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)**
Department of Science and Technology

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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 (GMIsw) in an area during June to September is defined as follows:

$$GMIsw = W_6P_6 + W_7P_7 + W_8P_8 + W_9P_9$$

The GMI for the northeast monsoon (GMIne) in an area during October to January is defined as:

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

where:

W = weight coefficient of monthly rainfall for the season;
P = rainfall amount in the i^{th} 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:

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

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^{th} crop stage; and
K = appropriate crop coefficient for the i^{th} 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 JANUARY 2021

OVERVIEW

Harvesting of early-planted dry season corn has now started in some areas of the country. Good to above normal yield is expected in portions of CAR, in Tayabas, Ambulong, Bukidnon, and Bohol. Meanwhile, the late-planted lowland 2nd palay and vegetating dry season corn remain in good condition due to sufficient moisture in Nueva Ecija, Aurora, portions of Quezon Province, portions of Bicol Region, and Misamis Oriental. The same crops may have likely suffered from moisture stress due to insufficient rainfall in Ilocos Sur, Ilocos Norte, portions of CAR, portions of Central Luzon, portions of MIMAROPA, and portions of Central Visayas.

Sufficient rainfall enables planting activities to commence in most of Central Visayas, in Zamboanga del Norte, Davao Region, and Butuan. In contrast, these activities are prevented by excessive moisture in Northern Samar, Surigao, and Hinatuan; and by insufficient rainfall in Zamboanga del Sur, SOCCSKSARGEN, and BARMM.

The weather systems that affected the country during the month were the Northeast (NE) monsoon, low pressure areas (LPAs), intertropical convergence zone (ITCZ), localized thunderstorms, easterlies and tail-end of frontal systems (TEFS) or shear line. No tropical cyclone entered the Philippine Area of Responsibility (PAR).

REGION I (Ilocos Region)

Moisture from rainfall remains insufficient in the area, and crops that survive towards the vegetative stage in Ilocos Sur and Ilocos Norte have likely suffered from moisture stress.

CAR (Cordillera Autonomous Region)

Harvesting of early-planted dry season corn has now started in the region. Meanwhile, the late-planted lowland 2nd palay and vegetating dry season corn have likely suffered from moisture stress due to the minimal moisture from rainfall during the month.

REGION II (Cagayan Valley)

Except in Batanes, the late-planted 2nd palay and dry season corn are suffering from moisture stress due to insufficient rainfall.

REGION III (Central Luzon)

The late-planted 2nd palay and dry season corn in Nueva Ecija and surviving crops in Aurora remain in good condition courtesy of the sufficient rainfall during the month. However, for the rest of the region, moisture from rainfall is insufficient which would most likely lead to moisture stress for the vegetative crops.

REGION IV-A (CALABARZON)

Harvesting of dry season corn has now started in Ambulong. Meanwhile, the surviving late-planted 2nd palay and dry season corn in the rest of Quezon Province are in good crop condition.

REGION IV-B (MIMAROPA)

The late-planted 2nd palay and dry season corn in most parts of the region received minimal rainfall during the month and may be suffering from moisture stress.

REGION V (Bicol Region)

The late-planted 2nd palay and dry season corn in vegetative stage throughout the region are now in good condition courtesy of the sufficient rainfall received during the month.

REGION VI (Western Visayas)

Farming activities are still not possible within the region since rainfall remains inadequate.

REGION VII (Central Visayas)

Harvesting of dry season corn has now started in Dauis, Bohol. For the rest of the region, crops in vegetating stage may be suffering from moisture stress due to insufficient rainfall.

REGION VIII (Eastern Visayas)

Planting of late-planted 2nd palay and dry season corn may now be possible in the region due to sufficient rainfall, except in Northern Samar which received excessive rainfall during the month.

REGION IX (Zamboanga Peninsula)

Farming activities for late-planted 2nd palay and dry season corn are now possible in Zamboanga del Norte courtesy of the sufficient rainfall amount. However, rainfall in Zamboanga del Sur remains insufficient.

REGION X (Northern Mindanao)

Harvesting of surviving dry season corn has now started in Bukidnon. Meanwhile the vegetating crops in Misamis Oriental are now in good crops condition courtesy of the sufficient rainfall received during the month.

REGION XI (Davao Region)

Farming activities for late-planted 2nd palay and dry season corn are now possible in the region courtesy of the sufficient rainfall amount.

REGION XII (SOCCSKSARGEN)

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

REGION XIII (CARAGA Region)

Planting activities are still not possible in Surigao and Hinatuan due to the excess rainfall received during the month. Meanwhile, planting activities for late-planted 2nd palay and dry season corn is now possible in Butuan.

ARMM
(Autonomous Region of Muslim Mindanao)

Rainfall received in the region is insufficient which hinders the planting activities for 2nd 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
CAR (Cordillera Autonomous Reg.)								
Baguio	195	59	235	59	243	61	244	60
Region I (Ilocos Reg.)								
Dagupan	137	63	157	61	158	61	160	60
Sinait	65	59	69	56	70	56	73	57
Laoag	31	37	36	32	36	32	37	33
Region II (Cagayan Valley)								
Aparri	164	88	318	90	426	95	455	95
Basco	100	51	150	44	204	46	219	40
Tuguegarao	168	80	300	88	363	93	365	93
Region III (Central Luzon)								
Iba	379	93	404	93	406	93	406	93
Munoz	206	93	238	93	259	93	260	93
Baler	226	93	343	85	516	93	569	95
Casiguran	231	93	442	90	731	90	769	86
Region IV-A (CALABARZON)								
Ambulong	226	90	328	93	367	93	369	93
Infanta	199	80	380	68	514	71	582	74
Tayabas	369	98	560	95	645	98	672	98
Region IV-B (MIMAROPA)								
Calapan	332	98	402	90	504	93	518	90
Coron	0	2	37	12	48	12	49	12
Cuyo	415	95	430	95	458	95	461	95
Puerto Princesa	77	63	105	41	141	56	150	64
Romblon	232	95	305	88	332	88	358	88
San Jose	351	93	371	93	404	93	416	93
Region V (Bicol Reg.)								
Daet	210	98	412	93	625	85	695	86
Legaspi	175	98	309	93	515	90	610	86
Masbate	110	93	156	78	229	73	281	76
Virac Synop	198	90	318	80	506	85	607	88
Region VI (Western Visayas)								
Roxas	203	98	247	80	314	85	327	86
Region VII (Central Visayas)								
Mactan	91	80	110	56	168	71	208	76
Dumaguete	54	61	81	54	159	80	178	81
Dauis	71	80	104	54	144	63	171	64
Region VIII (Eastern Visayas)								
Catarman	132	98	292	90	466	76	685	86
Catbalogan	180	95	247	93	402	90	501	90
Tacloban	47	61	115	51	218	37	362	62
Region IX (Western Mindanao)								
Dipolog	111	83	214	63	347	78	393	79
Zamboanga	103	71	133	73	149	78	159	71
Region X (Northern Mindanao)								
El Salvador	109	98	122	85	160	83	195	76
Malaybalay	115	51	160	46	208	71	254	88
Region XI (Davao Reg.)								
Davao	90	83	111	76	186	90	247	121
Region XII (SOCSARGEN)								
General Santos	28	54	44	46	62	59	105	112
Region XIII (CARAGA)								
Surigao	52	90	137	51	304	71	534	83
Hinatuan	30	41	148	66	377	85	724	62
ARMM (Autonomous reg. of Muslim Mindanao)								
Cotabato	74	39	113	34	133	39	150	102

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

STATIONS	*NOVEMBER*		*DECEMBER*		JANUARY		FEBRUARY	
	YMI	%RANK	YMI	%RANK	YMI	%RANK	YMI	%RANK
CAR (Cordillera Autonomous Reg.)								
Baguio	141	85	291	95	336	93		
Region I (Ilocos Region)								
Dagupan	69	124	85	68	199	93		
Laoag	19	141	21	56	47	62		
Sinait	16	141	18	61	49	69		
Region III (Central Luzon)								
Iba	89	120	110	80	145	86		
Munoz	112	117	264	93	311	88		
Casiguran	748	12	1693	83	1963	76		
Region IV-A (CALABARZON)								
Ambulong	361	73	503	98	555	95		
Tayabas	677	41	1351	85	1618	81		
Infanta	642	12	1387	66	1815	67		
Alabat	719	15	1404	78	1818	81		
Region IV-B (MIMAROPA)								
Calapan	250	46	583	68	703	60		
Coron	72	122	186	61	247	71		
Cuyo	53	71	165	59	258	71		
Region V (Bicol Region)								
Daet	716	49	1391	83	1856	81		
Legaspi	474	5	1104	68	1603	74		
Virac	425	7	1063	83	1694	86		
Region VIII (Eastern Visayas)								
Catarman	569	10	1118	59	2034	79		
Catbalogan	237	5	781	76	1279	86		
Region XIII (CARAGA)								
Hinatuan	417	22	1142	83	2080	76		
Surigao	301	27	1020	68	1718	64		

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
Region II (Cagayan Valley)						
Tuguegarao	357	93	774	98	813	98
Region IV-A (CALABARZON)						
Tayabas	518	85	1263	83	1463	83
Region IV-B (MIMAROPA)						
Calapan	112	34	294	37	423	40
Romblon	198	71	399	51	559	67
Puerto Princesa	77	37	332	66	440	74
Region V (Bicol Region)						
Masbate	126	54	400	51	593	55
Region VI (Western Visayas)						
Roxas	120	39	439	59	526	69
Region VII (Central Visayas)						
Mactan	51	32	327	80	484	81
Dumaguete	72	41	400	88	492	93
Region IX (Western Mindanao)						
Zamboanga	80	54	176	71	242	67
Region X (Northern Mindanao)						
El Salvador	34	29	214	63	363	64
Malaybalay	121	61	400	85	607	88

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
CAR *(Cordillera Autonomous Reg.)*								
Baguio	134	95	176	95				
Region I *(Ilocos Reg.)*								
Dagupan	14	66	122	98				
Sinait	2	51	26	88				
Laoag	2	51	31	88				
Region II *(Cagayan Valley)*								
Aparri	486	95	711	98				
Basco	198	73	286	43				
Tuguegarao	338	93	388	90				
Region III *(Central Luzon)*								
Iba	19	66	52	81				
Munoz	136	93	180	93				
Baler	670	88	965	90				
Casiguran	846	78	1102	76				
Region IV-A *(CALABARZON)*								
Ambulong	127	68	176	69				
Infanta	667	66	1073	76				
Tayabas	603	83	857	83				
Alabat	613	68	1007	79				
Region IV-B *(MIMAROPA)*								
Calapan	298	76	412	67				
Coron	101	68	159	76				
Cuyo	100	71	189	88				
Puerto Princesa	206	78	343	83				
Romblon	163	46	365	67				
San Jose	37	56	56	57				
Region V *(Bicol Reg.)*								
Daet	605	68	1046	79				
Legaspi	564	71	1037	81				
Masbate	222	51	466	57				
Virac	571	83	1170	90				
Region VI *(Western Visayas)*								
Roxas	258	80	369	81				
Region VII *(Central Visayas)*								
Dumaguete	265	93	382	90				
Mactan, Cebu	153	63	297	62				
Dauis	223	88	422	88				
Region VIII *(Eastern Visayas)*								
Catarman	492	49	1361	76				
Catbalogan	487	88	959	88				
Tacloban	291	39	819	74				
Region IX *(Western Mindanao)*								
Dipolog	453	90	791	95				
Zamboanga	78	71	160	76				
Region X *(Northern Mindanao*)								
El Salvador	153	80	297	76				
Malaybalay	226	85	488	90				
Region XI *(Davao Reg.)*								
Davao	211	85	466	90				
Region XII *(SOCSARGEN)*								
General Santos	78	78	253	88				
Region XIII *(CARAGA)*								
Surigao	644	83	1307	71				
Hinatuan	649	80	1540	74				
Butuan	297	83	533	55				
ARMM*(Autonomous reg. of Muslim Mindanao)*								
Cotabato	91	61	228	81				

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
CAR *(Cordillera Autonomous Reg.)*						
Baguio	102	95	149	95		
Region *I (Ilocos Reg.)*						
Dagupan	11	66	130	98		
Sinait	1	51	28	88		
Laoag	2	51	34	90		
Region II *(Cagayan Valley)*						
Aparri	372	95	620	98		
Basco	151	73	249	36		
Tuguegarao	258	93	313	93		
Region III *(Central Luzon)*						
Iba	14	66	51	86		
Munoz	104	93	153	93		
Baler	512	88	838	95		
Casiguran	647	78	930	79		
Region IV-A *(CALABARZON)*						
Ambulong	97	66	152	69		
Infanta	510	66	959	71		
Tayabas	461	83	742	83		
Alabat	469	71	904	79		
Region IV-B *(MIMAROPA)*						
Calapan	228	76	354	67		
Coron	78	71	142	88		
Cuyo	77	71	174	90		
Puerto Princesa	158	76	309	81		
Romblon	125	46	348	67		
San Jose	29	56	49	62		
Region V *(Bicol Reg.)*						
Daet	462	68	950	79		
Legaspi	431	71	955	83		
Masbate	170	51	439	64		
Virac	436	83	1099	90		
Region VI *(Western Visayas)*						
Roxas	197	80	320	81		
Region VII *(Central Visayas)*						
Dumaguete	171	88	390	86		
Mactan, Cebu	203	93	332	88		
Dauis	117	63	277	67		
Region VIII *(Eastern Visayas)*						
Catarman	376	49	1337	83		
Catbalogan	372	88	895	86		
Tacloban	223	39	807	74		
Region IX *(Western Mindanao)*						
Dipolog	347	90	719	95		
Zamboanga	59	71	151	76		
Region X *(Northern Mindanao*)						
El Salvador	111	80	320	81		
Malaybalay	172	85	462	83		
Region XI *(Davao Reg.)*						
Davao	161	88	443	93		
Region XII *(SOCSARGEN)*						
General Santos	60	78	253	86		
Region XIII *(CARAGA)*						
Surigao	492	83	1225	69		
Hinatuan	496	80	1481	74		
Butuan	227	83	488	52		
ARMM*(Autonomous reg. of Muslim Mindanao)*						
Cotabato	70	61	221	81		

TABLE 6.0 DECADAL AND CUMULATIVE DECADAL RAINFALL
For the month of JANUARY 2021
[actual values (in mm) and percent of normal]

	REGION	*DECADE*	*ACTUAL JAN*	*% Normal of Actual*	*CUMULATIVE JAN.*	*% Normal Cumulative*
R01	Ilocos Region	1	55.8	1744	55.8	1744
		2	6.4	158	62.2	858
		3	55.8	1330	118.0	1031
CAR	CAR	1	42.1	463	42.1	463
		2	24.3	197	66.3	310
		3	42.1	342	108.4	322
R02	Cagayan Valley	1	62.2	185	62.2	185
		2	77.5	191	139.7	188
		3	62.2	148	201.9	174
R03	Central Luzon	1	57.2	468	57.2	468
		2	44.2	170	101.4	265
		3	57.2	315	158.6	281
R04-A	CALABARZON	1	39.6	85	39.6	85
		2	116.7	241	156.4	164
		3	39.6	71	196.0	130
R04-B	MIMAROPA	1	22.0	243	22.0	243
		2	20.9	219	42.9	230
		3	22.0	184	64.9	212
NCR	NCR	1	43.3	476	43.3	476
		2	71.5	598	114.7	545
		3	43.3	442	158.0	512
R05	Bicol Region	1	51.8	64	51.8	64
		2	161.4	211	213.2	136
		3	51.8	54	265.0	105
R06	Western Visayas	1	63.2	264	63.2	264
		2	18.3	154	81.5	227
		3	63.2	282	144.7	248
R07	Central Visayas	1	54.2	136	54.2	136
		2	60.7	266	114.9	183
		3	54.2	142	169.1	167
R08	Eastern Visayas	1	119.3	114	119.3	114
		2	285.3	369	404.6	222
		3	119.3	99	524.0	173
R09	Zamboanga Peninsula	1	23.3	83	23.3	83
		2	113.8	641	137.1	299
		3	23.3	60	160.4	190
R10	Northern Mindanao	1	27.9	68	27.9	68
		2	168.0	515	195.8	266
		3	27.9	53	223.7	177
R11	Davao Region	1	84.9	122	84.9	122
		2	153.5	234	238.4	177
		3	84.9	101	323.3	147
R12	SOCCSKSARGEN	1	34.3	166	34.3	166
		2	82.1	470	116.4	305
		3	34.3	133	150.7	236
	CARAGA	1	115.0	75	115.0	75
		2	262.9	212	377.9	137
		3	115.0	65	492.9	109
	ARMM	1	10.1	58	10.1	58
		2	88.5	715	98.5	333
		3	10.1	44	108.6	207

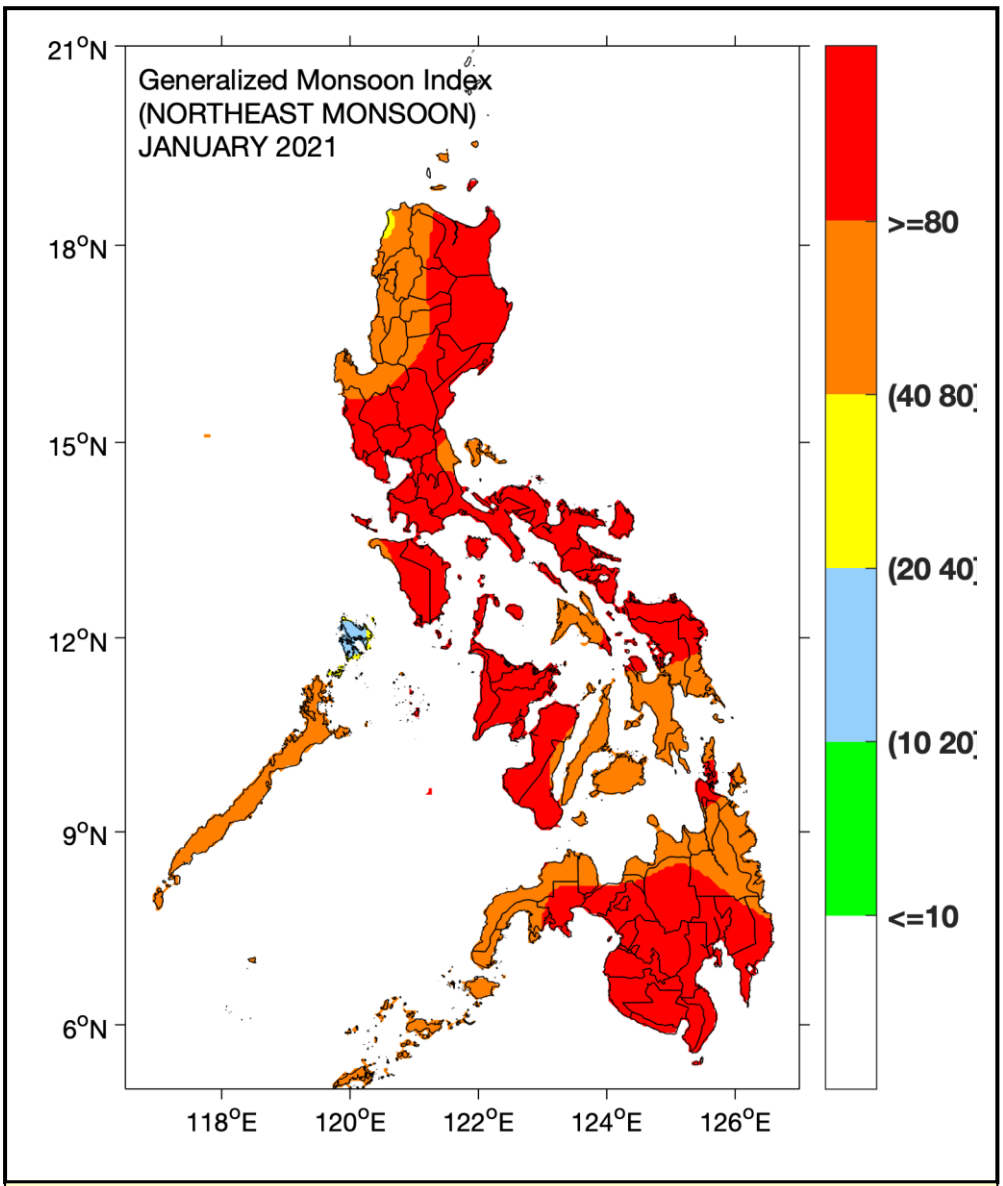
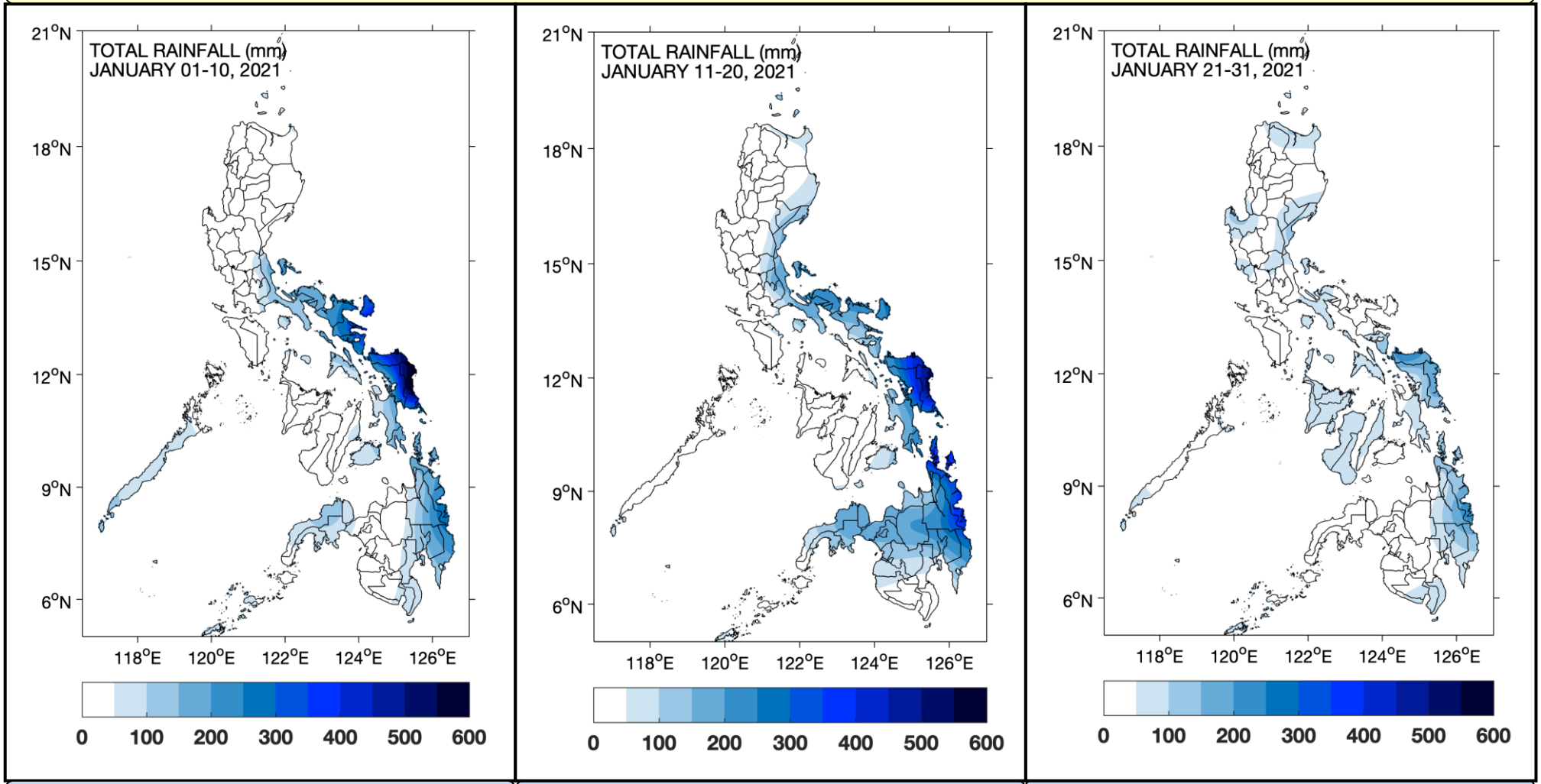


FIG. 1.0 **Spatial Analysis of GENERALIZED NORTHEAST MONSOON INDEX**
Ending JANUARY 2021 in Percentile Rank

FIG 2.0 **TEN DAYS ACTUAL RAINFALL DISTRIBUTION IN THE PHILIPPINES for the month of JANUARY 2021**

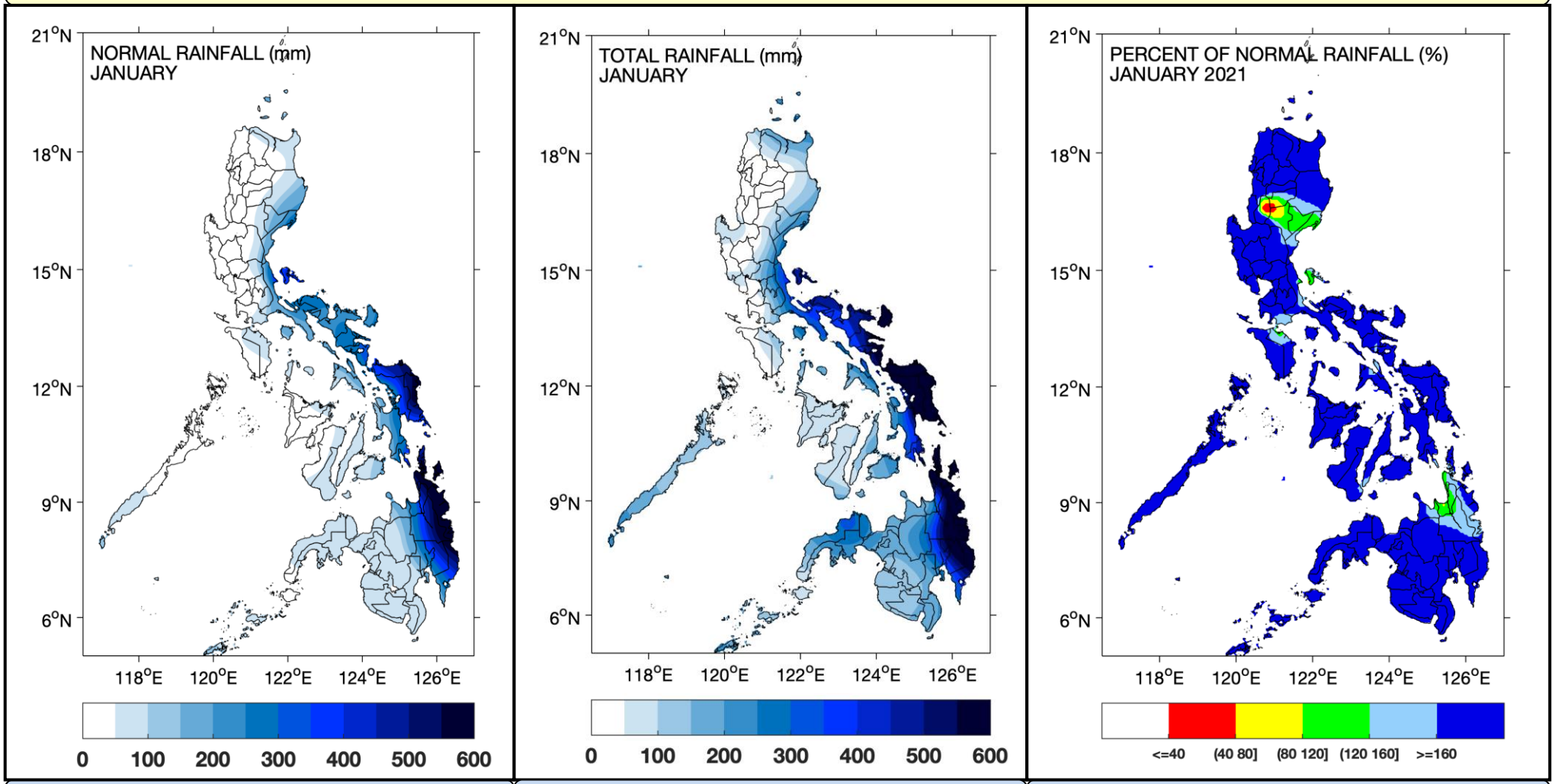


A. Decade 1 - JANUARY 01-10, 2021

B. Decade 2 - JANUARY 11-20, 2021

C. Decade 3 - JANUARY 21-31, 2021

FIG. 3.0 **RAINFALL IN THE PHILIPPINES for the month of JANUARY 2021**



A. Normal Rainfall (mm) | **B. Actual Rainfall (mm)** | **C. Percent of Normal Rainfall (%)**

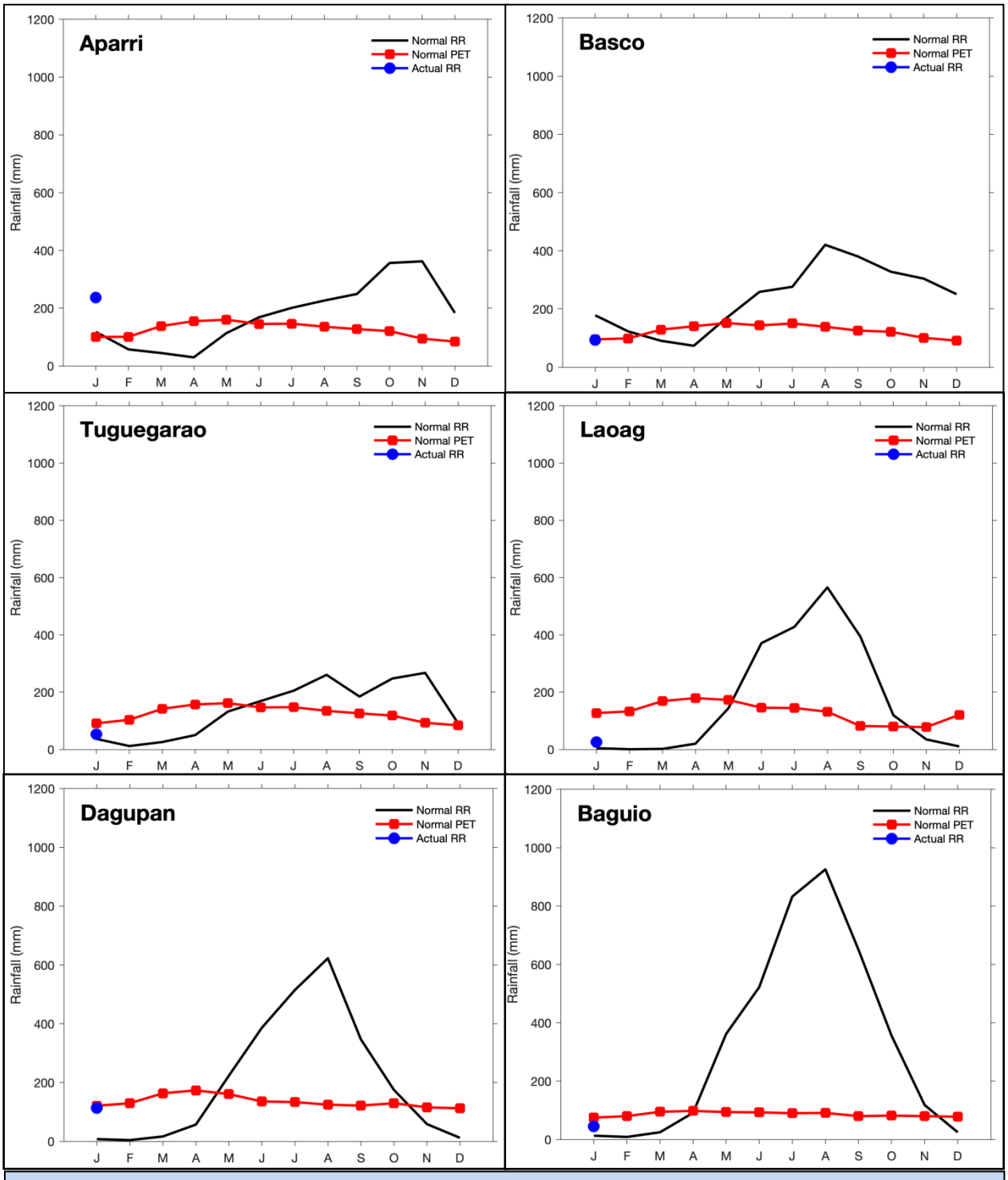


Fig. 4.a **Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Aparri, Basco, Tuguegarao, Laoag , Dagupan, and Baguio.**

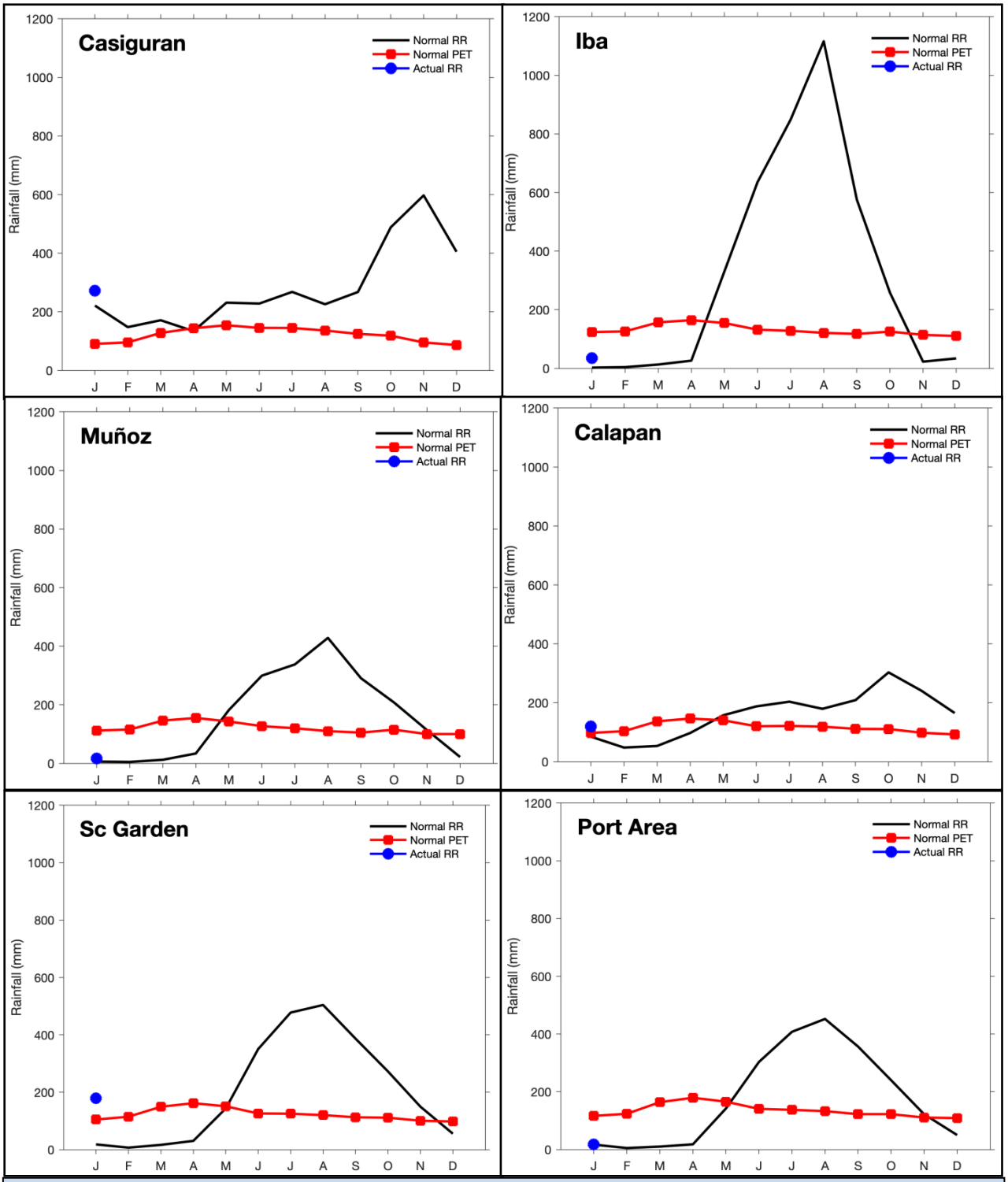


Fig 4.b. **Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Casiguran, Iba, Muñoz , Calapan , Port Area and Science Garden .**

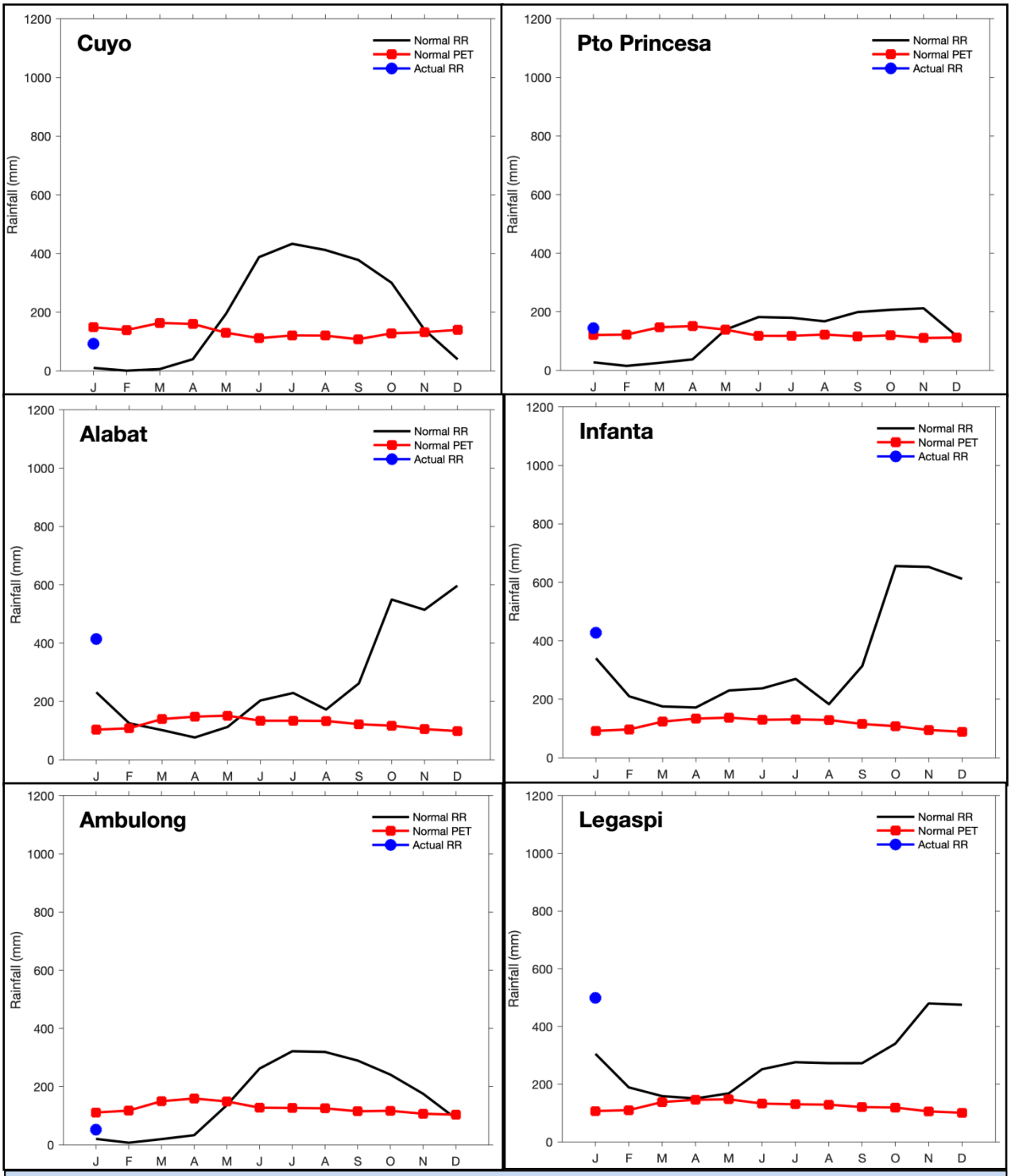


Fig. 4.c. **Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Cuyo, Pto. Princesa, Alabat, Infanta, Ambulong and Legaspi.**

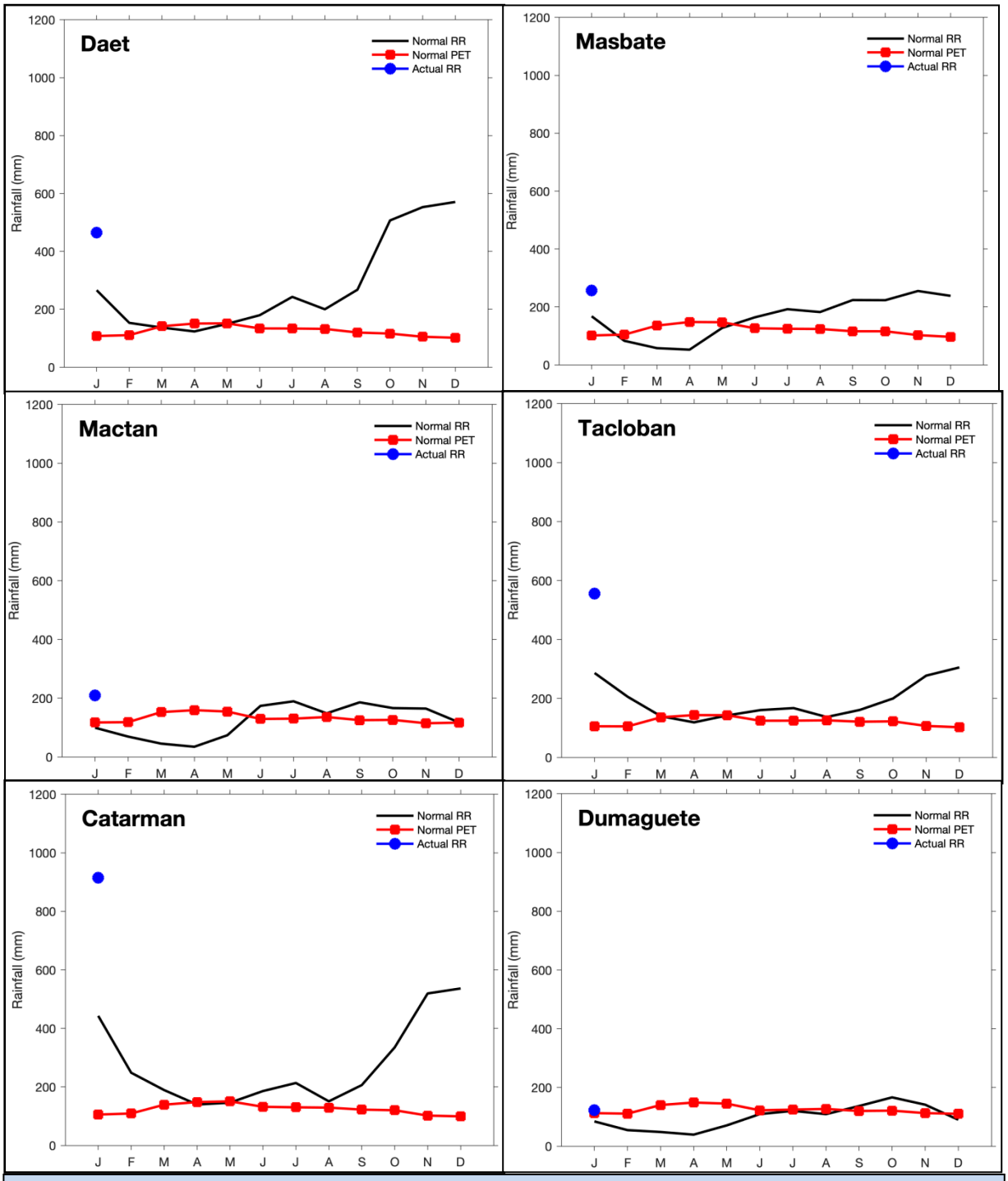


Fig. 5.d. **Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Daet, Masbate, Mactan, Tacloban, Catarman and Dumaguete.**

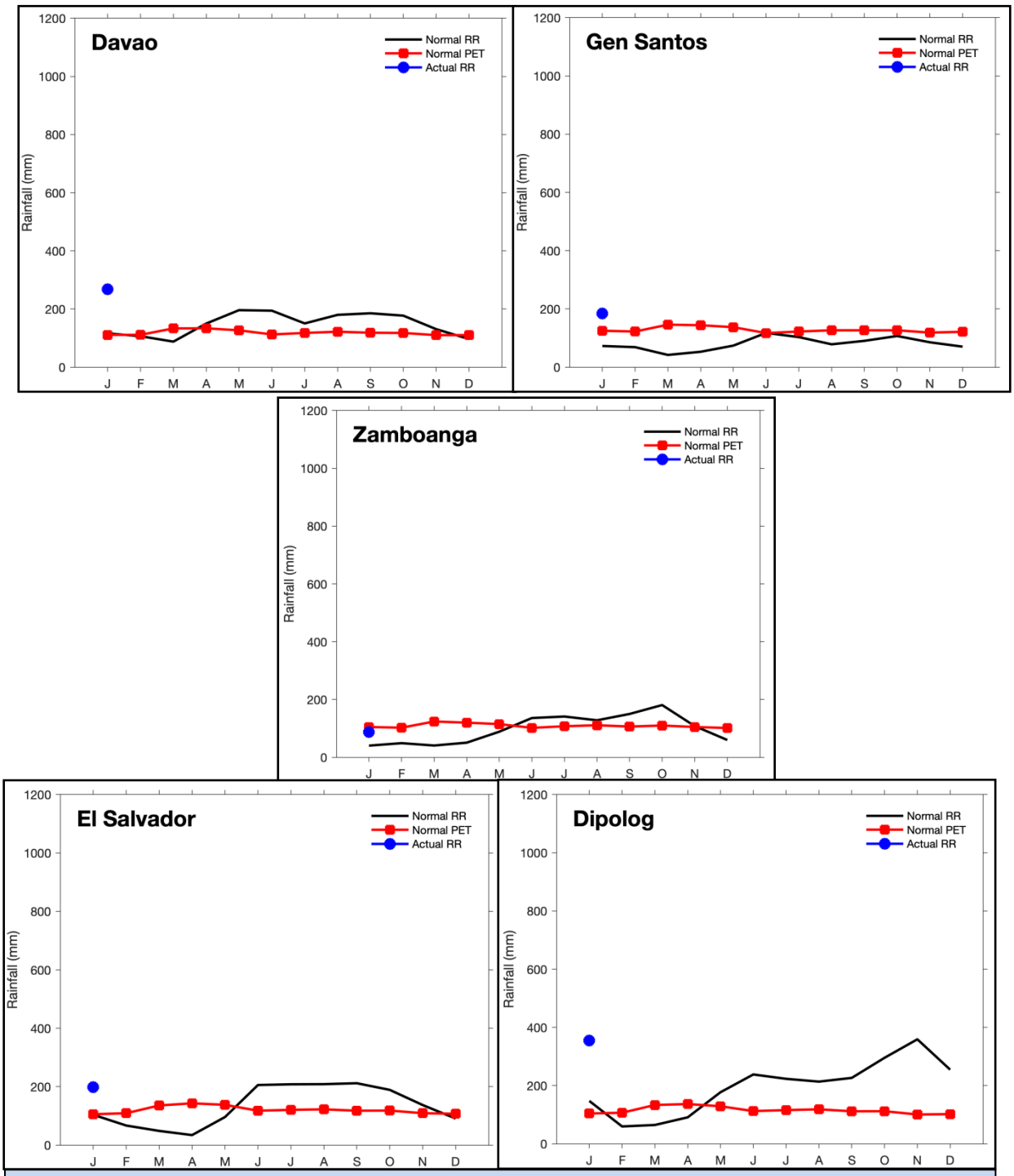


Fig 4.e. **Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Davao, General Santos, Zamboanga, El Salvador, and Dipolog.**