



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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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_w) 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_e) in an area during October to January is defined as:

$$GMIs_e = W_{10}P_{10} + W_{11}P_{11} + W_{12}P_{12} + W_{13}P_{13}$$

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:

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

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*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 JUNE 2019

OVERVIEW

Harvesting of dry season corn in Catanduanes and Hinatuan had just begun. Normal to above normal yield is expected in Catanduanes due to sufficient moisture experienced by the crops from planting to maturity. However, in Hinatuan, below normal yield is anticipated because crops experienced moisture stress during its critical stage of growth. Land preparation, planting and transplanting activities for delay planted lowland and upland palay in CAR, Region I, Region III, Ambulong, Tayabas, Coron, Cuyo, Pto. Princesa, San Jose, Legaspi, Catanduanes, Masbate, Catarman, Catbalogan, Tacloban, Zamboanga del Norte, Bukidnon, Surigao del norte and Davao region. These were made possible due to sufficient moisture available during the month in those areas. On the other hand, in Region II, Casiguran, Romblon, Region VII, Zamboanga del Sur, Misamis Oriental and General Santos, planting activities were hampered due to inadequate moisture in those areas. Standing crops in CAR, Laoag, Sinit, Baler, Tayabas, Masbate and Davao region are in good condition, but in Iba, Munos, Infanta, Calapan, Romblon, and Daet, crops are suffered from moisture stress.

The weather systems that affected the country during the month were the Southwest (SW) monsoon, tail-end of the cold front (TECF), ridge of high pressure areas (HPAs), easterlies, low pressure areas (LPAs), and localized thunderstorms. Two tropical cyclones (TCs) entered/developed in the Philippine area of Responsibility (PAR), namely Tropical depression (TD) "Dodong" (June 25-26) and Tropical Depression (TD) "Egay" (June 30-July 01). Those two TCs did not cross the country but enhanced the SW monsoon and brought significant rainfall in most areas of western Luzon and Visayas and increased the water level in dams. Onset of the rainy season associated with the SW monsoon was officially declared on June 14.

Generally, near normal rainfall conditions were experienced in most areas of western Luzon, western and eastern Visayas and most parts of Mindanao; while Bataan, Zambales, Leyte, Southern Leyte and Davao Region received above normal rainfall. In contrast, below normal rainfall was observed over several areas in northern and eastern Luzon, including Bicol Region, Central Visayas and some parts of Mindanao.

REGION I (Ilocos Region)

Land preparation, planting and transplanting activities for delay-planted, upland 1st palay across the region now commences, made possible by the sufficient rainfall. Standing upland palay and wet season corn in the Ilocos province are now in good crop condition.

CAR (Cordillera Autonomous Region)

Land preparation, planting and transplanting activities for delay-planted, upland 1st palay is ongoing in all parts of the region because of the adequate moisture during the month. Standing rice and corn crops are faring well.

REGION II (Cagayan Valley)

Land preparation and other farming activities are hindered by the inadequate rainfall over the region. Standing rice and corn crops were also affected by the moisture deficiency during the month.

REGION III (Central Luzon)

Sufficient rainfall received during the month favors land preparation, planting and transplanting activities for planting delay-planted, upland 1st palay throughout the region. Standing rice and corn crops are in good crop condition. However, in Casiguran, crops suffered from moisture stress due to the inadequate moisture during the month.

REGION IV-A (CALABARZON)

The ample amount of rainfall received during month is still favorable for land preparation, planting and transplanting activities for the delay-planted upland 1st palay, in Tayabas and Ambulong. In Infanta, however, farming activities related to planting delay-planted, lowland palay is not possible due to the minimal moisture available in June. Standing upland palay as well as wet season corn in Tayabas are faring well.

REGION IV-B (MIMAROPA)

Land preparation, planting and transplanting activities for delay-planted, upland 1st palay had just begun in most parts of the region except in Romblon. These activities were favored by the sufficient rainfall received during the month. Standing upland palay as well as wet season corn in Romblon suffered moisture stress due to the limited moisture during the month.

REGION V (Bicol Region)

Adequate rainfall received in Albay and Catanduanes favors land preparation, planting and transplanting activities for delay-planted, lowland 1st palay. The same is true to delay-planted, upland palay in Masbate. Similarly, standing upland 1st palay as well as wet season corn in Masbate are in good crop condition due to the ample amount of moisture available during the month.

REGION VI (Western Visayas)

Due to the insufficient rainfall received during the month, any farming activities related to planting rice and corn will not be possible across the region.

REGION VII (Central Visayas)

Any farming activity related to planting delay-planted, lowland and upland 1st palay is not possible in any part of the region because of the minimal moisture available during the month.

REGION VIII (Eastern Visayas)

Land preparation, planting and transplanting activities for delay-planted, lowland 1st palay as well as delay-planted, upland 1st palay has begun in eastern Samar. Moisture is sufficient during the month.

REGION IX (Zamboanga Peninsula)

Land preparation, planting and transplanting activities for delay-planted, upland 1st palay in Zamboanga del Norte had only recently started due to sufficient moisture available. On the other hand, any farming activity related to planting rice is not possible in Zamboanga del Sur because of the minimal moisture.

REGION X (Northern Mindanao)

Sufficient moisture in Bukidnon, favored land preparation, planting and transplanting activities for delay-planted upland 1st palay. On the other hand, farming activities in Misamis Oriental are hampered by the minimal rainfall received over the area.

REGION XI (Davao Region)

Due to sufficient moisture and favorable weather condition available during the month, land preparation, planting, and transplanting activities for delay-planted, upland 1st palay have just started across the region. Likewise, standing upland palay as well as wet season corn planted in May are faring well.

REGION XII (SOCCSKSARGEN)

Moisture available during the month remains inadequate for planting rice and corn in any part of the region.

REGION XIII (CARAGA Region)

Harvesting of dry-season corn has now started in Surigao del Sur; below normal yield is expected because crops experienced moisture deficiency during the critical stage of growth.

ARMM (Autonomous Region of Muslim Mindanao)

In-season fruits and vegetables are in good crop condition due to the sufficient moisture available during the month. Rice and corn crops were not planted all over the region because of the inadequate rainfall received last month.

For Particulars, please contact:
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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
CAR (Cordillera Administrative Reg.)								
Baguio	49	36						
Region I (Ilocos Reg.)								
Dagupan	85	69						
Vigan	57	47						
Laoag	39	36						
Region II (Cagayan Valley)								
Aparri	10	25						
Basco	21	31						
Tuguegarao	25	39						
Region III (Central Luzon)								
Iba	136	71						
Cabanatuan	46	54						
Baler	55	39						
Casiguran	19	10						
NCR (Metro Manila)								
Science Garden	83	75						
Region IV-A (CALABARZON)								
Ambulong	32	29						
Infanta	31	25						
Tayabas	42	36						
Region IV-B (MIMAROPA)								
Calapan	57	58						
Coron	58	44						
Cuyo	92	63						
Puerto Princesa	46	66						
Romblon	26	8						
San Jose	76	71						
Region V (Bicol Reg.)								
Daet	26	25						
Legaspi	72	78						
Masbate	34	59						
Virac Synop	50	49						
Region VI (Western Visayas)								
Roxas	39	17						
Region VII (Central Visayas)								
Mactan	23	14						
Dumaguete	22	31						
Tagbilaran	22	27						
Region VIII (Eastern Visayas)								
Catarman	48	56						
Catbalogan	40	37						
Tacloban	57	68						
Region IX (Zamboanga Peninsula)								
Dipolog	66	44						
Zamboanga	16	17						
Region X (Northern Mindanao)								
Lumbia	33	39						
Malaybalay	69	39						
Region XI (Davao Reg.)								
Davao	89	93						
Region XII (SOCCSKSARGEN)								
General Santos	30	63						
Region XIII (Caraga)								
Surigao	26	37						
Hinatuan	82	59						
ARMM (Autonomous reg. of Muslim Mindanao)								
Cotabato	55	14						

TABLE 2.0 CUMULATIVE YIELD MOISTURE INDICES FOR DRY SEASON CORN in Millimeters and Percentile Rank.
(April – June 2019)

STATIONS	APRIL		MAY		JUNE	
	YMI	%RANK	YMI	%RANK	YMI	%RANK
Region IV-A (CALABARZON)						
Infanta	93	51	410	75	502	53
Region V (Bicol Reg.)						
Daet	6	5	196	53	290	37
Legaspi	69	42	211	34	437	53
Virac	52	41	261	37	309	34
Region VIII (Eastern Visayas)						
Catarman	53	37	164	15	263	24
Region XIII (CARAGA)						
Hinatuan	155	36	194	7	400	14
Surigao	86	29	179	31	265	29

TABLE 3.0 CUMULATIVE YIELD MOISTURE INDICES FOR LOWLAND FIRST PALAY in Millimeters and Percentile Rank.
(May - August 2019)

STATIONS	MAY		JUNE		JULY		AUGUST	
	YMI	% RANK	YMI	% RANK	YMI	% RANK	YMI	% RANK
Region IV-A (CALABARZON)								
Infanta	257	86	374	47				
Region V (Bicol Reg.)								
Daet	154	76	273	46				
Legaspi	115	44	401	64				
Virac	91	47	274	37				
Region VIII (Eastern Visayas)								
Catarman	53	24	237	27				
Region XIII (CARAGA)								
Hinatuan	31	7	292	12				
Surigao	75	44	184	36				

**TABLE 4.0 CUMULATIVE YIELD MOISTURE INDICES FOR
UPLAND PALAY in Millimeters and Percentile Rank.
(May - August 2019)**

STATIONS	MAY		JUNE		JULY		AUGUST	
	YMI	% RANK	YMI	% RANK	YMI	% RANK	YMI	% RANK
CAR (Cordillera Autonomous Reg.)								
Baguio	335	51	595	37				
Region I (Ilocos Reg.)								
Dagupan	125	27	530	66				
Vigan	176	41	459	54				
Laoag	180	42	368	42				
Region II (Cagayan Valley)								
Aparri	183	66	235	66				
Basco	330	59	428	71				
Tuguegarao	241	61	356	83				
Region III (Central Luzon)								
Iba	191	39	871	69				
Cabanatuan	165	46	385	59				
Baler	353	64	545	63				
Casiguran	232	47	306	34				
Region IV-A (CALABARZON)								
Tayabas	222	59	377	76				
Region IV-B (MIMAROPA)								
Calapan	61	15	263	36				
Romblon	152	56	255	36				
Region V (Bicol Reg.)								
Masbate	204	59	357	76				
Region VI (Western Visayas)								
Roxas	20	8	157	10				
Region VII (Central Visayas)								
Cebu	12	15	95	7				
Dumaguete	12	10	91	19				
Tagbilaran	77	41	153	34				
Region VIII (Eastern Visayas)								
Catbalogan	24	7	190	15				
Tacloban	99	31	300	61				
Region IX (Western Mindanao)								
Dipolog	67	22	284	24				
Zamboanga	1	2	61	3				
Region X (Northern Mindanao)								
Malaybalay	142	19	404	19				
Lumbia	55	19	182	10				
Region XI (Davao Reg.)								
Davao	224	66	537	93				
Region XII (SOCSARGEN)								
General Santos	35	17	133	36				
ARMM (Autonomous reg. of Muslim Mindanao)								
Cotobato	73	10	254	10				

**TABLE 5.0 CUMULATIVE YIELD MOISTURE INDICES FOR
WET SEASON CORN in Millimeters and Percentile Rank.
(May - July 2019)**

STATIONS	MAY		JUNE		JULY	
	YMI	%RANK	YMI	%RANK	YMI	%RANK
CAR (Cordillera Autonomous Reg.)						
Baguio	256	76	544	34		
Region I (Ilocos Reg.)						
Dagupan	95	37	543	68		
Laoag	138	66	451	61		
Vigan	134	63	341	34		
Region II (Cagayan Valley)						
Aparri	140	95	197	56		
Basco	253	92	360	58		
Tuguegarao	184	92	311	80		
Region III (Central Luzon)						
Iba	146	56	898	71		
Cabanatuan	126	69	369	61		
Baler	270	92	482	61		
Casiguran	177	69	259	24		
Region IV-A (CALABARZON)						
Tayabas	170	69	341	54		
Region IV-B (MIMAROPA)						
Calapan	47	22	270	39		
Romblon	116	80	230	31		
Region V (Bicol Reg.)						
Masbate	156	83	325	75		
Region VI (Western Visayas)						
Roxas	15	12	167	10		
Region VII (Central Visayas)						
Cebu	9	19	101	7		
Dumaguete	9	17	96	20		
Tagbilaran	59	64	143	31		
Region VIII (Eastern Visayas)						
Catbalogan	18	7	202	17		
Tacloban	76	44	298	61		
Region IX (Western Mindanao)						
Dipolog	51	25	291	24		
Zamboanga	1	2	67	5		
Region X (Northern Mindanao)						
Lumbia	42	19	182	37		
Malaybalay	109	27	398	19		
Region XI (Davao Reg.)						
Davao	172	90	518	92		
Region XII (SOCSARGEN)						
General Santos	27	25	135	42		

**TABLE 6.0 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						
<i>Region I (Ilocos Reg.)</i>								
Dagupan	362	69						
Vigan	168	27						
Laoag	253	58						
<i>Region II (Cagayan Valley)</i>								
Aparri	47	25						
Basco	87	31						
Tuguegarao	103	39						
<i>Region III (Central Luzon)</i>								
Iba	608	71						
Cabanatuan	197	53						
Baler	172	39						
Casiguran	66	10						
<i>Region IV-A (CALABARZON)</i>								
Ambulong	128	29						
Tayabas	139	36						
<i>Region IV-B (MIMAROPA)</i>								
Coron	247	44						
Cuyo	324	63						
Puerto Princesa	156	66						
Romblon	92	8						
San Jose	292	71						
<i>Region V (Bicol Reg.)</i>								
Masbate	136	59						
<i>Region VI (Western Visayas)</i>								
Roxas	123	17						
<i>Region VII (Central Visayas)</i>								
Mactan, Cebu	75	14						
Dumaguete	70	31						
Tagbilaran	68	27						
<i>Region VIII (Eastern Visayas)</i>								
Catbalogan	149	37						
Tacloban	180	68						
<i>Region IX (Zamboanga Peninsula)</i>								
Dipolog	194	44						
Zamboanga	53	17						
<i>Region X (Northern Mindanao)</i>								
Lumbia	114	39						
Malaybalay	234	39						
<i>Region XI (Davao Reg.)</i>								
Davao	280	93						
<i>Region XII (SOCCSKSARGEN)</i>								
General Santos	87	63						

**TABLE 7.0 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
Region IV-A (CALABARZON)								
Infanta	104	25						
Region V (Bicol Reg.)								
Daet	107	25						
Legaspi	256	78						
Virac	164	49						
Region VIII (Eastern Visayas)								
Catarman	164	56						
Catbalogan	149	37						
Tacloban	180	68						
Region XIII (Caraga)								
Hinatuan	234	59						
Surigao	97	37						

TABLE 8.0 DECADAL AND CUMULATIVE DECADAL RAINFALL
For the month of JUNE 2019
[actual values (in mm) and percent of normal]

	REGION	DECADE	ACTUAL JUNE	% Normal of Actual	CUMULATIVE JUNE-MAY	% Normal Cumulative
R01	Ilocos Region	16	55.4	52	392.1	95
		17	135.5	152	527.6	106
		18	129.4	89	656.9	102
CAR	CAR	16	16.8	20	452.7	105
		17	115.8	156	568.5	112
		18	57.1	48	625.6	100
R02	Cagayan Valley	16	19.3	35	647.3	104
		17	61.2	91	708.5	103
		18	38.7	45	747.1	96
R03	Central Luzon	16	37.9	50	522.6	94
		17	107.7	126	630.3	98
		18	186.5	176	816.8	109
R04-A	CALABARZON	16	37.8	62	474.5	73
		17	48.7	65	523.3	72
		18	94.5	94	617.8	75
R04-B	MIMAROPA	16	76.3	108	227.9	67
		17	53.2	66	281.1	66
		18	113.6	111	394.7	75
NCR	NCR	16	24.5	33	270.5	80
		17	53.7	60	324.2	76
		18	267.6	224	591.7	108
R05	Bicol Region	16	68.6	120	539.2	62
		17	16.0	23	555.2	59
		18	101.6	116	656.8	64
R06	Western Visayas	16	54.1	80	194.0	51
		17	49.5	52	243.5	51
		18	58.3	57	301.8	52
R07	Central Visayas	16	44.6	96	371.5	89
		17	21.6	38	393.1	83
		18	38.3	62	431.4	81
R08	Eastern Visayas	16	113.6	230	805.7	82
		17	31.1	48	836.8	79
		18	53.9	66	890.7	79
R09	Zamboanga Peninsula	16	117.4	160	301.3	60
		17	23.0	32	324.3	56
		18	19.0	29	343.3	53
R10	Northern Mindanao	16	88.0	117	531.0	81
		17	51.7	61	582.7	78
		18	69.5	82	652.2	79
R11	Davao Region	16	95.9	146	997.0	108
		17	97.9	134	1095.0	109
		18	76.4	109	1171.4	109
R12	SOCCSKSARGEN	16	68.9	119	356.6	73
		17	40.7	61	397.3	71
		18	55.2	85	452.5	73
	CARAGA	16	97.9	147	961.2	65
		17	71.1	107	1032.3	67
		18	54.6	81	1087.0	67
	ARMM	16	73.9	108	316.5	66
		17	34.7	49	351.2	64
		18	35.2	53	386.4	63

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

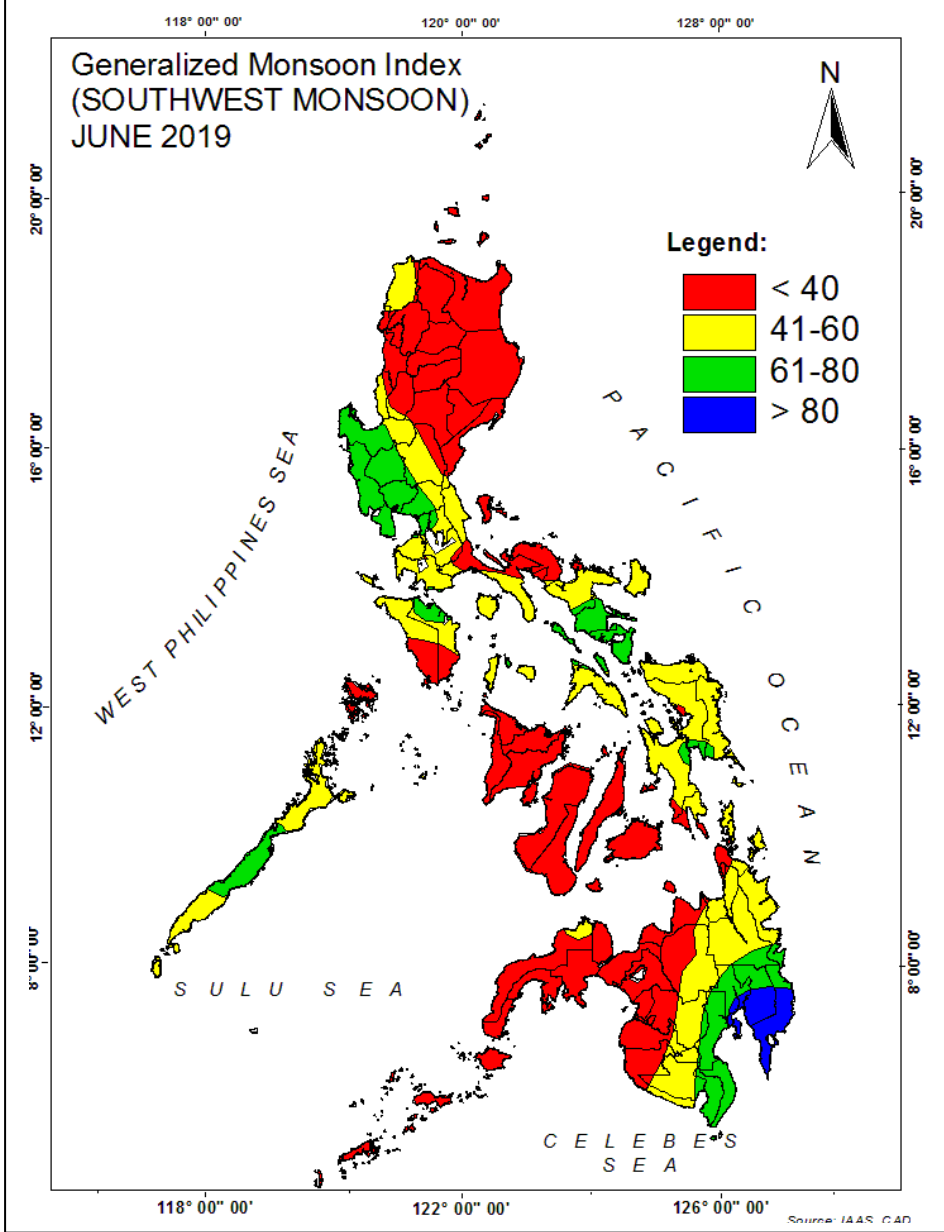


FIG. 2.0 ACTUAL CUMULATIVE RAINFALL DURING THE PASSAGE OF TROPICAL CYCLONE IN THE PHIL. FOR THE MONTH OF JUNE 2019

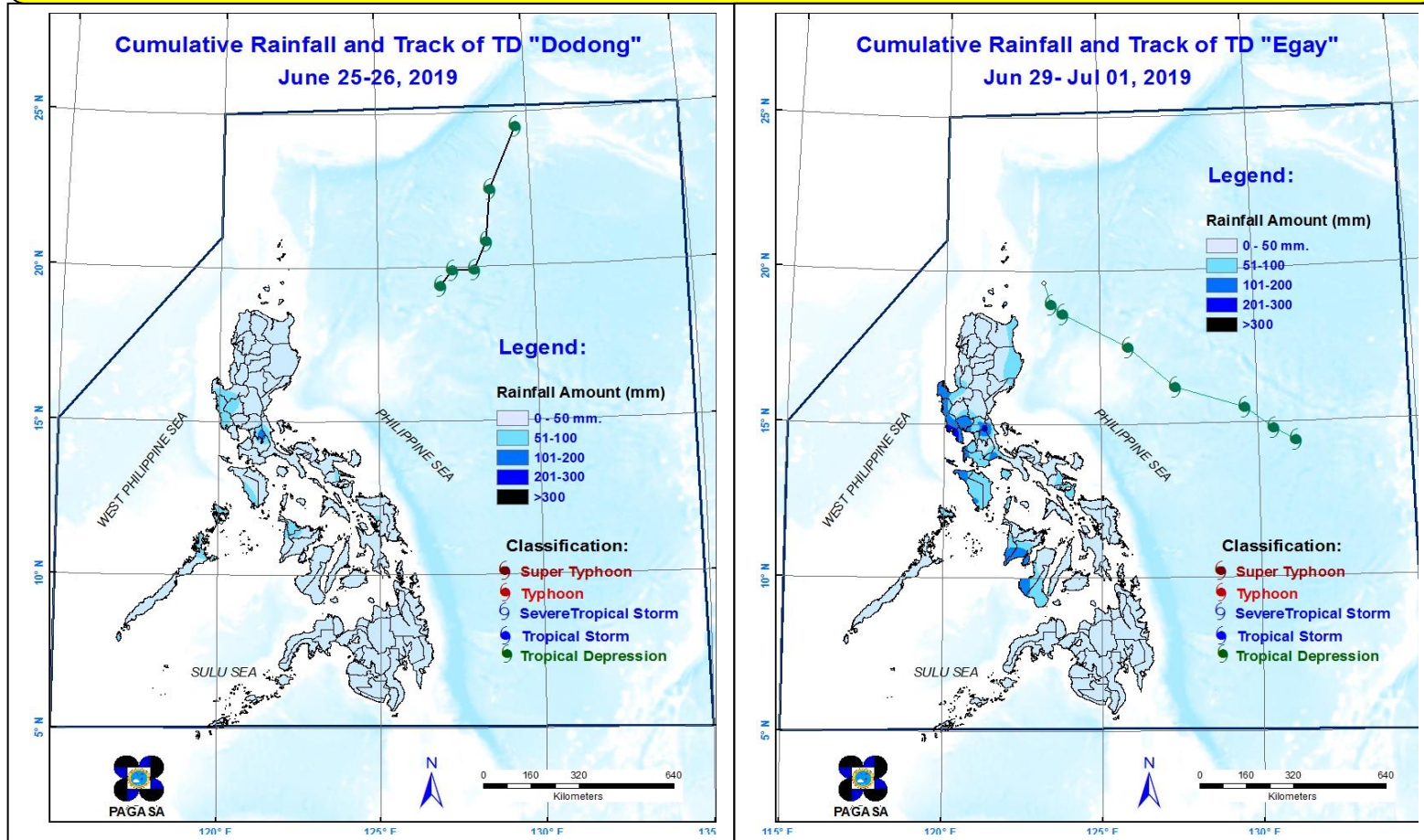


Fig. 2.a. Actual Cumulative Rainfall during the Passage of Tropical Depression (TD) "DODONG" (JUNE 25-26, 2019)

Fig. 2.b. Actual Cumulative Rainfall during the Passage of Tropical Depression (TD) "EGAY" (JUNE 29-Jul31, 2019)

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

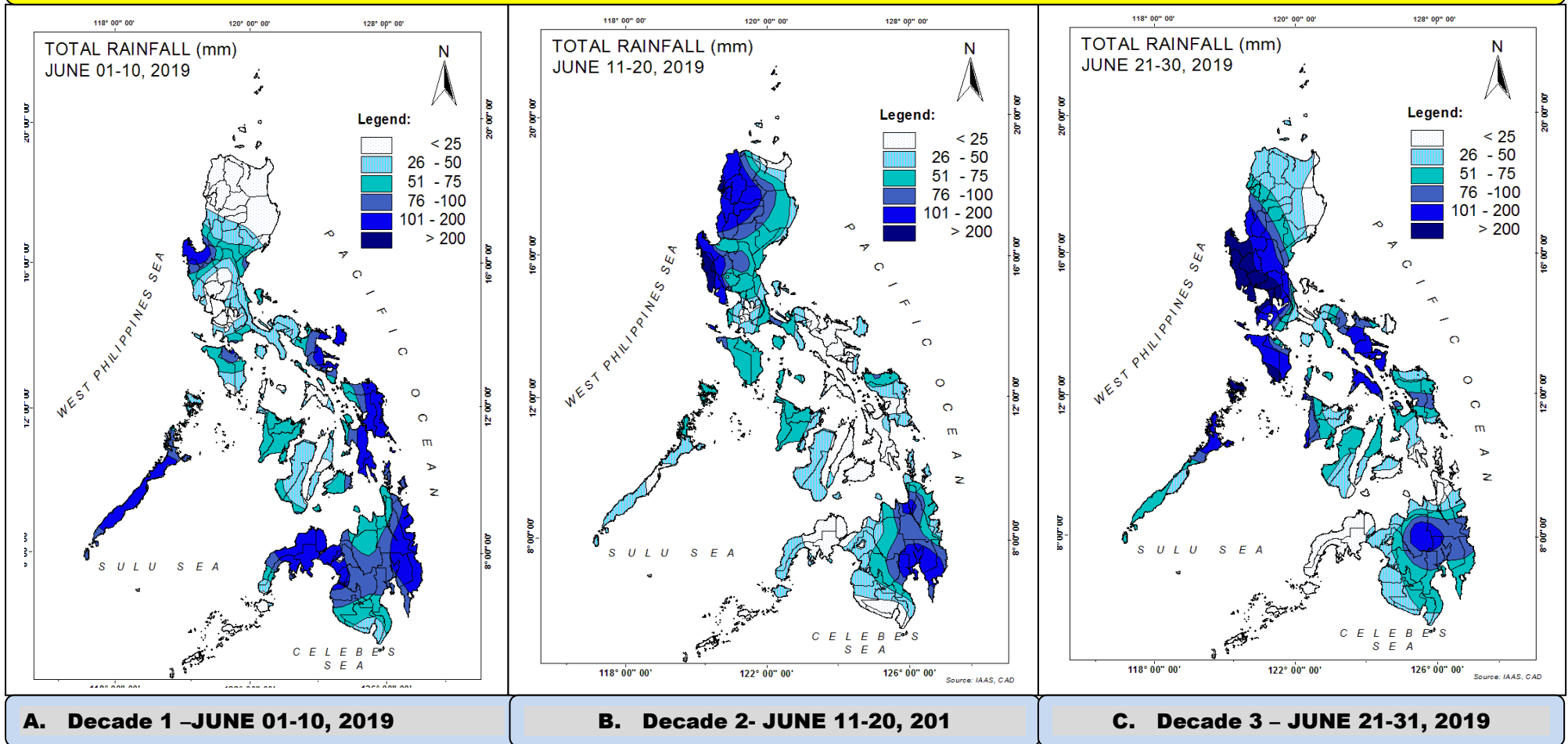
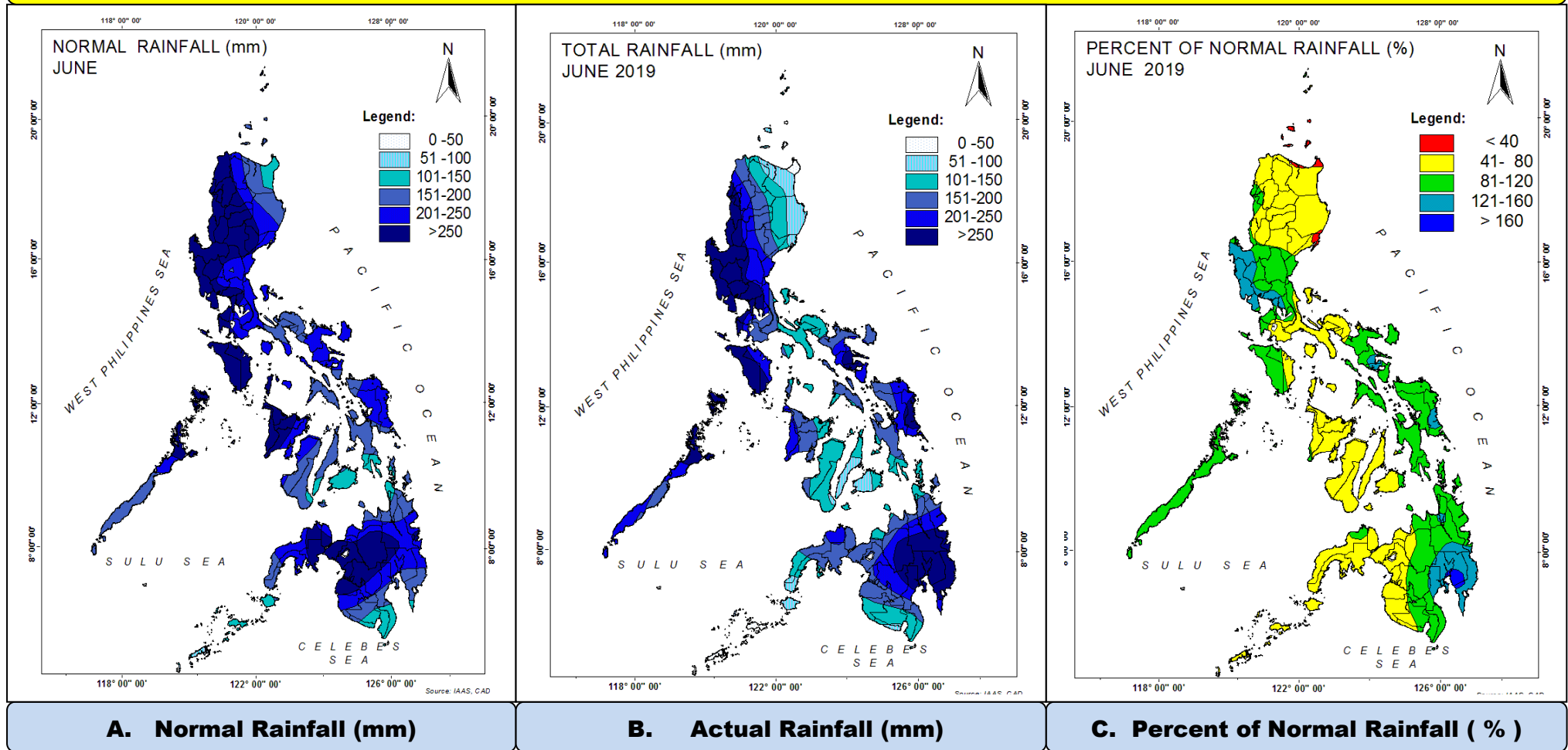


FIG. 4.0 RAINFALL IN THE PHILIPPINES for the month of JUNE 2019



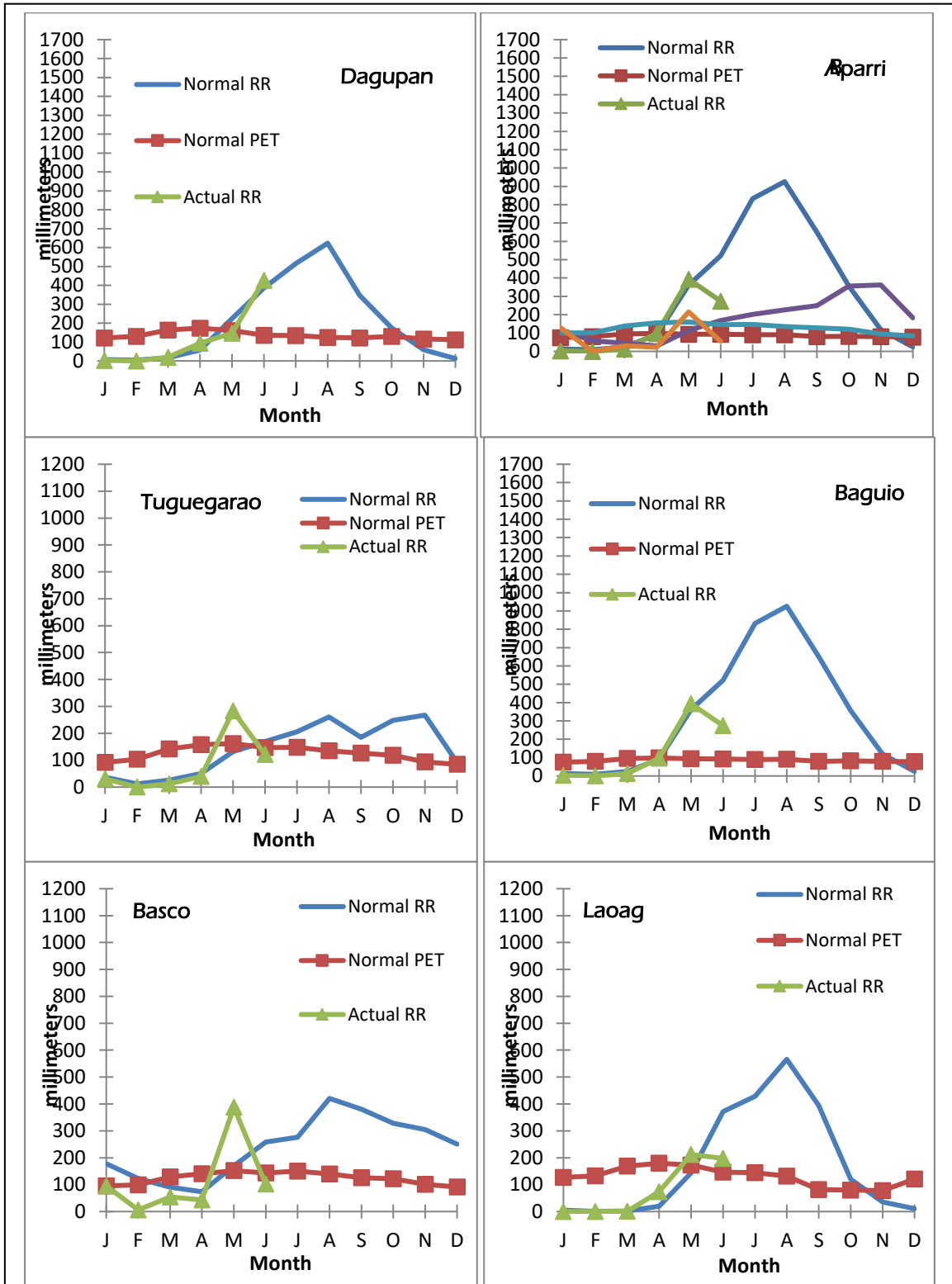


Fig. 5.0 Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Laoag, Basco, Baguio, Aparri, Dagupan, and Tuguegarao.

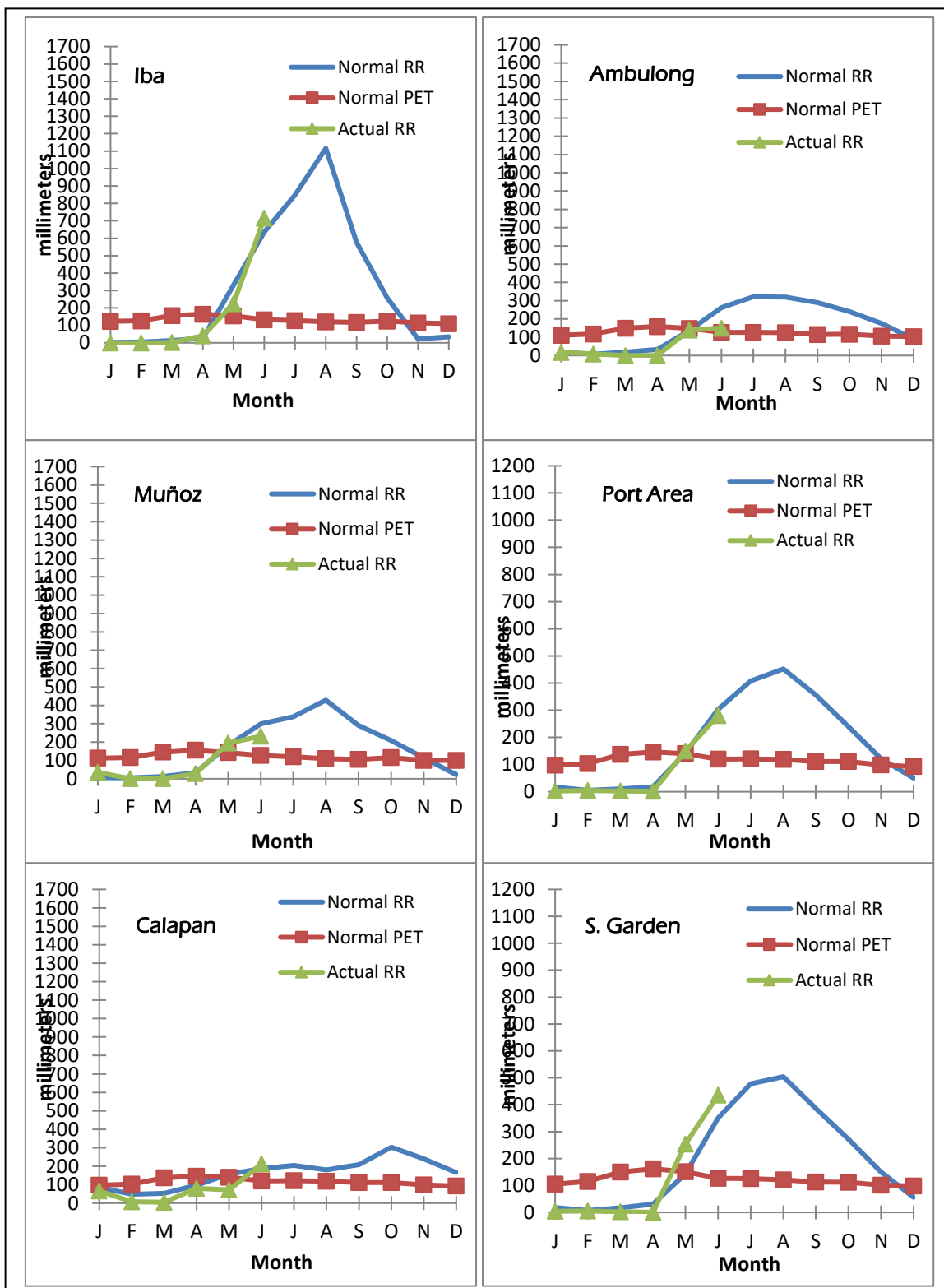


Fig 5a. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Iba, Ambulong, Muñoz, Port Area, Calapan, and Science Garden.

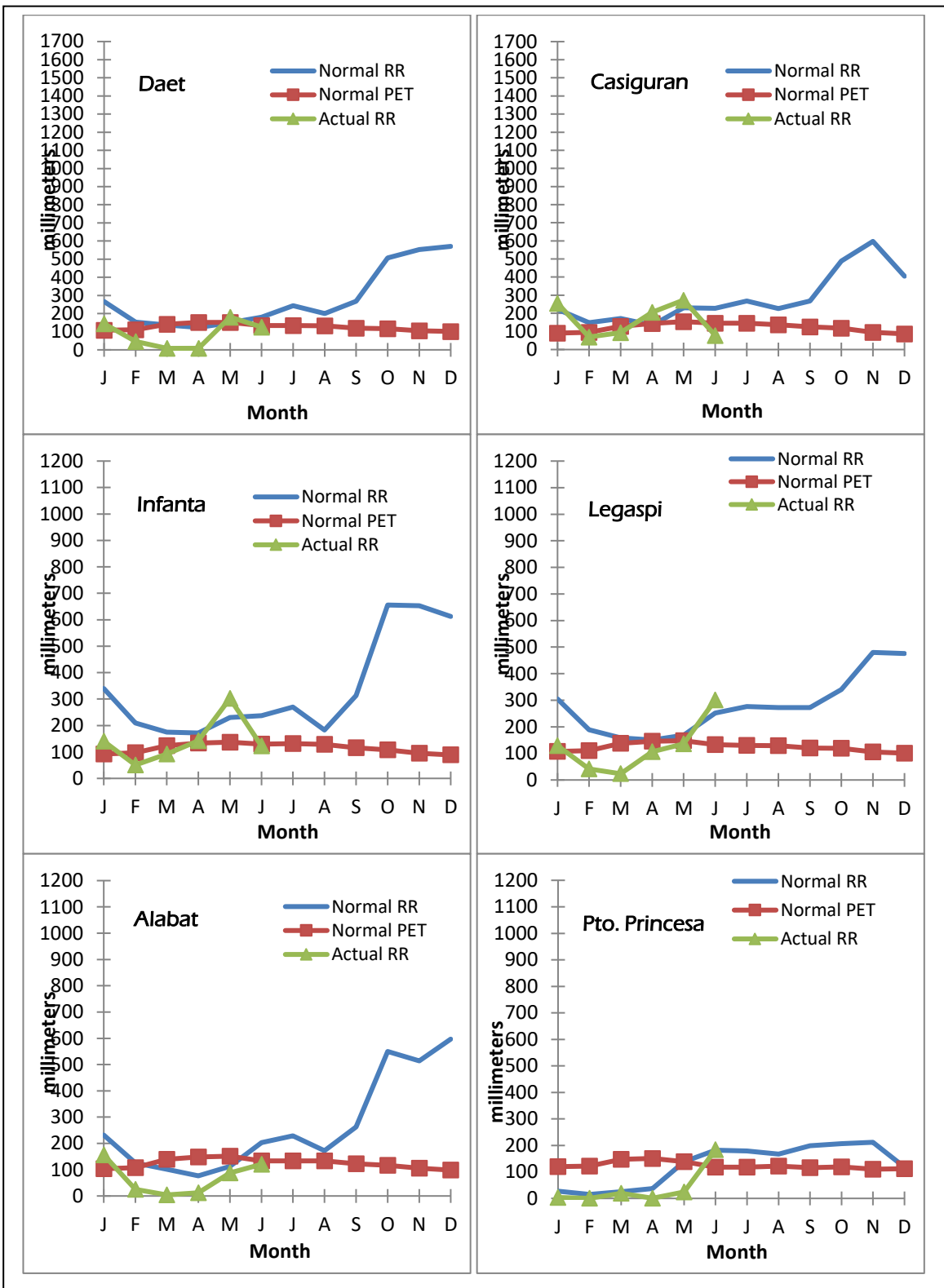


Fig. 5b. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Daet, Casiguran, Infanta, Legaspi, Alabat, and Puerto Princesa.

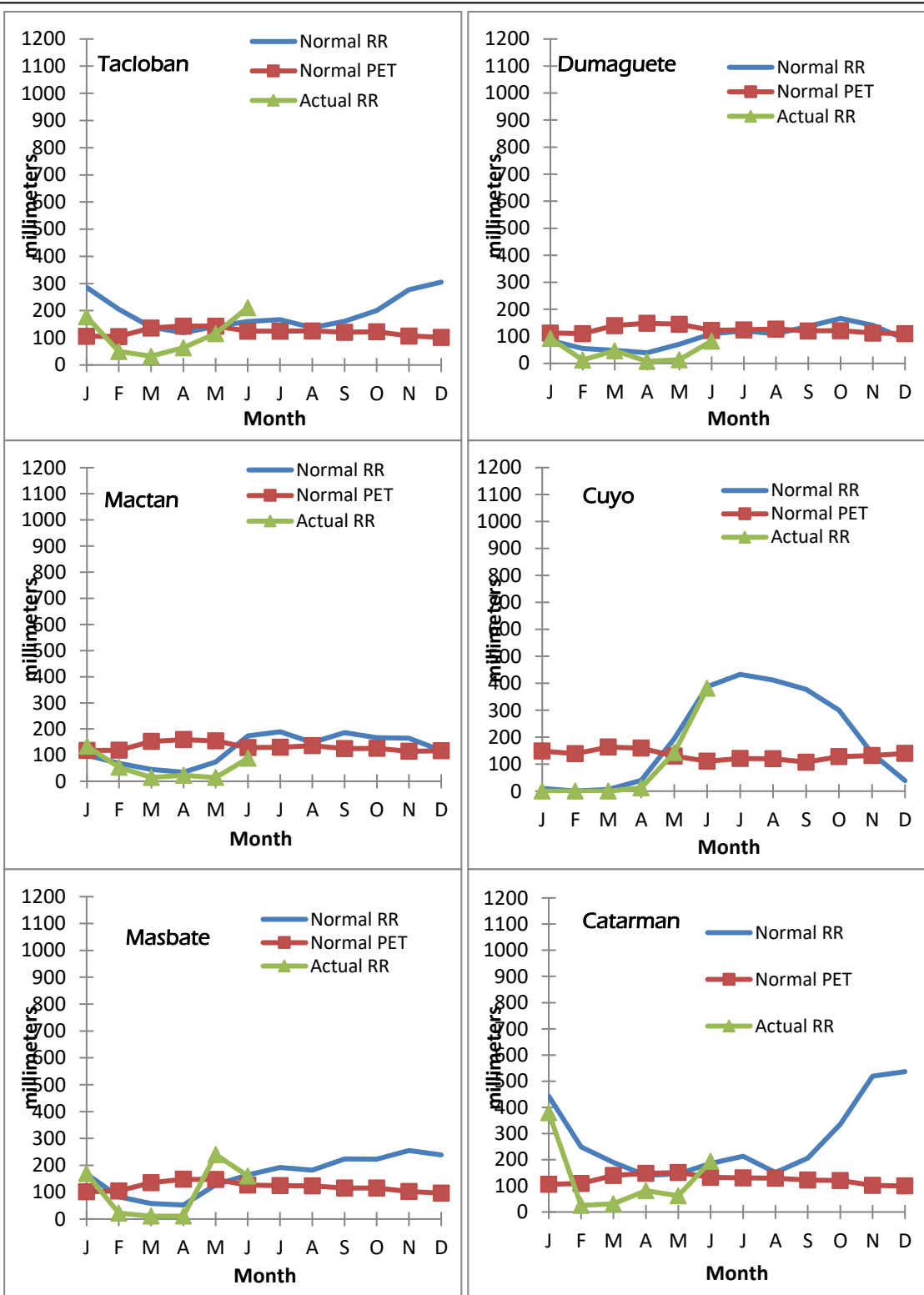


Fig. 5c. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Cuyo, Masbate, Mactan, Tacloban, Catarman and Dumaguete.

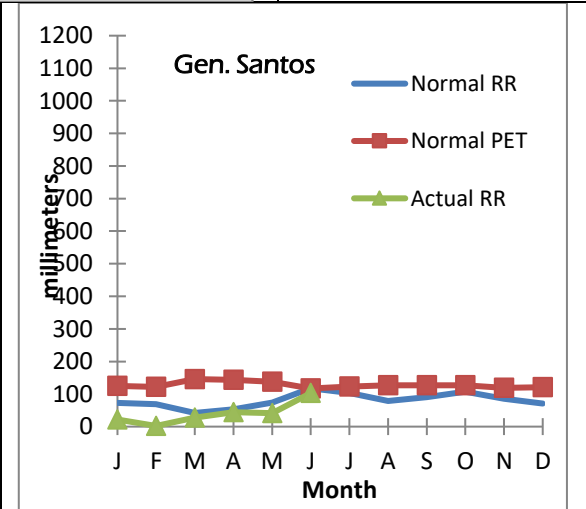
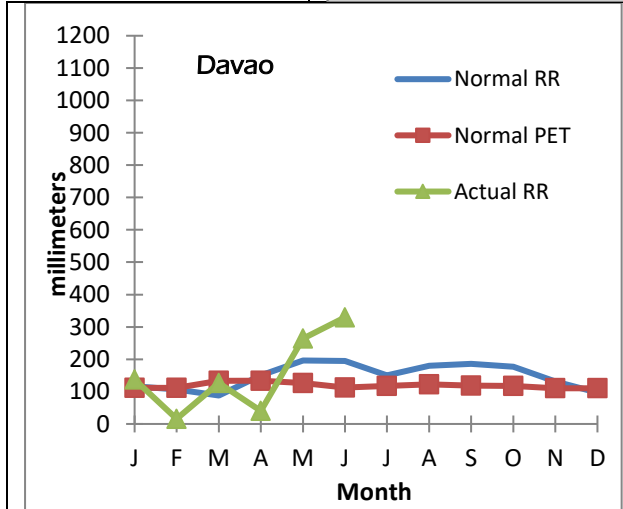
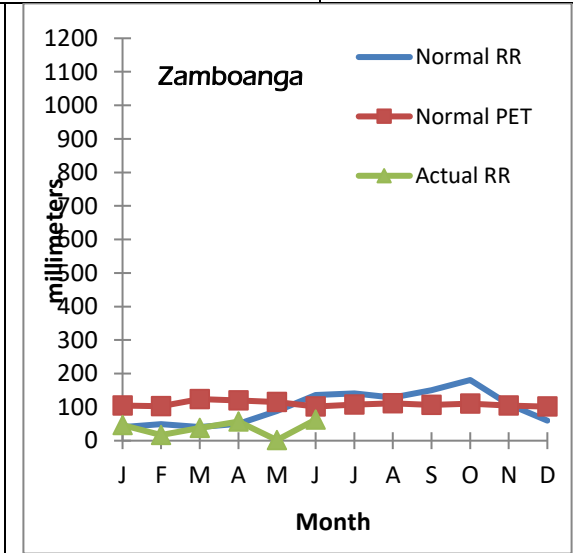
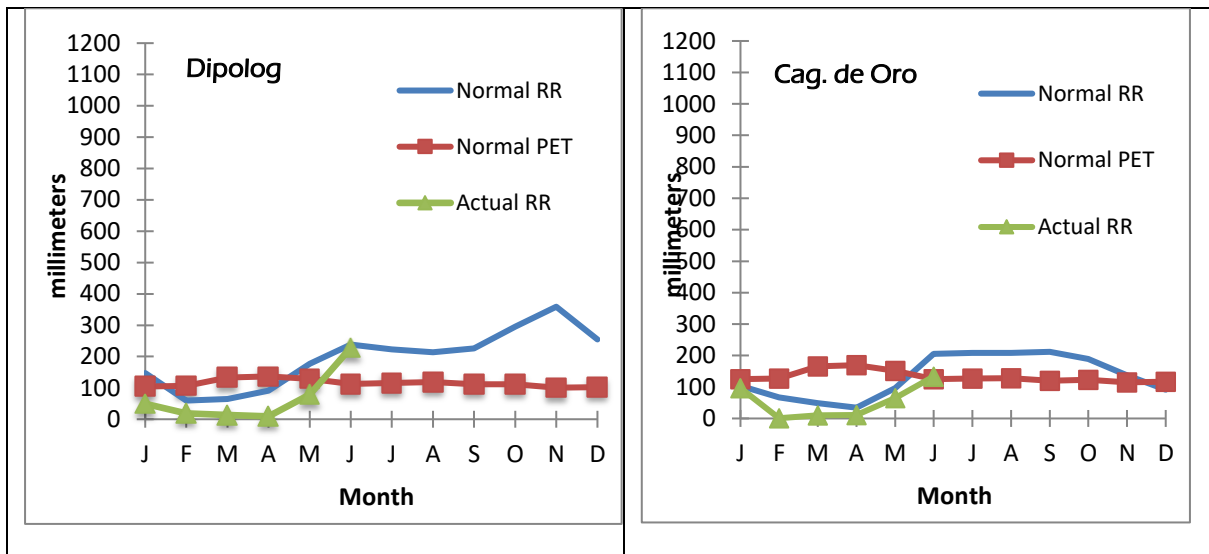


Fig 5d. Comparison of normal rainfall and potential evapotranspiration with the actual monthly rainfall at Davao, General Santos, Zamboanga, Cagayan de Oro, and Dipolog.