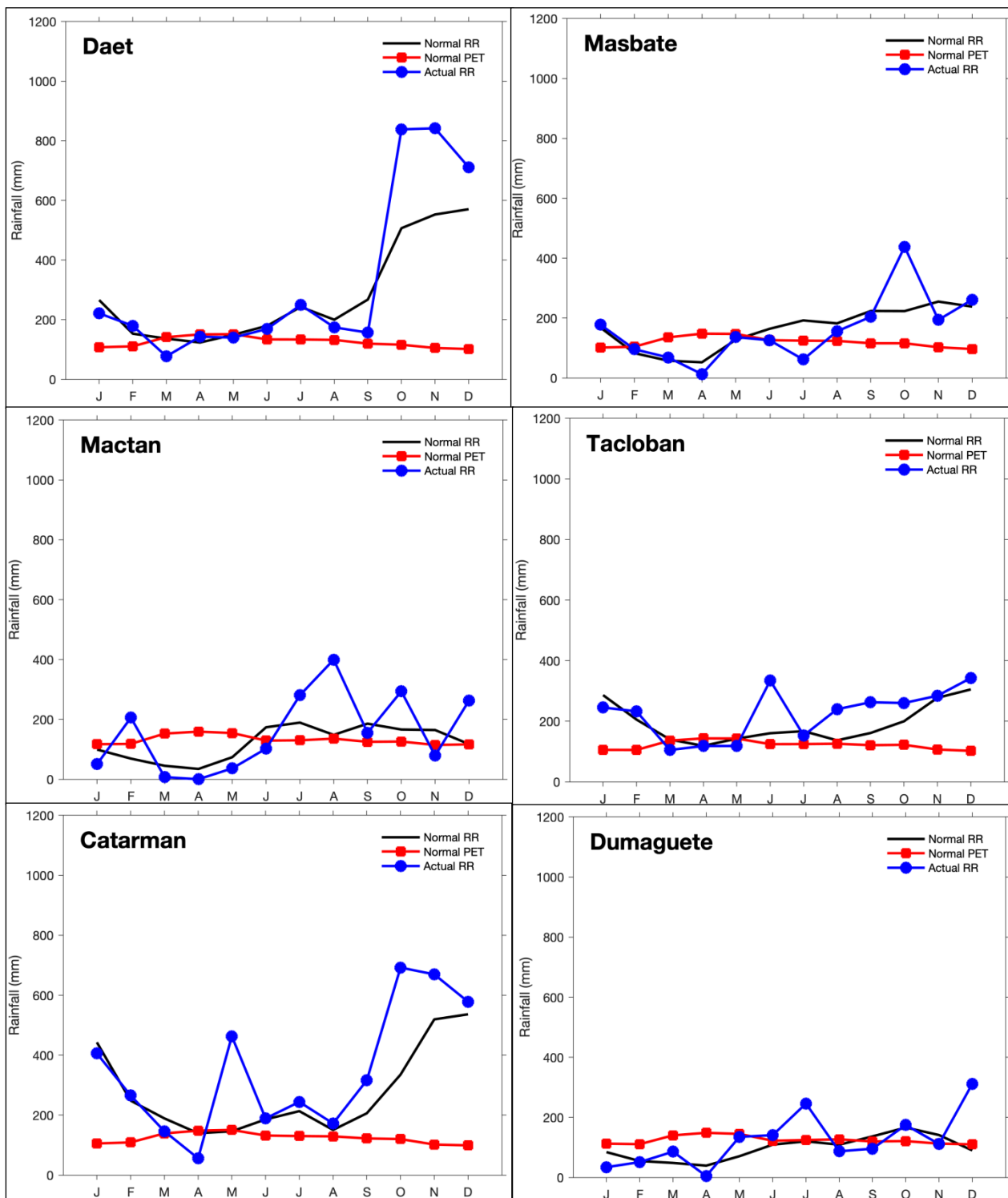


**Fig 5.b. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Casiguran, Iba, Muñoz, Calapan, Port Area and Science Garden.**

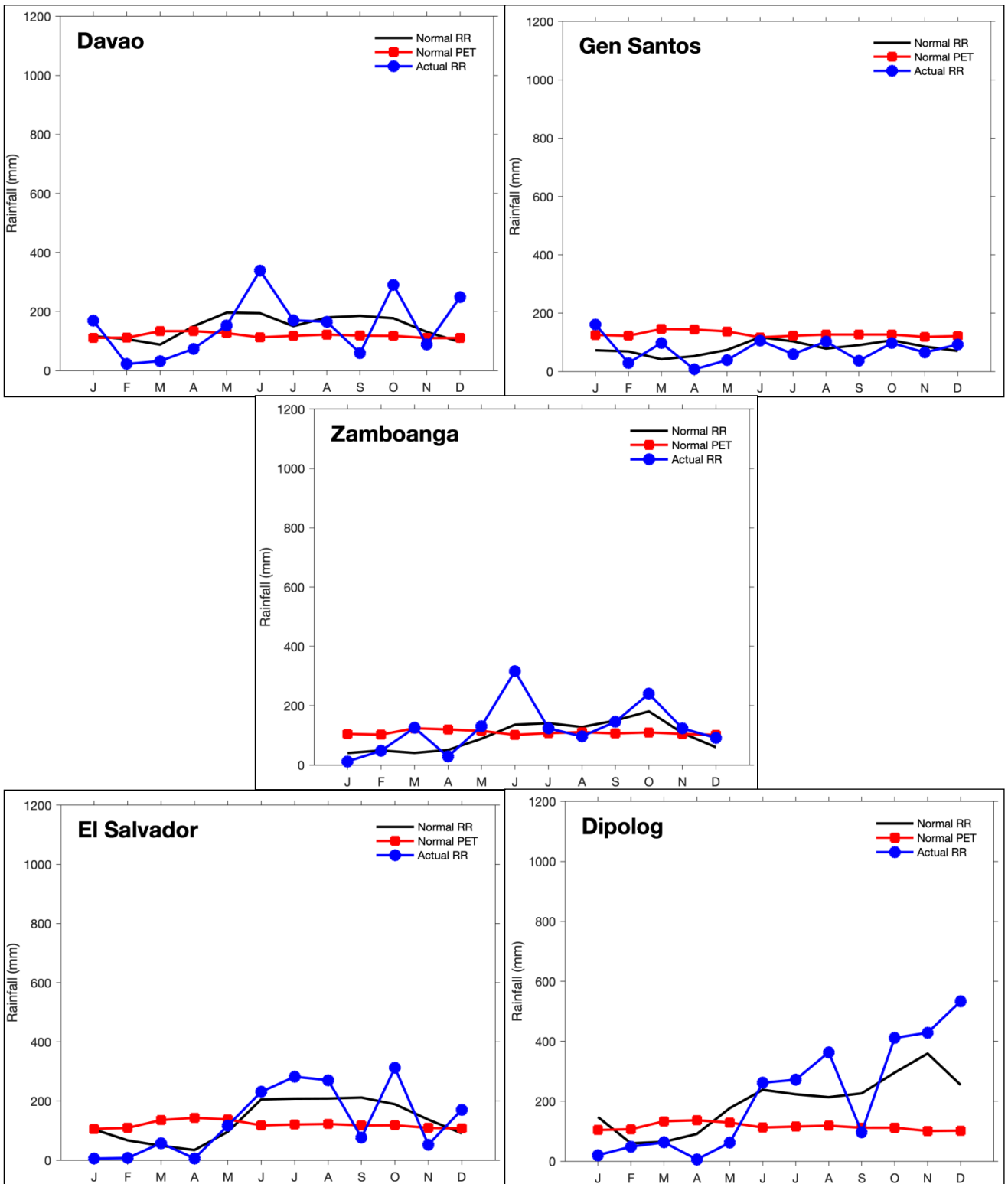




**Fig. 5.c. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Cuyo, Pto. Princesa, Alabat, Infanta, Ambulong and Legaspi.**



**Fig. 5.d. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Daet, Masbate, Mactan, Tacloban, Catarman and Dumaguete.**



**Fig 5.e. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Davao, General Santos, Zamboanga, El Salvador, and Dipolog.**