



# **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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# Preface

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:

$$YMI = \sum_i^n [P_i K_i]$$

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 SEPTEMBER 2019

## OVERVIEW

Harvesting of late-planted upland 1<sup>st</sup> palay in most parts of the country and late-planted lowland 1<sup>st</sup> palay in Legaspi, Virac, Catarman, Tacloban and Hinatuan had just begun; good to normal yield is expected in Dagupan, Nueva Ecija, Coron, Cuyo, San Jose, Albay, Catanduanes, Malaybalay, and Davao, due to sufficient moisture experienced by the crops from planting to maturity. In contrast, below normal yield is anticipated in Ilocos Sur, Ilocos Norte, Cordillera Autonomous Region (CAR), Zambales, Aurora, Pto. Princesa, Tacloban, Dipolog, and Bukidnon because crops suffered from water logging and moisture stress during the critical stage of growth. Standing crops are suffering from moisture stress in most of CAR, Ilocos Provinces, Central Luzon, Tayabas, Ambulong, most parts of MIMAROPA, Masbate, and Bukidnon, are in good condition, but in Panay Island, Central Visayas, Catbalogan, Dipolog, Misamis Oriental and SOCCSKSARGEN.

The weather systems that affected the country during the month were the Southwest (SW) monsoon, low pressure areas (LPAs), localized thunderstorms and the passage of five (5) tropical cyclones (TCs) namely: Tropical Depression (TD) “Kabayan” (September 1), Typhoon (TY) “Liwayway” (September 1-5), tropical Depression (TD) “Marilyn” (September 12-14), Severe Tropical Storm (STS) “Nimfa” (September 17-20) and Typhoon (TY) “Onyok” (September 28-30). All TCs did not make landfall but enhanced the southwest monsoon, which caused floodings and class suspensions, as indicated in the Situational Report (SitRep) by the National Disaster and Reduction Risk Management Council (NDRRMC).

Rainfall assessment during the month indicates that most parts of Luzon experienced near to above normal rainfall conditions, including Guimaras, Iloilo, and Basilan in the Visayas and Mindanao. The rest of the country experienced below normal rainfall conditions.

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

Harvesting of late-planted, upland 1<sup>st</sup> palay has started in Ilocos region; below normal yield may be anticipated because of water logging brought by TCs that passed through the region. The vegetating, delay-planted lowland palay might likewise be affected the same.

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

Harvesting of late-planted, upland 1<sup>st</sup> palay had just started across the region; below normal yield is expected because of the passage of TCs which brought along storms and heavy rains. Crops were submerged under water and muds. The vegetating, late-planted lowland palay might also be affected by TCs during the month.

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

The vegetating, late-planted lowland 1<sup>st</sup> palay are in good condition across the region due to the availability of sufficient moisture.

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

Harvesting of delay-planted upland 1<sup>st</sup> palay had just started across the region; good to normal yield is expected in Nueva Ecija due to favorable growing conditions. Likewise, in Cabanatuan, the rainfall amount during the month was favorable for the vegetating, delay-planted lowland palay. Meanwhile, below normal yield is expected in Zambales and Baler due to water logging and moisture stress, respectively.

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

Sufficient rainfall received during the month is favorable for the vegetating, delay-planted upland 1<sup>st</sup> palay in Tayabas and Ambulong.

**REGION IV-B (MIMAROPA)**

Harvesting of late-planted, upland 1<sup>st</sup> palay had just started in most parts of the region; yield is expected to be good to normal in Coron, Cuyo, and San Jose. Below normal yield is anticipated in Pto. Princesa because crops experienced moisture deficiency during the critical stage of growth and development. Vegetating, delay-planted lowland 1<sup>st</sup> palay in most parts of the region were in good condition due to adequate moisture available during the month.

**REGION V (Bicol Region)**

Harvesting of late-planted, lowland 1<sup>st</sup> palay in Albay and Catanduanes had just started; yield is expected to be good to above normal because crops were in good condition throughout the growing period. Standing crops in Masbate experienced moisture deficiency last month but somewhat recovered because of ample amount of moisture available during the month.

**REGION VI (Western Visayas)**

The standing vegetating late-planted lowland 1<sup>st</sup> palay experienced moisture deficiency throughout the region due to the insufficient moisture available during the month.

**REGION VII (Central Visayas)**

The standing, late-planted lowland 1<sup>st</sup> palay in vegetating stage experienced moisture stress across the region due to the insufficient moisture available during the month.

**REGION VIII (Eastern Visayas)**

Harvesting of June-planted lowland and upland 1<sup>st</sup> palay in Catarman and Tacloban has started: below normal yield is anticipated because crops experienced moisture deficiency during the critical stage of growth and development. The standing July-planted, lowland 1<sup>st</sup> palay in Catbalogan now experienced moisture stress because of insufficient moisture available during the month.

**REGION IX (Zamboanga Peninsula)**

Harvesting of delay-planted upland 1<sup>st</sup> palay in Zamboanga del Norte had just started: below normal is probable because of insufficient moisture available during maturity stage. The vegetating, late-planted lowland 1<sup>st</sup> palay which experienced moisture stress last month has now recovered due to sufficient moisture available during the month.

**REGION X (Northern Mindanao)**

Harvesting of late-planted, upland 1<sup>st</sup> palay has now started in Bukidnon; good to normal yield is anticipated this season due to sufficient moisture supply and favorable weather condition experienced by the crops from planting to maturity. Sufficient moisture obtainable during the month favors the standing vegetating late-planted lowland 1<sup>st</sup> palay in Bukidnon, contrary to what is happening in Misamis Oriental, where standing crops experienced moisture stress due to very low rainfall received during the last two months.

**REGION XI (Davao Region)**

Good to normal yield is expected this season for the harvestable delay-planted upland 1<sup>st</sup> palay across the region. It is because crops experienced favorable condition throughout their growing period.

**REGION XII (SOCCSKSARGEN)**

The vegetating, late-planted lowland 1<sup>st</sup> palay experienced moisture stress due to insufficient amount of moisture available during the month.

**REGION XIII (CARAGA Region)**

Harvesting of June-planted lowland 1<sup>st</sup> palay has started in Surigao del sur: below normal yield is anticipated due to insufficient moisture experienced by the crops from vegetation up to maturity.

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

The vegetating, late-planted lowland 1<sup>st</sup> palay across the region experienced moisture stress due to scarcity of moisture available during the month and of last month.

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**TABLE 1.0 GENERALIZED SOUTHWEST MONSOON INDICES**  
**FOR JUNE TO SEPTEMBER 2019 in Millimeters and Percentile Rank.**

STATIONS	JUNE		JULY		AUGUST		SEPTEMBER	
	GMI	%RANK	GMI	%RANK	GMI	%RANK	GMI	%RANK
<b>CAR (Cordillera Administrative Reg.)</b>								
Baguio	49	36	172	22	658	64	821	73
<b>Region I (Ilocos Reg.)</b>								
Dagupan	85	69	161	32	342	36	431	34
Vigan	57	47	140	24	440	58	541	61
Laoag	39	36	140	41	492	83	580	81
<b>Region II (Cagayan Valley)</b>								
Aparri	10	25	80	56	212	92	294	88
Basco	21	31	59	19	273	81	433	92
Tuguegarao	25	39	73	41	155	58	213	56
<b>Region III (Central Luzon)</b>								
Iba	136	71	377	63	809	76	1023	88
Cabanatuan	46	54	127	42	296	73	381	81
Baler	55	39	102	25	119	14	186	17
Casiguran	19	10	62	7	161	41	229	42
<b>NCR (Metro Manila)</b>								
Science Garden	83	75	177	51	343	54	434	44
<b>Region IV-A (CALABARZON)</b>								
Ambulong	32	29	97	24	201	46	257	37
Infanta	31	25	69	10	93	3	133	2
Tayabas	42	36	112	46	168	63	205	32
<b>Region IV-B (MIMAROPA)</b>								
Calapan	57	58	105	41	160	53	197	46
Coron	58	44	233	75	538	95	613	88
Cuyo	92	63	218	71	321	63	376	49
Puerto Princesa	46	66	76	54	107	25	173	54
Romblon	26	8	69	12	146	27	174	17
San Jose	76	71	197	36	406	86	496	81
<b>Region V (Bicol Reg.)</b>								
Daet	26	25	66	12	122	31	189	31
Legaspi	72	78	142	76	230	85	265	61
Masbate	34	59	91	59	126	47	168	36
Virac Synop	50	49	114	54	202	80	248	66
<b>Region VI (Western Visayas)</b>								
Roxas	39	17	185	88	236	81	251	63
<b>Region VII (Central Visayas)</b>								
Mactan	23	14	84	41	108	36	134	32
Dumaguete	22	31	76	66	93	53	109	34
Tagbilaran	22	27	76	64	104	69	113	37
<b>Region VIII (Eastern Visayas)</b>								
Catarman	48	56	75	25	149	66	162	34
Catbalogan	40	37	92	29	150	36	190	17
Tacloban	57	68	92	51	110	34	131	14
<b>Region IX (Zamboanga Peninsula)</b>								
Dipolog	66	44	128	58	181	64	193	31
Zamboanga	16	17	60	34	71	8	113	24
<b>Region X (Northern Mindanao)</b>								
Lumbia	33	39	87	12	110	32	127	32
Malaybalay	69	39	153	41	221	39	268	19
<b>Region XI (Davao Reg.)</b>								
Davao	89	93	154	98	234	100	260	98
<b>Region XII (SOCCSKSARGEN)</b>								
General Santos	30	63	71	81	98	86	111	76
<b>Region XIII (Caraga)</b>								
Surigao	26	37	71	46	87	25	94	10
Hinatuan	82	59	120	46	162	49	172	20
<b>ARMM (Autonomous reg. of Muslim Mindanao)</b>								
Cotabato	55	14	102	8	147	7	159	8

**TABLE 2.0 CUMULATIVE YIELD MOISTURE INDICES FOR DELAYED PLANTED UPLAND PALAY in Millimeters and Percentile Rank. (June -September 2019)**

STATIONS	JUNE		JULY		AUGUST		SEPTEMBER	
	YMI	%RANK	YMI	%RANK	YMI	%RANK	YMI	%RANK
<i>CAR (Cordillera Administrative Reg.)</i>								
Baguio	233	36	649	69	2250	61	2990	73
<i>Region I (Ilocos Reg.)</i>								
Dagupan	362	69	630	97	1224	34	1650	41
Vigan	168	27	459	66	1447	46	1928	59
Laoag	253	58	637	76	1793	83	2179	83
<i>Region II (Cagayan Valley)</i>								
Aparri	47	25	336	29	768	90	1026	85
Basco	87	31	259	85	964	80	1536	86
Tuguegarao	103	39	293	61	562	47	777	54
<i>Region III (Central Luzon)</i>								
Iba	608	71	1455	92	2877	80	3898	90
Cabanatuan	197	53	492	71	1049	66	1402	75
Baler	172	39	338	49	395	10	642	12
Casiguran	66	10	229	78	557	29	789	22
<i>Region IV-A (CALABARZON)</i>								
Ambulong	128	29	359	97	699	37	933	34
Tayabas	139	36	383	53	569	53	695	27
<i>Region IV-B (MIMAROPA)</i>								
Coron	247	44	864	98	1864	95	2018	76
Cuyo	324	63	768	75	1107	53	1407	49
Puerto Princesa	156	66	282	8	383	24	637	47
Romblon	92	8	251	66	504	17	611	8
San Jose	292	71	734	63	1424	83	1797	78
<i>Region V (Bicol Reg.)</i>								
Masbate	136	59	340	12	455	31	605	25
<i>Region VI (Western Visayas)</i>								
Roxas	123	17	657	36	824	80	888	53
<i>Region VII (Central Visayas)</i>								
Mactan, Cebu	75	14	289	32	369	34	469	31
Dumaguete	70	31	265	8	321	44	382	32
Tagbilaran	68	27	274	19	368	61	403	32
<i>Region VIII (Eastern Visayas)</i>								
Catbalogan	149	37	331	24	521	32	663	14
Tacloban	180	68	307	85	365	19	452	12
<i>Region IX (Zamboanga Peninsula)</i>								
Dipolog	194	44	428	20	604	49	654	20
Zamboanga	53	17	223	12	259	10	421	22
<i>Region X (Northern Mindanao)</i>								
Lumbia	114	39	301	14	379	32	445	32
Malaybalay	234	39	529	75	754	24	941	15
<i>Region XI (Davao Reg.)</i>								
Davao	280	93	537	27	802	100	904	93
<i>Region XII (SOCCSKSARGEN)</i>								
General Santos	87	63	238	44	327	80	384	63

**TABLE 3.0 CUMULATIVE YIELD MOISTURE INDICES FOR DELAYED PLANTED LOWLAND FIRST PALAY in Millimeters and Percentile Rank. (June -September 2019)**

STATIONS	JUNE		JULY		AUGUST		SEPTEMBER	
	YMI	% RANK	YMI	% RANK	YMI	% RANK	YMI	% RANK
<b>Region IV-A (CALABARZON)</b>								
Infanta	104	25	239	12	319	3	449	2
<b>Region V (Bicol Reg.)</b>								
Daet	107	25	250	12	436	19	649	15
Legaspi	256	78	520	75	810	73	934	49
Virac	164	49	396	53	688	75	841	56
<b>Region VIII (Eastern Visayas)</b>								
Catarman	164	56	263	25	505	58	554	24
Catbalogan	149	37	331	29	521	32	656	14
Tacloban	180	68	307	47	365	19	448	12
<b>Region XIII (Caraga)</b>								
Hinatuan	234	59	382	42	520	27	560	7
Surigao	97	37	255	44	308	22	331	8

**TABLE 4.0 CUMULATIVE YIELD MOISTURE INDICES FOR LOWLAND FIRST PALAY in Millimeters and Percentile Rank. (July-October 2019)**

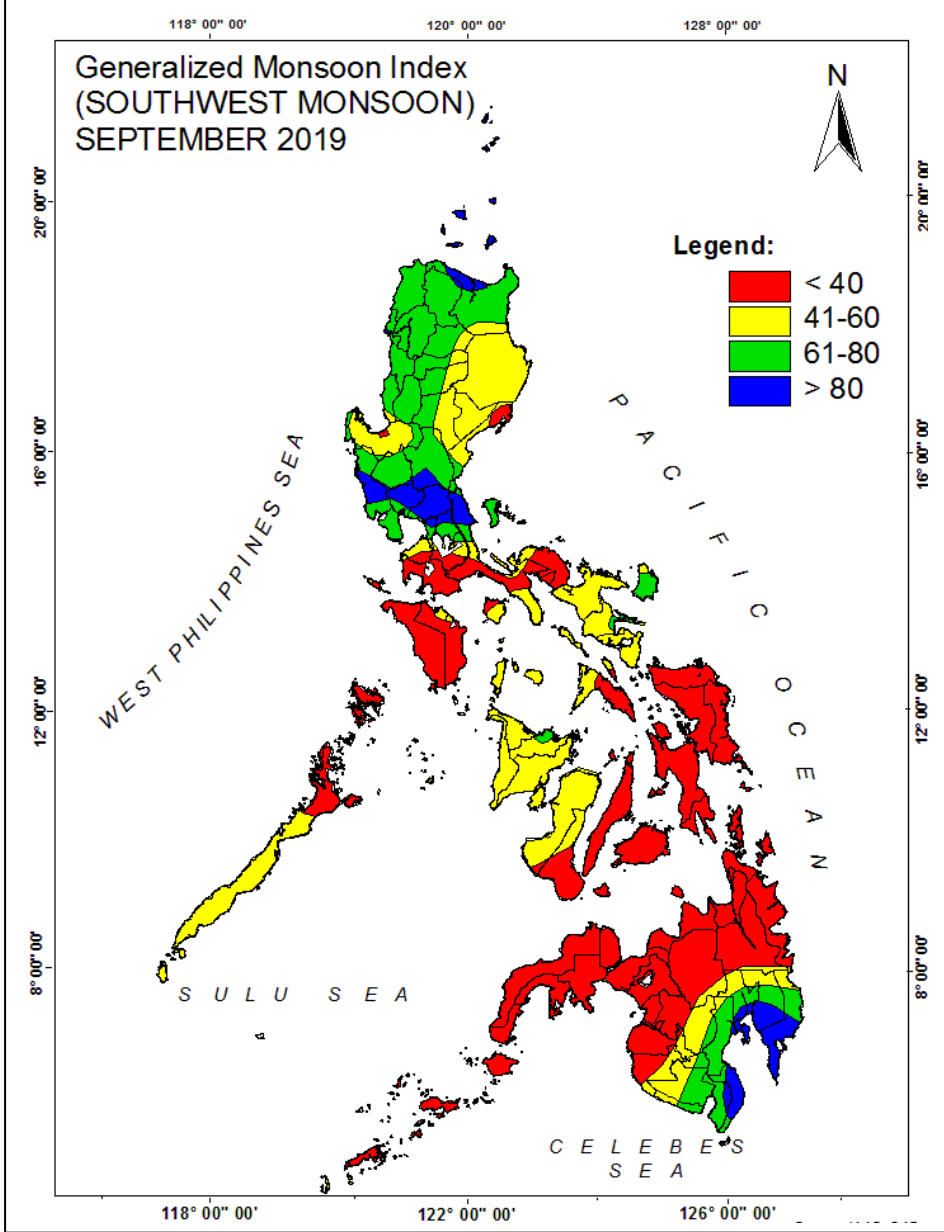
STATIONS	JULY		AUGUST		SEPTEMBER		OCTOBER	
	YMI	%RANK	YMI	%RANK	YMI	%RANK	YMI	%RANK
<b>CAR (Cordillera Administrative Reg.)</b>								
Baguio	372	36	1820	73	2597	81		
<b>Region I (Ilocos Reg.)</b>								
Dagupan	240	25	777	27	1225	39		
Laoag	343	58	1390	90	1794	80		
Vigan	261	34	1154	58	1660	69		
<b>Region II (Cagayan Valley)</b>								
Basco	154	42	791	86	1392	93		
Tuguegarao	170	47	414	61	639	59		
<b>Region III (Central Luzon)</b>								
Iba	758	59	2044	76	3117	90		
Cabanatuan	265	47	768	73	1139	78		
<b>Region IV-A (CALABARZON)</b>								
Ambulong	207	39	514	47	761	37		
Tayabas	219	63	219	24	518	27		
<b>Region IV-B (MIMAROPA)</b>								
Calapan	155	37	320	39	481	25		
Coron	552	76	1457	97	1773	85		
Cuyo	397	64	704	53	955	31		
P. Princesa	113	32	204	14	471	37		
Romblon	142	25	371	37	483	17		
San Jose	395	76	1020	86	1411	81		
<b>Region V (Bicol Reg.)</b>								
Masbate	182	59	286	39	444	24		
<b>Region VI (Western Visayas)</b>								
Roxas	478	100	629	90	696	66		
<b>Region VII (Central Visayas)</b>								
Cebu	192	68	264	44	369	31		
Dumaguete	174	86	225	59	289	39		
Tagbilaran	184	90	269	75	305	41		
<b>Region VIII (Eastern Visayas)</b>								
Catbalogan	163	31	335	36	484	15		
Tacloban	114	37	167	14	258	3		
<b>Region IX (Zamboanga Peninsula)</b>								
Zamboanga	151	75	184	31	354	34		
<b>Region X (Northern Mindanao)</b>								
Lumbia	167	49	238	36	307	32		
Malaybalay	264	44	468	27	664	12		
<b>Region XII (SOCCSKSARGEN )</b>								
General Santos	134	88	216	81	275	61		
<b>ARMM (Autonomous reg. of Muslim Mindanao)</b>								
Cotabato	148	14	281	5	334	7		



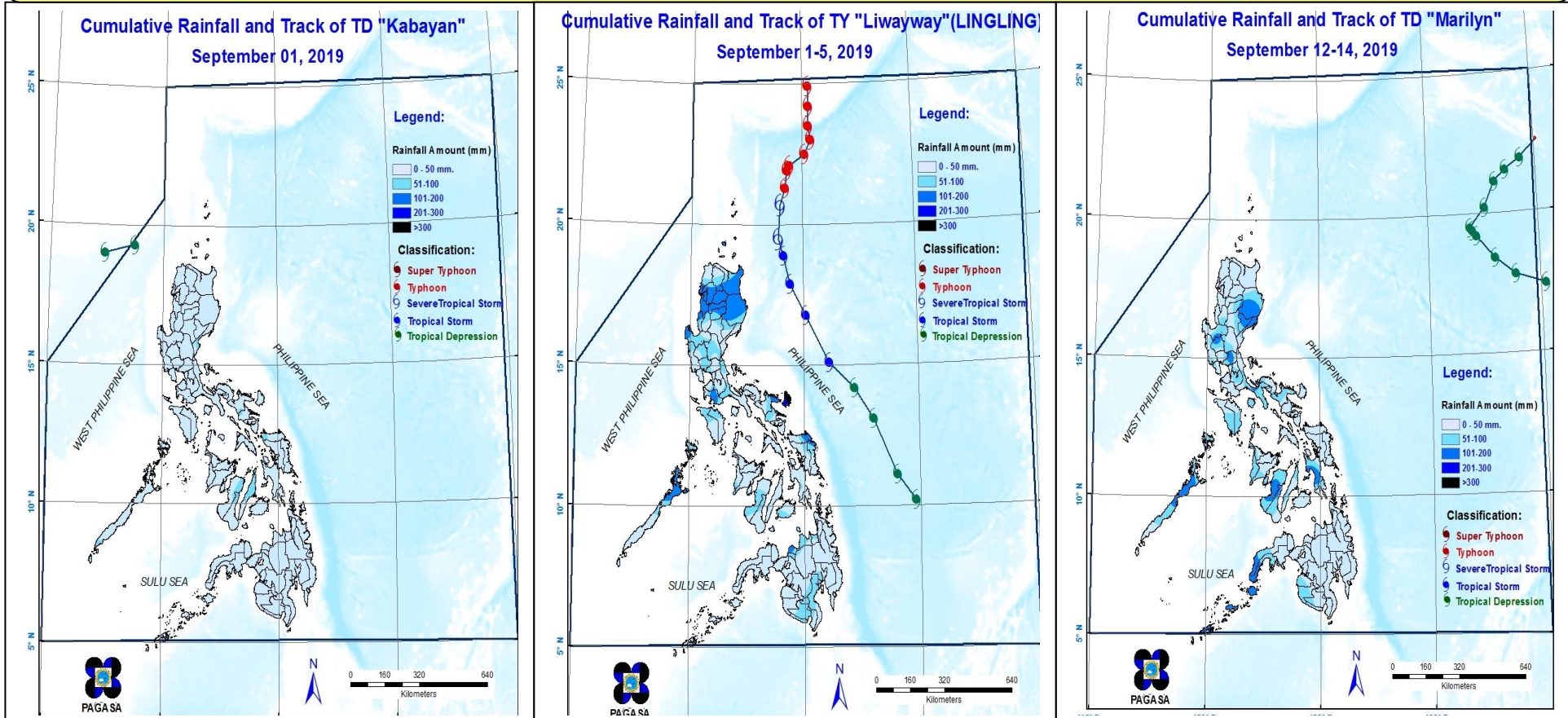
**TABLE 5.0 DECADAL AND CUMULATIVE DECADAL RAINFALL**  
**For the month of SEPTEMBER 2019**  
**[actual values (in mm) and percent of normal ]**

	<i>REGION</i>	<i>DECADE</i>	<i>ACTUAL SEP..</i>	<i>% Normal of Actual</i>	<i>CUMULATIVE JAN-SEP</i>	<i>% Normal Cumulative</i>
<b>R01</b>	Ilocos Region	25	315.5	189	2315.2	113
		26	158.0	99	2473.2	112
		27	45.3	53	2518.5	110
<b>CAR</b>	CAR	25	224.8	153	1986.3	114
		26	134.4	98	2120.7	113
		27	56.2	72	2176.9	111
<b>R02</b>	Cagayan Valley	25	91.9	88	1490.2	102
		26	150.5	140	1640.7	104
		27	48.7	66	1689.5	103
<b>R03</b>	Central Luzon	25	181.7	146	1995.8	109
		26	250.5	162	2246.2	113
		27	44.4	51	2290.6	111
<b>R04-A</b>	CALABARZON	25	40.3	46	1151.7	78
		26	173.2	180	1325.0	84
		27	19.5	21	1344.5	81
<b>R04-B</b>	MIMAROPA	25	52.3	55	1133.6	92
		26	237.4	218	1371.0	102
		27	6.9	8	1377.9	96
<b>NCR</b>	NCR	25	72.7	59	1520.4	95
		26	242.9	175	1763.3	101
		27	27.2	31	1790.5	98
<b>R05</b>	Bicol Region	25	20.8	27	1087.5	72
		26	133.5	175	1221.0	77
		27	3.3	4	1224.3	73
<b>R06</b>	Western Visayas	25	29.7	35	905.0	73
		26	55.8	67	960.8	73
		27	15.9	19	976.7	70
<b>R07</b>	Central Visayas	25	33.9	60	798.0	87
		26	34.2	65	832.2	85
		27	6.4	10	838.5	81
<b>R08</b>	Eastern Visayas	25	27.3	45	1228.6	79
		26	47.7	78	1276.3	79
		27	7.2	9	1283.5	75
<b>R09</b>	Zamboanga Peninsula	25	11.0	16	673.5	61
		26	81.5	149	755.0	66
		27	0.6	1	755.6	62
<b>R10</b>	Northern Mindanao	25	61.4	79	1108.1	80
		26	15.2	20	1123.4	77
		27	23.6	31	1147.0	74
<b>R11</b>	Davao Region	25	61.9	108	1652.2	113
		26	13.6	23	1665.8	110
		27	8.5	14	1674.3	106
<b>R12</b>	SOCCSKSARGEN	25	25.2	47	792.3	79
		26	42.8	87	835.1	79
		27	6.3	13	841.4	76
	CARAGA	25	34.9	56	1454.6	72
		26	5.1	9	1459.7	70
		27	12.7	20	1472.4	69
	ARMM	25	21.1	34	692.8	65
		26	79.2	141	772.0	69
		27	5.4	9	777.4	66

**FIG. 1.0 Spatial Analysis of GENERALIZED SOUTHWEST MONSOON INDEX Ending SEPTEMBER 2019 in Percentile Rank**



**FIG. 2.0 ACTUAL CUMULATIVE RAINFALL DURING THE PASSAGE OF TROPICAL CYCLONE IN THE PHIL. FOR THE MONTH OF SEPTEMBER 2019**

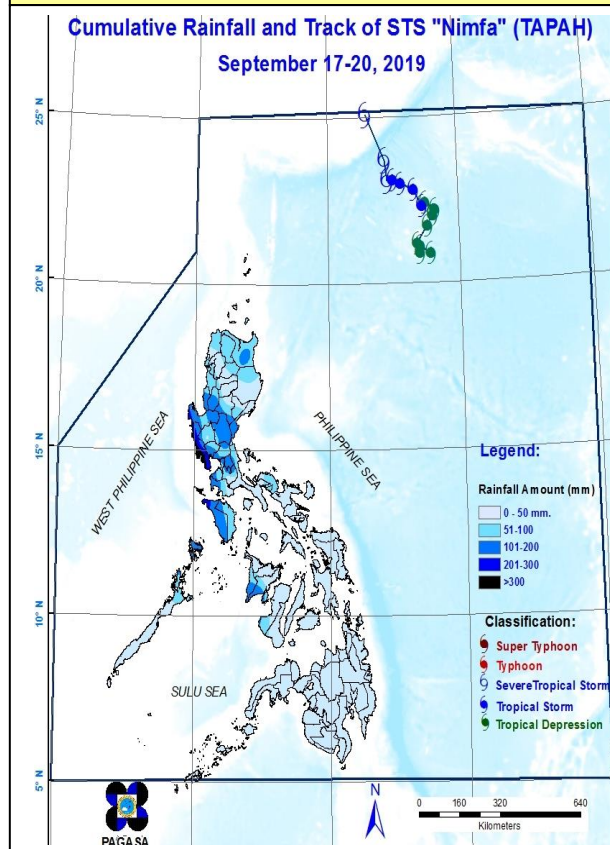


**Fig. 2.a. Actual Cumulative Rainfall during the Passage of Tropical Depression (TD) "KABAYAN" ( September 01. 2019)**

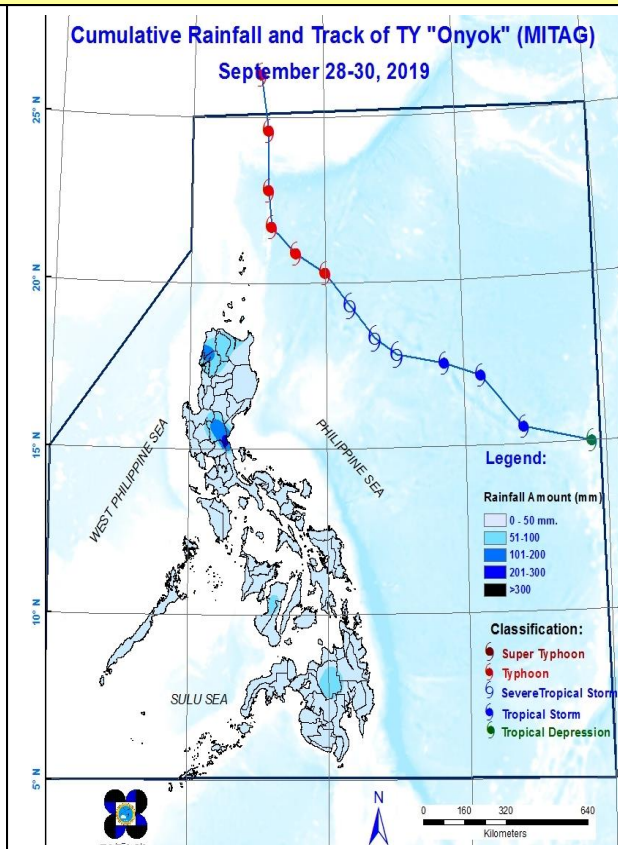
**Fig. 2.b. Actual Cumulative Rainfall during the Passage of Typhoon (TY) "LIWAYWAY" (September 01-05. 2019)**

**Fig. 2.c. Actual Cumulative Rainfall during the Passage of Tropical Depression (TD) "MARILYN" ( September 12-14. 2019)**

**ACTUAL CUMULATIVE RAINFALL DURING THE PASSAGE OF TROPICAL CYCLONE IN THE PHIL. FOR THE MONTH OF SEPTEMBER 2019**

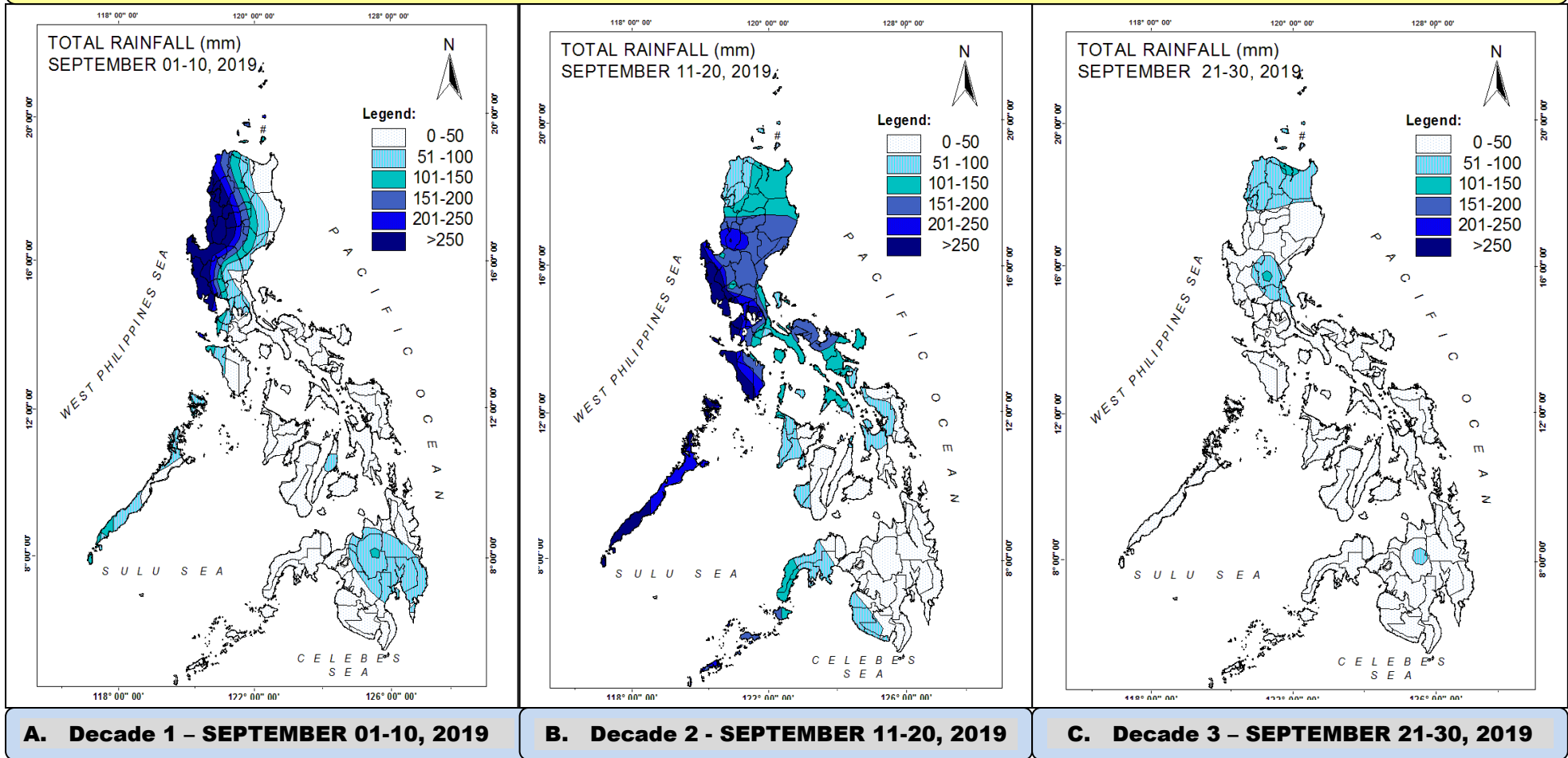


**Fig. 2.d. Actual Cumulative Rainfall during the Passage of Severe Tropical Storm (STS) "NIMFA" (September 17-20, 2019)**

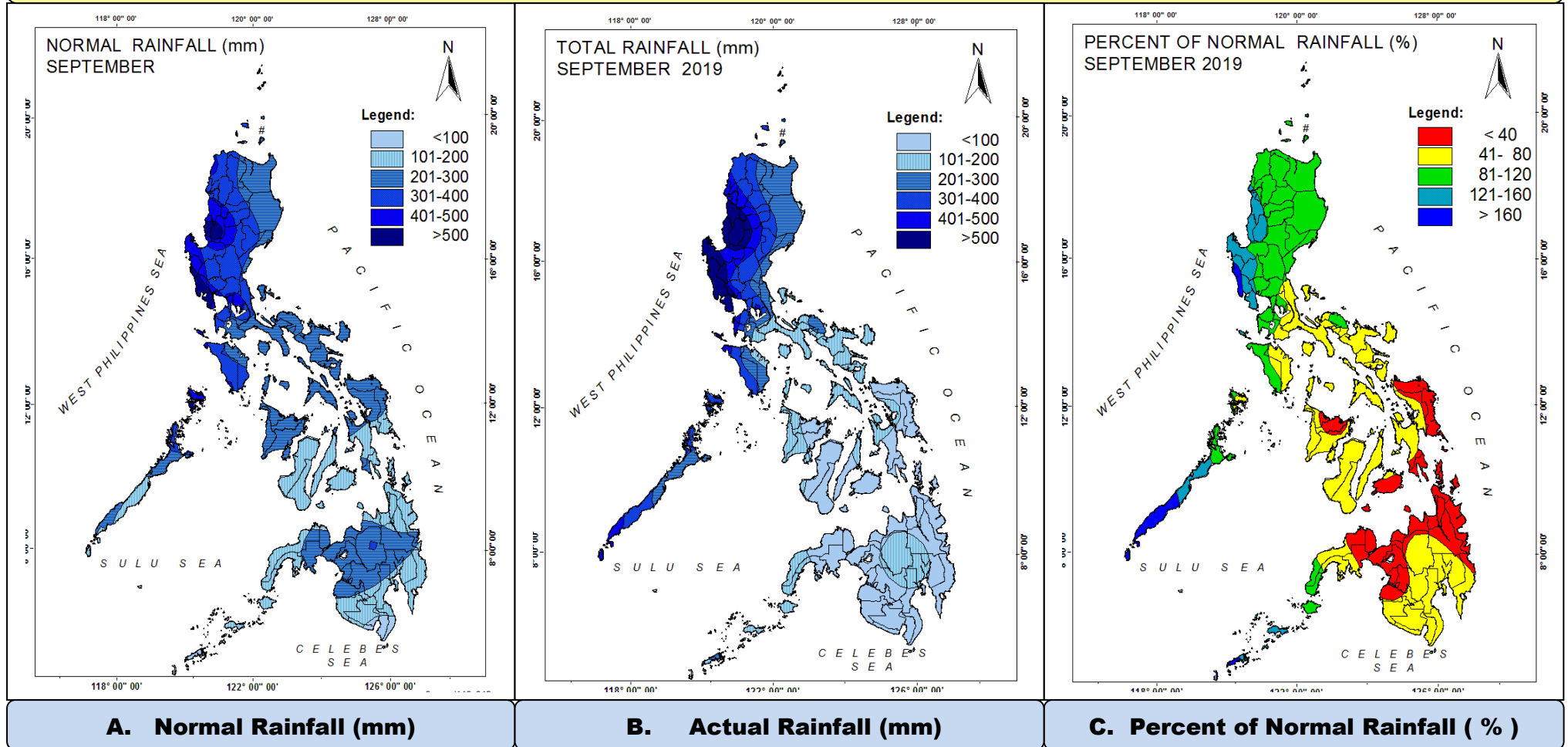


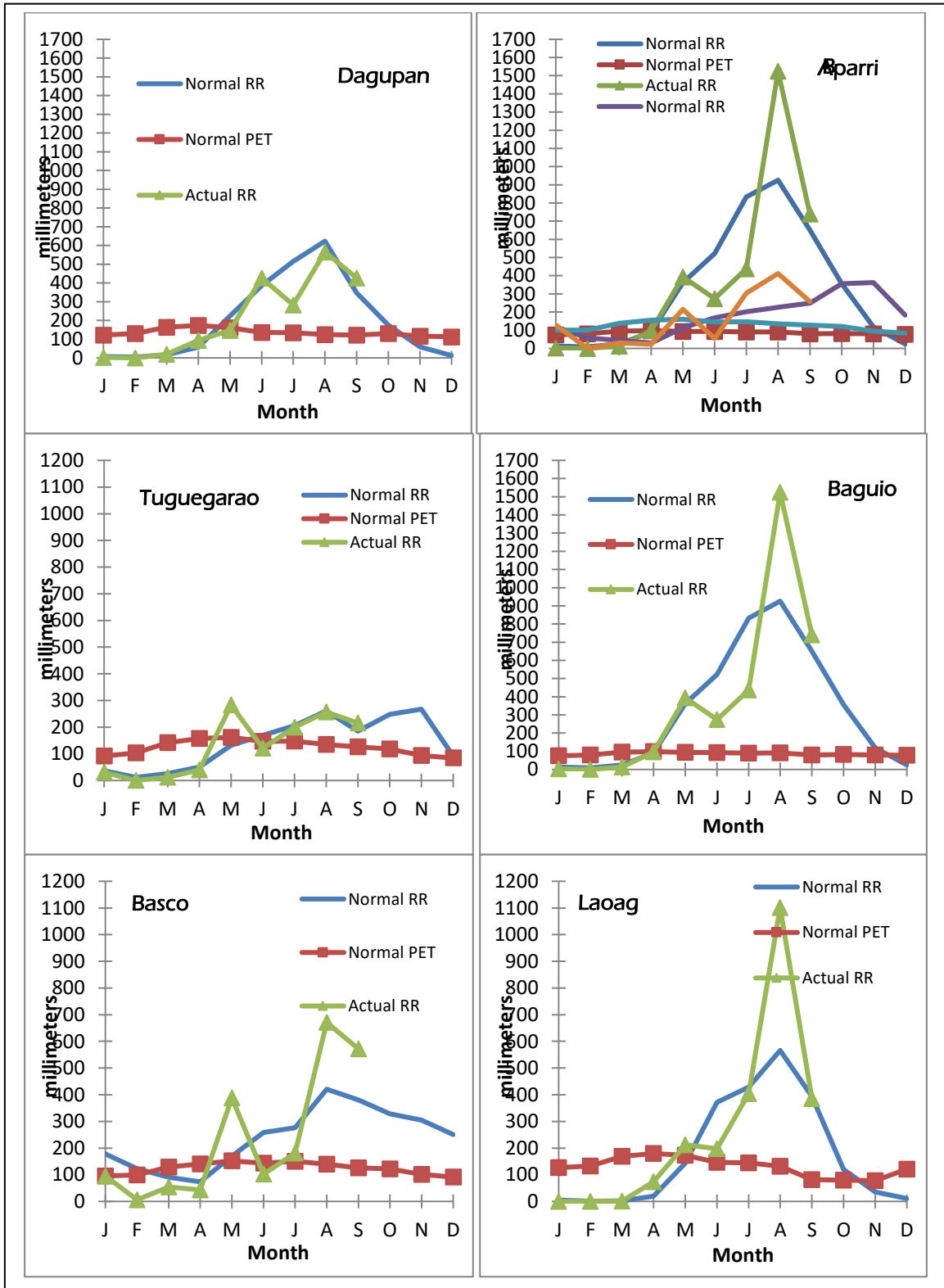
**Fig. 2.e. Actual Cumulative Rainfall during the Passage of Typhoon (TY) "ONYOK" (September 29-30, 2019)**

**FIG. 3.0 TEN DAYS ACTUAL RAINFALL DISTRIBUTION IN THE PHILIPPINES for the month of SEPTEMBER 2019**

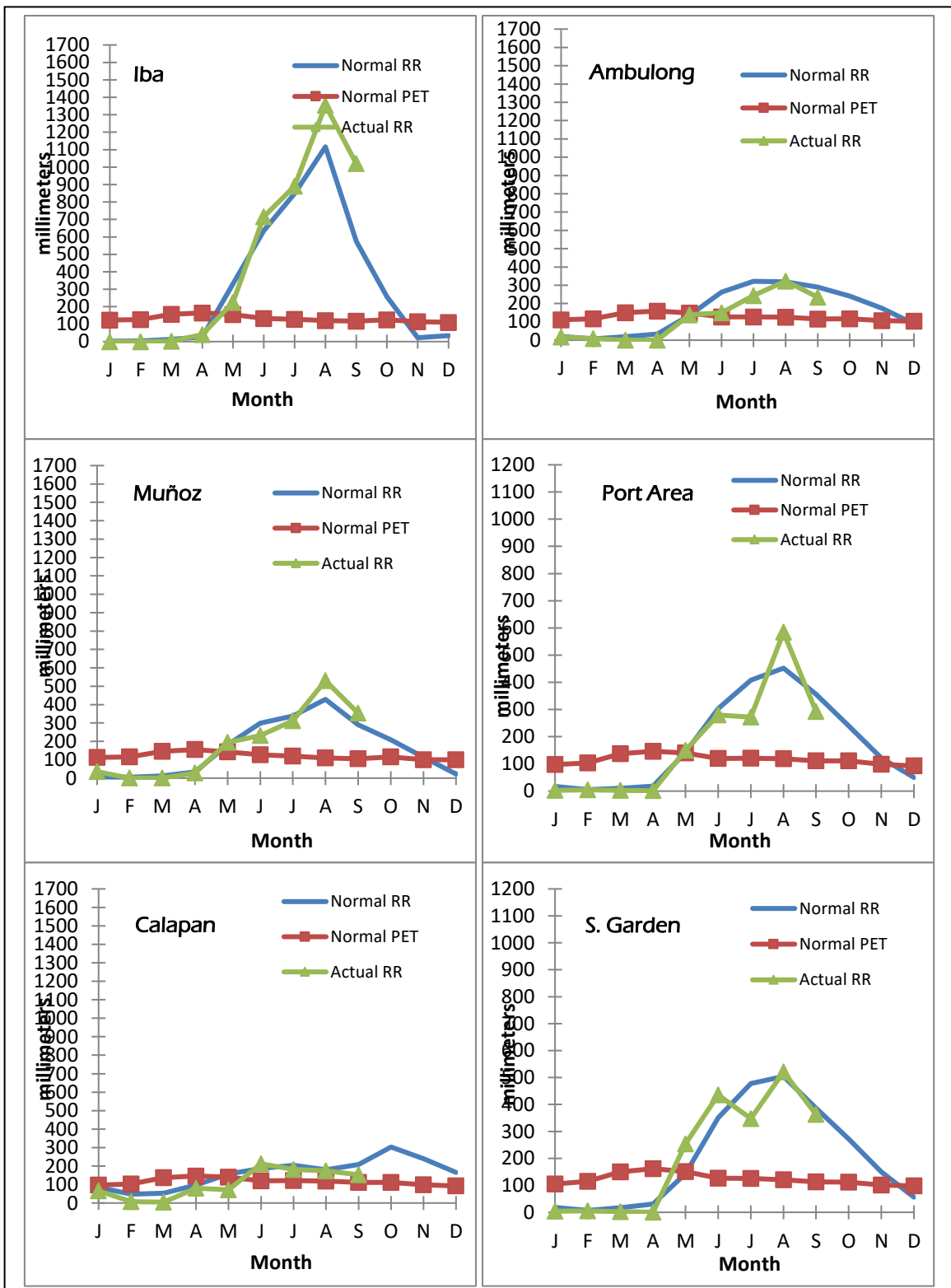


**FIG. 4.0 RAINFALL IN THE PHILIPPINES for the month of SEPTEMBER 2019**



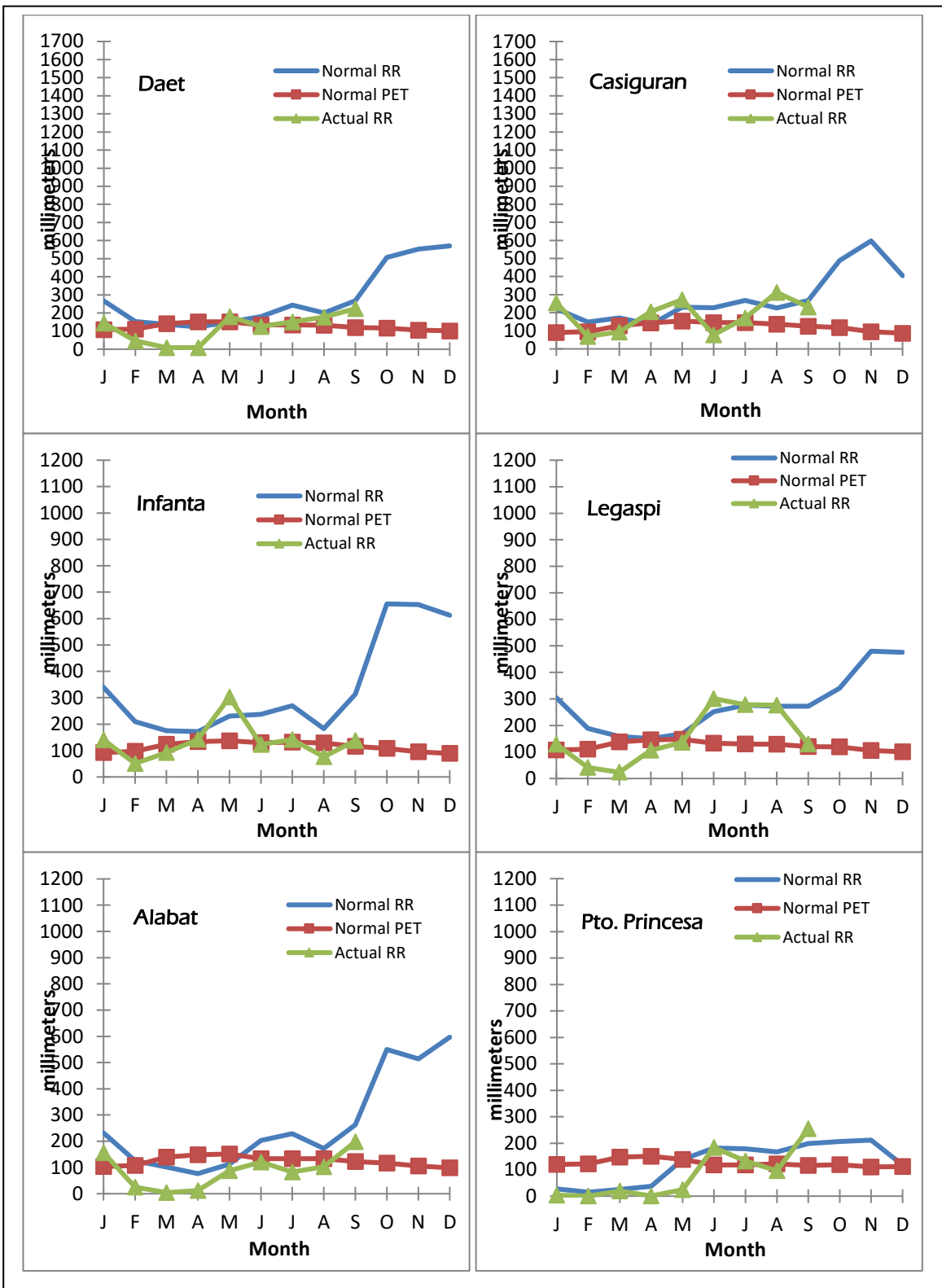


**Fig. 5.0 Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Laoag, Basco, Baguio, Aparri, Dagupan, and Tuguegarao.**

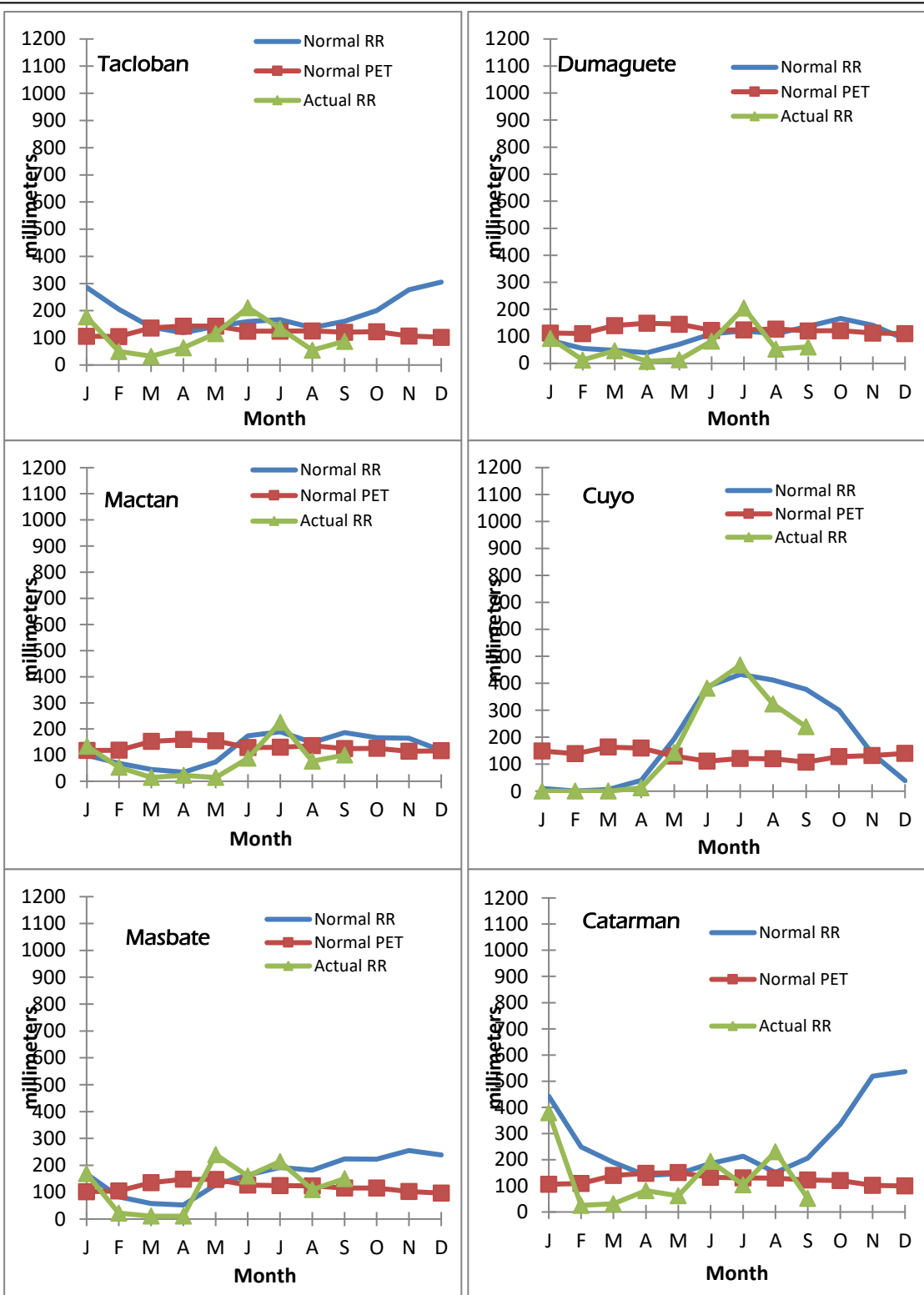


**Fig 5a. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Iba, Ambulong, Muñoz, Port Area, Calapan, and Science Garden.**

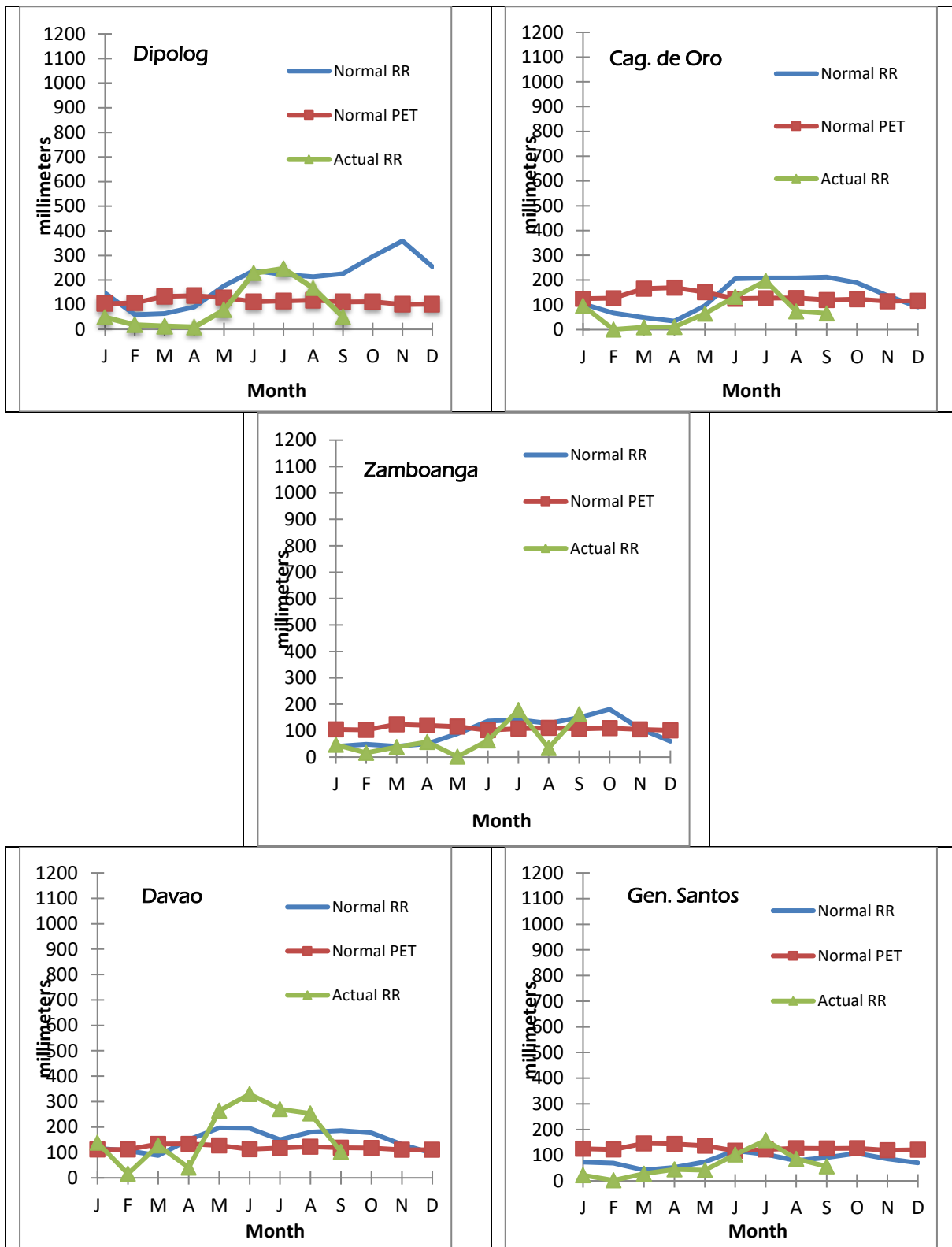




**Fig. 5b. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Daet, Casiguran, Infanta, Legaspi, Alabat, and Puerto Princesa.**



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



**Fig 5d. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Davao, General Santos, Zamboanga, Cagayan de Oro, and Dipolog.**