

# 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 Tabulated values of normal rainfall and season. 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:

$$GMIne = W_{10}P_{10} + W_{11}P_{11} + W_{12}P_{12} + W_{1}P_{1}$$
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:

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

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 OCTOBER 2021

### OVERVIEW

Harvesting of lowland 1<sup>st</sup> palay has just started in most parts of the country. Due to occurrences of heavy rainfall (most of which were induced by the passage of Severe Tropical Storm "MARING" and Tropical Depression "Lannie") mature and harvestable crops may have been damaged in Ilocos Sur, Abra, Kalinga, Benguet, Cagayan, Nueva Vizcaya, Bulacan, Tarlac, Zambales, Quezon, Rizal, Cavite, Palawan, parts of MIMAROPA, Zamboanga Peninsula, and CARAGA. Standing dry season palay and non-mature wet season palay in Eastern Visayas, Zamboanga Peninsula, Northern Mindanao, and Lanao del Sur may have also been damaged by the occurrence of heavy rainfall.

Heavy rainfall that caused flooding may have also hindered the establishment or land preparation activities for 2<sup>nd</sup> planting season of corn in Ilocos Region, CAR, Cagayan Valley, Central Luzon, CALABARZON, MIMAROPA and Bicol Region. In these regions (except MIMAROPA and Bicol Region), heavy rainfall possibly damaged the 3<sup>rd</sup> planting season corn in the vegetative stage. The same may have happened to the 2<sup>nd</sup> planting season corn, curently in flowering stage, in Negros Occidental, Iloilo, Eastern Visayas, Zamboanga Peninsula, Northern Mindanao, and CARAGA. Generally, and for surviving crops in areas affected by heavy rainfall, the moisture for the month had been sufficient for the rainfed crops in Catanduanes, Camarines Sur, Negros Occidental, Bohol, Leyte, Zamboanga Sibugay, Misamis Oriental, Lanao del Norte, Davao del Norte, Compostella Valley, and Lanao del Sur.

The weather systems that affected the country during the month were the Southwest (SW) monsoon, localized thunderstorms, low pressure areas (LPAs), easterlies, intertropical convergence zone (ITCZ), and the passage of three (3) tropical cyclones (TCs), namely: Tropical Depression (TD) "LANNIE" (Oct. 4 – 6), Severe Tropical Storm (STS) "MARING" (Oct. 8 – 12) and Tropical Depression (TD) "NANDO" (Oct. 9). TD "LANNIE" made landfall and brought heavy rainfall, which caused flooding in MIMAROPA and Region 6 while STS "MARING" did not landfall but enhanced the Southwest monsoon which brought moderate to heavy rainfall and caused flooding and landslide in Region 1, Region 2, Region 3, MIMAROPA, CARAGA and CAR with an estimated cost of damage to agriculture amounting to P3,267,218,527.47 based on NDRRMC Sitrep no. 15 on STS "MARING" (2021).

Rainfall assessment for the month showed that near to above normal rainfall conditions were experienced in most parts of the country except for Central Luzon, where below normal rainfall conditions were observed.

#### REGION I (Ilocos Region)

Harvesting of lowland first palay is ongoing. Mature crops in the norther part of llocos Sur may have been damaged due to heavy rainfall if not harvested earlier.

Establishment or land preparation stage for the 2<sup>nd</sup> planting season corn has generally started, however, the occurrence of heavy rainfall might have hindered the activity. The 3<sup>rd</sup> planting season corn is in the vegetative stage, and thus, may have also been affected by heavy rainfall.

#### CAR (Cordillera Autonomous Region)

Harvesting of lowland first palay is ongoing. The western part of Abra, northeastern part of Kalinga and southern part of Benguet were affected by heavy rainfall, which may have damaged the mature crops in said areas if not harvested beforehand.

Establishment or land preparation activities for the 2<sup>nd</sup> planting season corn have started; however, the occurrence of heavy rainfall may have hampered the farming activity. Meanwhile, the 3<sup>rd</sup> planting season corn crops that are in the vegetative stages, might have also been affected by heavy rainfall.

#### REGION II (Cagayan Valley)

Harvesting of lowland first palay has started. The southern part of Cagayan, northern part of Isabela and the eastern part of Nueva Vizcaya were affected by heavy rainfall, which may have damaged the mature crops in said areas if not harvested beforehand.

Establishment or land preparation activity for the 2<sup>nd</sup> planting season corn has also started, however, heavy rainfall may have adversely affected the activity. Corn in the 3<sup>rd</sup> planting season is in the vegetative stage, and thus, may have also been affected by heavy rainfall.

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

Harvesting of lowland first palay is ongoing. The southern part of Bulacan and parts of Tarlac and Zambales have been affected by heavy rainfall, which may have damaged the mature crops in said areas if not harvested beforehand.

Establishment or land preparation activities for the 2<sup>nd</sup> planting season corn has generally started, however, heavy rainfall events might have hindered these farming activities. Corn in the 3<sup>rd</sup> planting season is in the vegetative stage, and thus, may have also been affected by the heavy rainfall occurrence.

#### REGION IV-A (CALABARZON)

Harvesting of lowland first palay is ongoing. Below normal yield is anticipated as the parts of Quezon province, most of Rizal, and most of Cavite have been affected by heavy rainfall. Potential damage to the mature crops in said areas might have been experienced.

Establishment or land preparation activities for the 2<sup>nd</sup> planting season corn has also started, however, heavy rainfall event might have hindered the activity. Corn in the 3<sup>rd</sup> planting season is in the vegetative stage, and thus, may have also been adversely affected by heavy rainfall.

#### REGION IV-B (MIMAROPA)

Harvesting of lowland first palay is ongoing. The northern part of Palawan mainland had been affected by heavy rainfall, which may have damaged the mature crops in said areas if not harvested beforehand.

Establishment or land preparation stage for the 2<sup>nd</sup> planting season corn has generally started, however, heavy rainfall activity may have hindered the activity.

#### REGION V (Bicol Region)

Harvesting of lowland first palay is ongoing. Below normal yield is possible due to the heavy rainfall induced by the passage of STS Maring and TD Lannie.

<b>REGION VI (Western Visayas)</b> The 2 <sup>nd</sup> planting season corn are in the flowering stage. These crops, particularly in Negros Occidental and parts of Iloilo may have been damaged due to heavy rainfall.	<b>REGION XI (Davao Region)</b> Most parts of the region, except for the western and southern part, have been affected by heavy rainfall. Generally, there might be no ongoing farming activity during the month.
<b>REGION VII (Central Visayas)</b> The 2 <sup>nd</sup> planting season corn are in the flowering stage. These crops in all parts of the region may have been damaged due to heavy rainfall brought by the passage of TD Lannie.	The monthly rainfall is sufficient for the rainfed crops in Davao del Norte and Compostella Valley, excess in Davao Oriental, and inadequate in Davao del Sur.
<b>REGION VIII (Eastern Visayas)</b> Dry season palay are in the nursery stage. These crops in most of Eastern Visayas (especially Southern Leyte) may have been damaged due to heavy rainfall brought by the passage of TD Lannie Meanwhile the 2 <sup>nd</sup> planting season corp	<b>REGION XII (SOCCSKSARGEN)</b> The wet season palay are now in the reproductive/flowering stage. Rainfall during the month may be insufficient to support the crops in all stages.
in flowering stage may have also been damaged by the heavy rainfall.	<b>REGION XIII (CARAGA Administrative</b> <b>Region)</b> Harvesting of lowland first palay is ongoing
<b>REGION IX (Zamboanga Peninsula)</b> Harvesting of lowland first palay is ongoing, while dry season palay are now in the vegetative stage. The entire Zamboanga Peninsula (except for Isabela) had been affected by heavy rainfall, which may have damaged the vegetative and	while the dry season palay are now in nursery stage. Most of CARAGA have been affected by heavy rainfall, which may have damaged the standing crops including the 2 <sup>nd</sup> planting season corn in flowering stage.
mature crops.	For the surviving crops, moisture for the month is generally sufficient for all stages.
Potential damage to the 2nd planting season corn, currently in flowering stage, may have also occurred because of heavy rainfall.	<b>BARMM (Bangsamoro Autonomous Region</b> <b>of Muslim Mindanao)</b> The dry season palay are now in nursery
<b>REGION X (Northern Mindanao)</b> Harvesting The wet season palay are now in the reproductive/flowering stage. Most of Northern Mindanao had been affected by heavy rainfall, which may have damaged the standing crops.	stage. These crops, particularly in most of Lanao del Sur may have been damaged by heavy rainfall. Otherwise, the available moisture had been sufficient for the crops in the province, while the other parts of the region have had insufficient rainfall.
Additionally, the 2 <sup>nd</sup> planting season corn in flowering stage may have also been damaged by the occurrence of heavy rainfall.	

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## **TABLE 1.GENERALIZED NORTHEAST MONSOON INDICES**<br/>In Millimeters and Percentile Rank (October 2021 to January 2022)

	000			MRER	DECE	DECEMBER			
STATIONS	GMI		GMI	WRANK	GMI	WBLN %RANK	GMI	WRANK	
CAR (Cordillera Autonomous Reg.)						///////////////////////////////////////	Civil	///////////////////////////////////////	
Baguio	232	57							
Region I (llocos Reg.)									
Dagupan	98	40							
Vigan	62	45							
Laoag	55	55							
Region II (Cagayan Valley)									
Aparri	124	17							
Basco	127	29							
Tuguegarao	86	7							
Region III (Central Luzon)									
Iba	101	36							
Munoz	85	24							
Baler	108	10							
Casiguran	208	29							
Region IV-A (CALABARZON)									
Ambulong	76	21							
Infanta	138	14							
Tayabas	202	24							
Region IV-B (MIMAROPA)									
Calapan	165	21							
Coron	117	38							
Сиуо	107	29							
Puerto Princesa	103	40							
Romblon	121	31							
San Jose	143	45							
Region V (Bicol Reg.)									
Daet	132	10							
Legaspi	123	14							
Masbate	92	36							
Virac Synop	191	40							
Region VI (Western Visayas)									
Roxas	87	12							
Region VII (Central Visayas)									
Mactan	81	24							
Dumaguete	83	57							
Dauis	119	71							
Region VIII (Eastern Visayas)									
Catarman	137	14							
Catbalogan	146	43							
Tacloban	128	62							
Region IX (Western Mindanao)									
Dipolog	95	5							
Zamboanga	71	24							
Region X (Northern Mindanao)									
El Salvador	98	57							
Malaybalay	83	7							
Region XI (Davao Reg.)									
Davao	98	60							
Region XII (SOCSARGEN)									
General Santos	36	36							
Region XIII (CARAGA)									
Surigao	208	83							
Hinatuan	108	45							
ARMM (Autonomous reg. of Muslim									
Mindanao)									
Cotabato	90	24		1		1			

#### TABLE 2. CUMULATIVE YIELD MOISTURE INDICES FOR LOWLAND FIRST Ρ I)

PALAY	in Millime	ters and Pe	ercentile F	Rank. (Ju	Ily-Octobe	r 2021
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STATIONS	JULY		AUGUST		SEPTEMBER		OCTOBER	
	YMI	%RANK	YMI	%RANK	YMI	%RANK	YMI	%RANK
CAR (Cordillera Administrative Reg.)								
Baguio	1309	88	2227	88	2680	81	3504	81
Region I (llocos Reg.)								
Dagupan	441	62	820	31	1018	14	1302	26
Laoag	620	74	945	55	1189	38	1348	38
Sinait	724	83	1009	40	1285	33	1438	33
Region II (Cagayan Valley)								
Basco	256	69	646	74	1438	98	1859	93
Tuguegarao	103	26	189	10	281	2	489	5
Region III (Central Luzon)								
lba	1340	90	1721	60	2291	50	2540	52
Munoz	234	40	649	45	968	43	1154	38
Region IV-A (CALABARZON)								
Ambulong	537	93	697	76	1008	81	1161	74
Tayabas	299	79	489	76	1156	98	1798	90
Region IV-B (MIMAROPA)								
Calapan	457	95	624	83	1020	93	1514	95
Coron	366	52	505	17	974	24	1385	40
Cuyo	251	26	379	79	673	12	941	12
P. Princesa	251	93	443	90	477	45	783	69
Romblon	589	98	798	95	1127	90	1450	86
San Jose	538	79	774	40	1269	50	1727	74
Region V (Bicol Reg.)								
Masbate	139	31	304	36	640	69	854	69
Region VI (Western Visayas)								
Roxas	166	38	415	50	774	74	959	55
Region VII (Central Visayas)								
Cebu	111	19	247	24	377	21	566	21
Dumaguete	105	45	259	64	452	79	681	83
Dauis	59	14	150	21	418	64	756	90
Region VIII (Eastern Visayas)								
Catbalogan	87	10	273	21	508	24	932	48
Tacloban	128	40	280	38	554	74	961	90
Region IX (Zamboanga Peninsula)								
Zamboanga	51	5	115	5	296	26	462	24
Region X (Northern Mindanao)								
El Salvador	172	36	296	21	469	21	697	31
Malaybalay	172	7	403	14	1056	81	1301	69
Region XII (SOCCSKSARGEN )								
General Santos	96	62	173	50	268	55	325	40
ARMM (Autonomous reg. of Muslim								
Cotabato	1/5	10	250	7	561	20	855	12
00100010	1+5	13	200	1	501	23	000	-1-3

TABLE 3. DEKADAL AND CUMULATIVE DEKADAL RAINFALLFor the month of OCTOBER 2021								
[actual values (in mm) and percent of normal ]								
	PECION		ACTUAL	% Normal	CUMULATIVE	% Normal		
	NEGION	DERAD	ОСТ	of Actual	JANOCT	Cumulative		
		28	59.8	71	2195.8	93		
R01	Ilocos Region	29	285.9	386	2481.7	101		
		30	11.9	14	2493.6	98		
		28	100.3	103	1914.2	93		
CAR	CAR	29	281.4	291	2195.6	102		
		30	15.8	13	2211.5	97		
Doo		28	160.1	141	1581.3	90		
RUZ	Cagayan valley	29	241.5	178	1822.8	96		
		30	53.9	34	1876.7	91		
D02	Control Luzon	28	52.4	53	2004.2	93		
RUJ	Central Luzon	29	165.3	203	2169.5	97		
		30	45.1	35	2214.7	93		
R04-A		28	94.2	74	2073.7	116		
N04-A		29	141.5	112	2215.2	116		
		30	119.5	68	2334.7	112		
R04-B		28	146.7	153	1650.4	108		
N04-D		29	120.9	170	1771.3	111		
		30	100.4	21	18/1./	07		
NCR	NCR	20	52.5	52	1003.9	97		
		29	36.5	34	1934.3	90		
		28	136.6	121	1970.0	<u>92</u> 130		
R05 Bicol	Bicol Region	20	121.6	121	2352.2	129		
	5	29	121.0	78	2433.0	125		
		28	88.3	80	1539 /	123		
R06	Western Visayas	20	77.8	97	1617.2	103		
		30	50.2	59	1667.4	102		
		28	99.2	140	1377 1	124		
R07	Central Visayas	29	41 7	69	1418.8	122		
		30	114.7	178	1533.6	124		
		28	207.8	250	2816.5	158		
R08	Eastern Visayas	29	70.0	85	2886.5	155		
		30	164.2	157	3050.7	155		
		28	91.8	110	1476.1	114		
R09	Zamboanga Peninsula	29	58.0	80	1534.1	112		
		30	80.3	87	1614.4	110		
<b>D</b> 46	North en Add	28	62.6	67	1928.9	118		
K10	Northern Mindanao	29	74.0	95	2002.9	117		
		30	121.3	159	2124.2	119		
<b>D</b> 14	Davao Bagian	28	21.0	33	2170.4	133		
K11	Davao Region	29	80.6	144	2251.0	133		
		30	143.3	207	2394.3	136		
R12	SOCCSKSARGEN	28	57.9	117	1573.6	136		
		29	45.2	85	1618.8	134		
		30	69.8	114	1688.6	133		
D40	CADACA	28	82.8	101	2806.9	126		
R13	CARAGA	29	67.2	90	2874.1	125		
		30	203.2	241	3077.3	129		
		28	79.6	122	1422.3	114		
		29	51.9	86	1474.1	113		
		30	85.3	128	1559.4	114		





FIG. 2. ACTUAL CUMULATIVE RAINFALL [mm] DURING THE PASSAGE OF TROPICAL CYCLONE IN THE PHILIPPINE AREA OF RESPONSIBILITY FOR THE MONTH OF OCTOBER 2021.













