HOW TO COMPUTE WATER DUTY REQUIREMENT FOR HYDROLOGIC DESIGN OF IRRIGATION CANAL USING CLIMATE CHANGE DATA

A Training Module for

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STEPS ON HOW TO COMPUTE WATER DUTY REQUIREMENT FOR HYDROLOGIC DESIGN OF IRRIGATION CANAL USING CLIMATE CHANGE DATA

Climate change affects irrigation water demand via changes in physiology and phenology, soil water balance, evapotranspiration and effective precipitation. As agriculture is the main sector of water use in the Philippines, and even in other agriculture-based countries, estimation of the agricultural water demand is essential for long-term water resources development and planning.

Of all the present local and international researches, one of those recommended is the **hydrologic design**. It is a process of determining the design parameters for the irrigation project by applying appropriate hydrologic analysis. This design involves design parameters like:

- Water Duty (lps/ha);
- Design Service Area (ha.);
- Optimum Reservoir Capacity (mcm) or Height (m);
- Probable Design Flood of Major Structures;
- Design Flood for Spillway & Temporary Diversion Works; and
- Farm Drainage Unit Discharge.

This paper presents a glimpse on the use of the climate change data on the hydrologic design of irrigation projects, particularly on how to compute water duty requirement. The document complements the PowerPoint presentation by Rolando M Maloles on "the Use of Climate Change Data on the Hydrologic Design of Irrigation Projects" available here.

Results that can be obtained from this exercise could further increase and help technical experts, and even the general public (e.g. farmers), on how to mitigate and ease the issues that come up with the changes in weather patterns. Please also consider to look at.

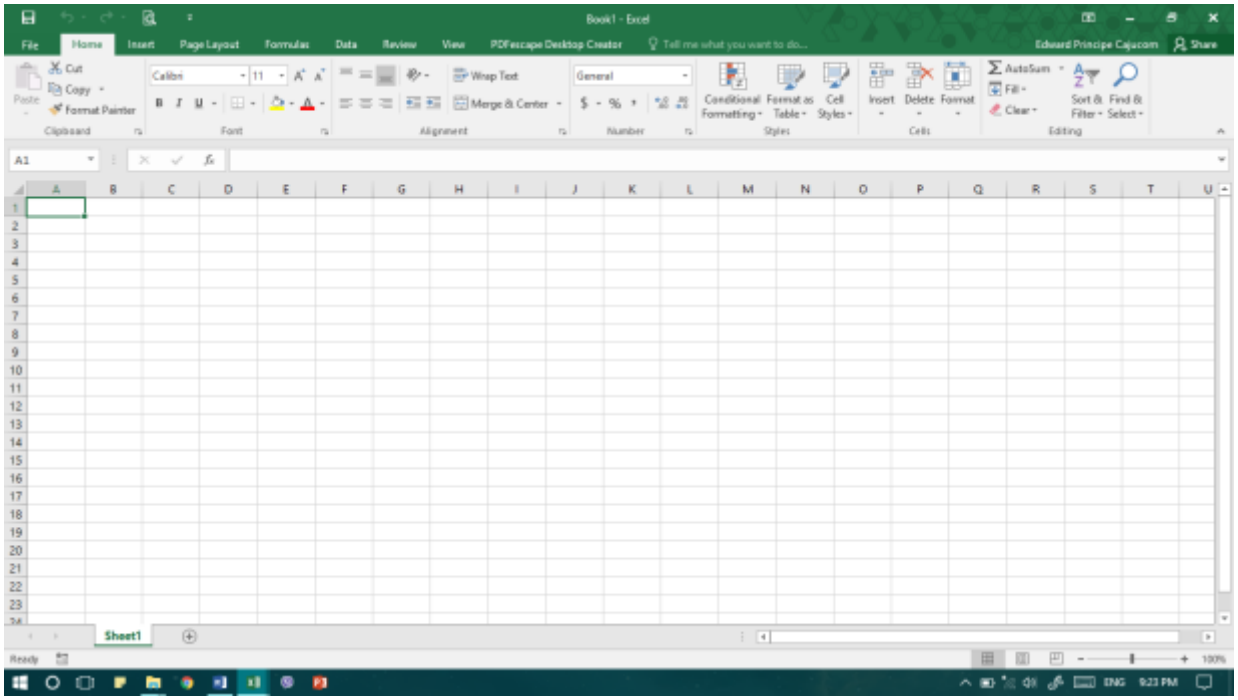
What you need for this exercise:

- Microsoft Excel
- Climate Change Data from PAGASA (PHILIPPINES.zip available in the Portal)
- Template Models (Daily Rainfall Template and Cropping Calendar Template)

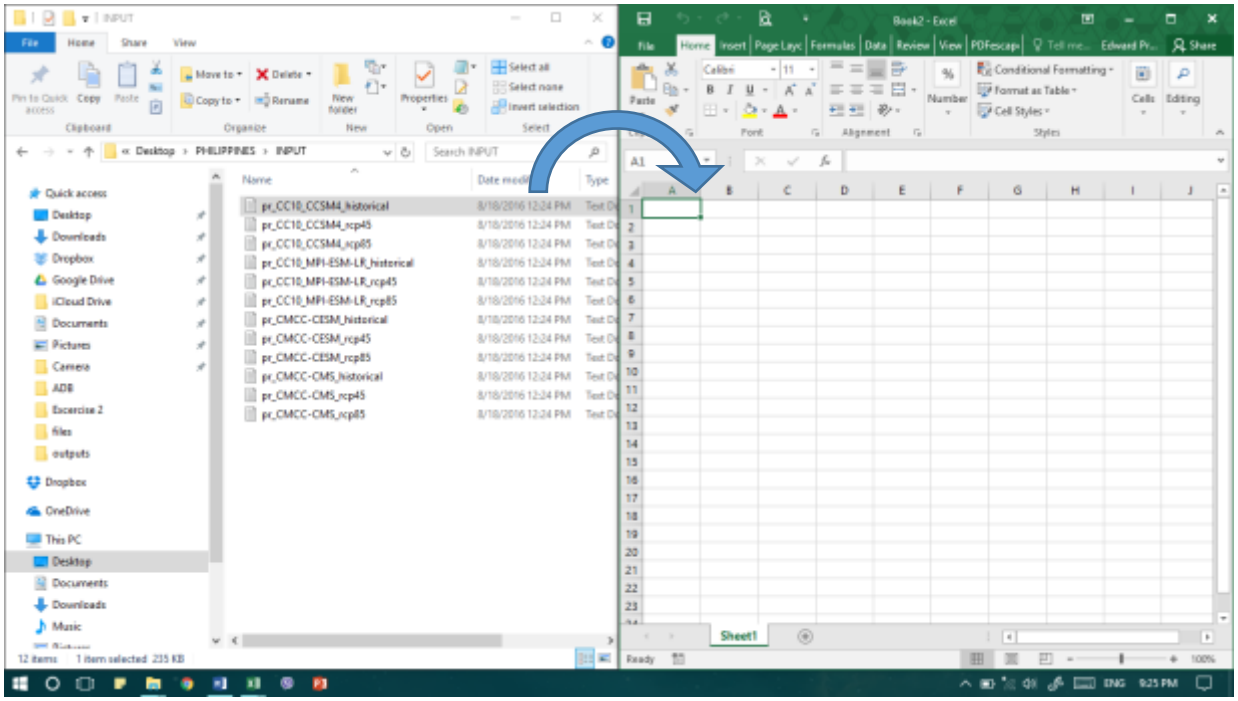
For the Case study: The computation is done on a 10-day basis considering that the water stored in the paddy will be sufficient to supply the crop requirement for 10 days with zero rainfall. If no irrigation is provided after ten days, the crop will be damaged or the yield will be significantly reduced.

Step-by Step Procedure:

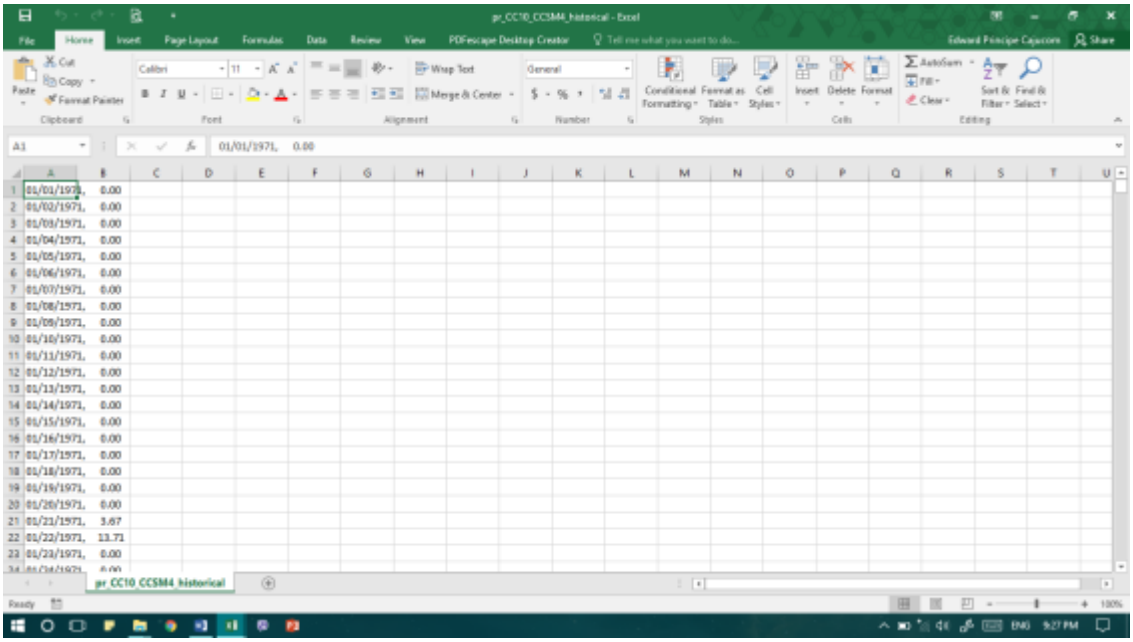
1. Open a blank excel workbook.



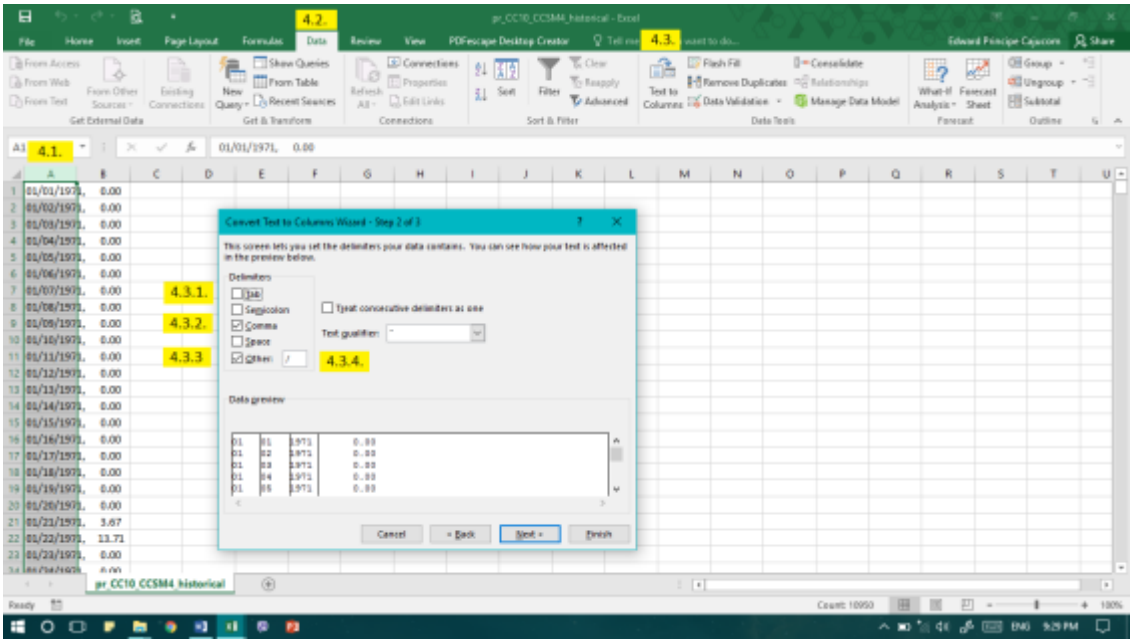
2. Convert the '.txt' file in 'INPUT' folder to '.xls' format by simply dragging the file to blank excel sheet.



3. After dragging the '.txt' file to the excel sheet, a new excel workbook will be opened.

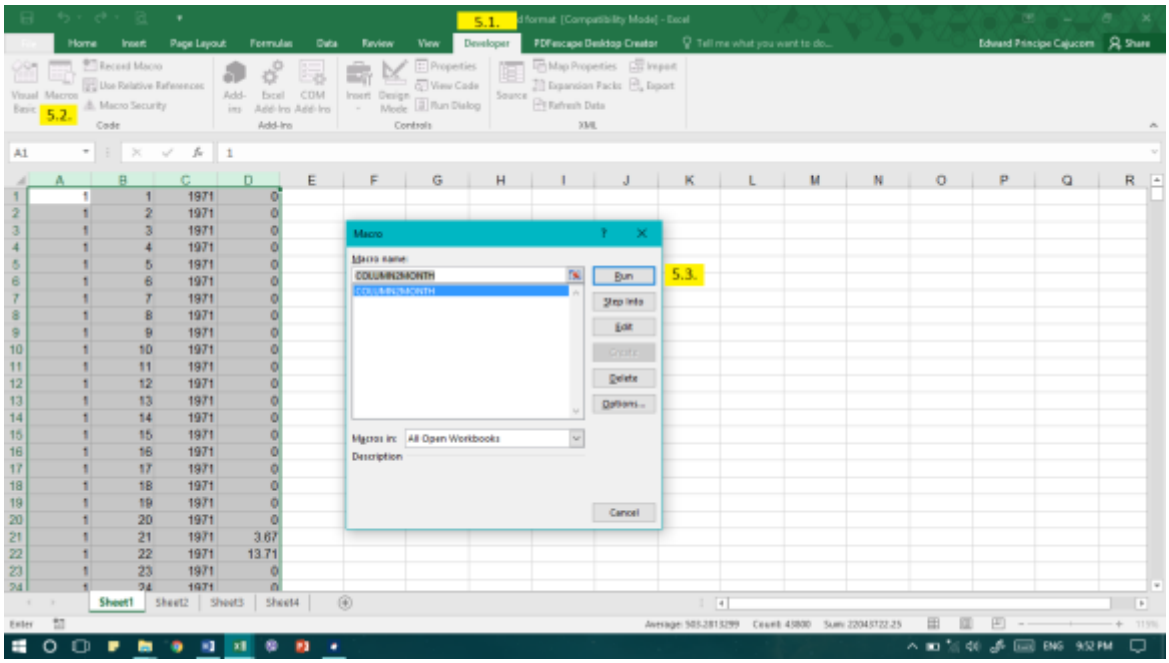


4. To separate the month, day and year from date of your data, delimit the values by clicking the:
    a. Column A' of your worksheet
    b. Data
    c. Text to columns
    d. Uncheck the tab
    e. Check the 'Comma'
    f. Check the 'Others'
    g. Put slash"/" on 'Others' delimiter



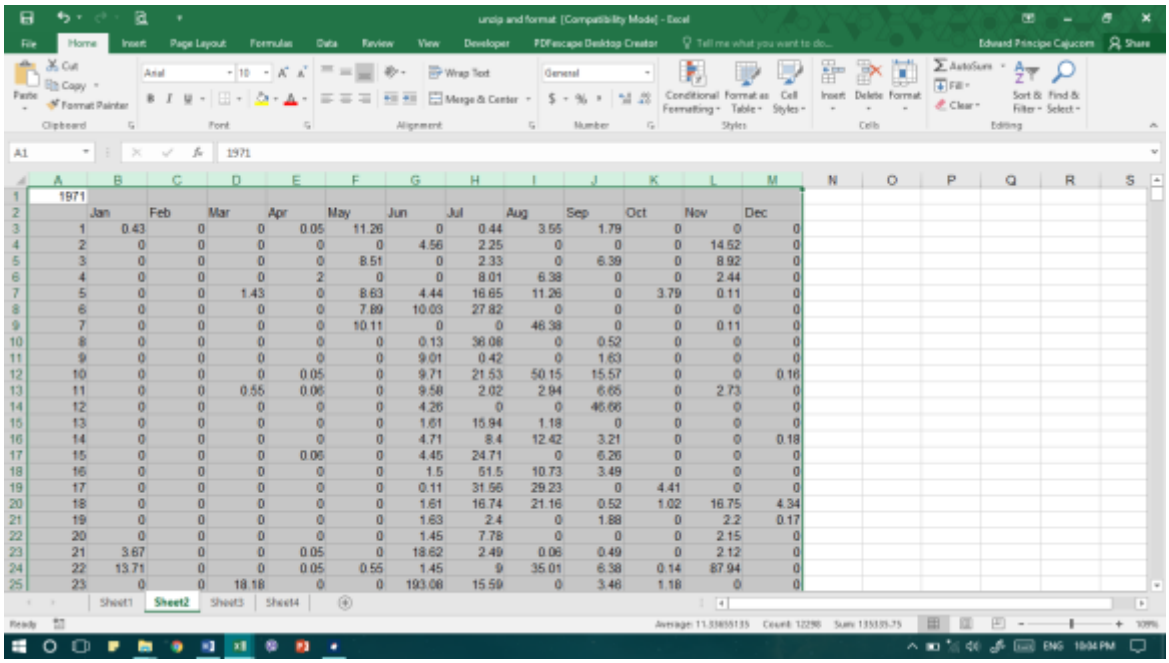
Note: After delimiting the values on your "Column A", you will notice that the separator (/) on the dates of your values were deleted and the dates of your data were dispersed to the second to third rows. This means that your data were delimited and you can proceed to the next step. Copy the delimited data to Sheet 1 of "unzip and format" file in 'INPUT' folder;

5. To get the daily horizontal rainfall format, run "Macros"
   a. Developer* b. Macros c. Run (COLUMN2MONTH)



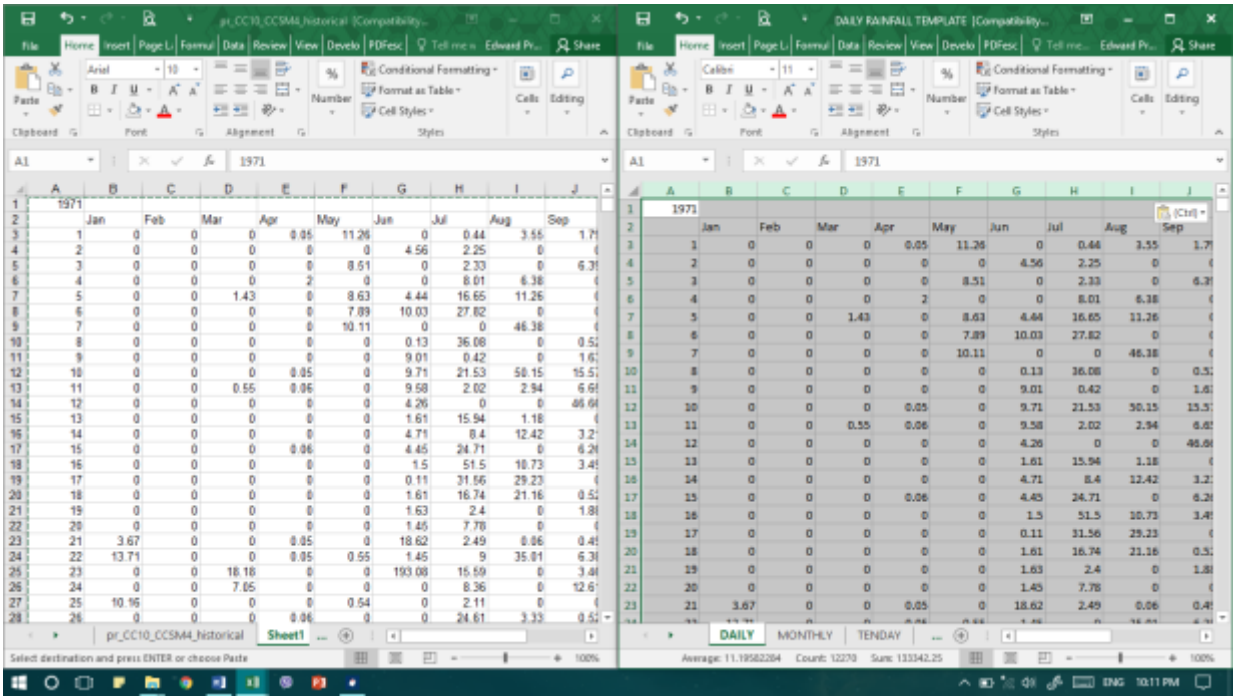
Note: If the Developer option is not available on the ribbon of your Microsoft Excel, go to File then click Options. Under Option Menu, click the "Customize Ribbon" and under that, enable the Developer option.

6. Go to ‘Sheet 2’ of your “unzip and format” workbook, then copy all the values. Note that the values were dispersed horizontally and were arranged and designated according to their respective months;

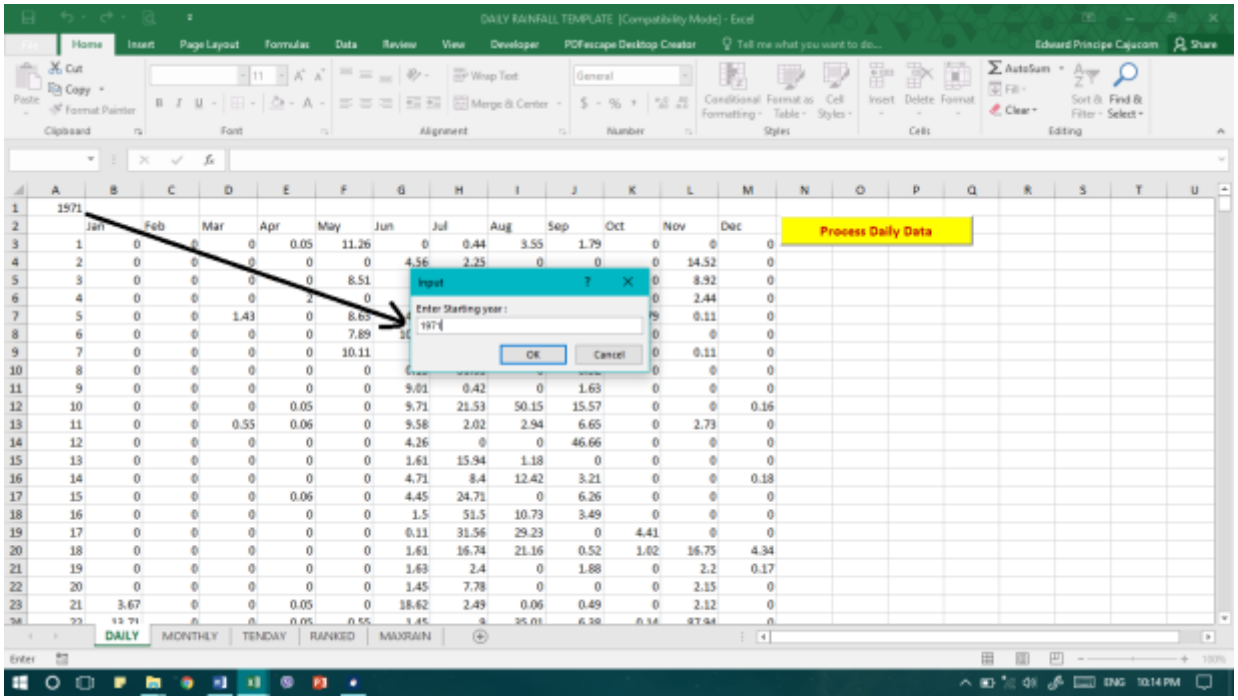


1971	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0.43	0	0	0.05	11.26	0	0.44	3.55	1.79	0	0	0
2	0	0	0	0	0	4.56	2.25	0	0	0	14.52	0
3	0	0	0	0	8.51	0	2.33	0	6.39	0	8.92	0
4	0	0	0	2	0	0	8.01	6.38	0	0	2.44	0
5	0	0	1.43	0	8.63	4.44	16.65	11.26	0	3.79	0.11	0
6	0	0	0	0	7.89	10.03	27.82	0	0	0	0	0
7	0	0	0	0	10.11	0	0	46.38	0	0	0.11	0
8	0	0	0	0	0	0.13	36.08	0	0.52	0	0	0
9	0	0	0	0	0	9.01	0.42	0	1.63	0	0	0
10	0	0	0	0.05	0	9.71	21.53	50.15	15.57	0	0	0.16
11	0	0	0.55	0.06	0	9.58	2.02	2.94	6.65	0	2.73	0
12	0	0	0	0	0	4.26	0	0	46.66	0	0	0
13	0	0	0	0	0	1.61	15.94	1.18	0	0	0	0
14	0	0	0	0	0	4.71	8.4	12.42	3.21	0	0	0.18
15	0	0	0	0.06	0	4.45	24.71	0	6.26	0	0	0
16	0	0	0	0	0	1.5	51.5	10.73	3.49	0	0	0
17	0	0	0	0	0	0.11	31.56	29.23	0	4.41	0	0
18	0	0	0	0	0	1.61	16.74	21.16	0.52	1.02	16.75	4.34
19	0	0	0	0	0	1.63	2.4	0	1.88	0	2.2	0.17
20	0	0	0	0	0	1.45	7.78	0	0	0	2.15	0
21	3.67	0	0	0.05	0	18.62	2.49	0.06	0.49	0	2.12	0
22	13.71	0	0	0.05	0.55	1.45	9	35.01	6.38	0.14	87.94	0
23	0	0	18.18	0	0	193.08	15.59	0	3.46	1.18	0	0

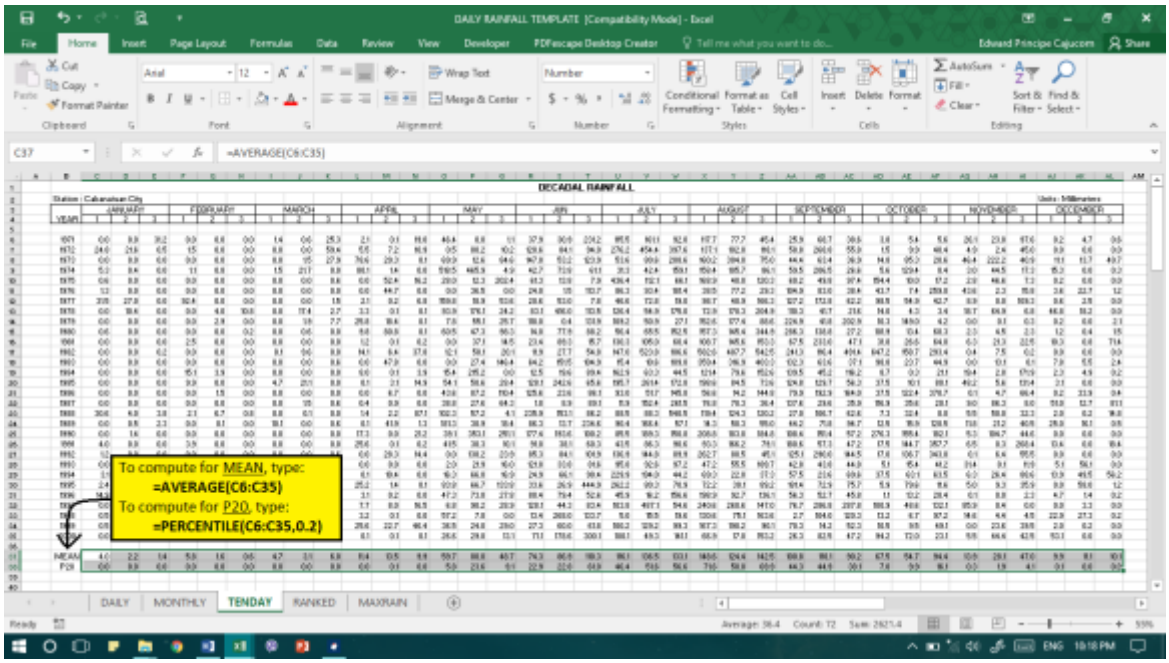
7. Go back to your “Philippines” folder and inside the “INPUT” subfolder, open the “Daily Rainfall Template” document. Copy all the values in the “Sheet 2” of your worksheet to “Sheet 1” of “Daily Rainfall Template”



8. Click/Run the “Process Daily Data” and type “1971” or “2035” (depends on the year you are processing);

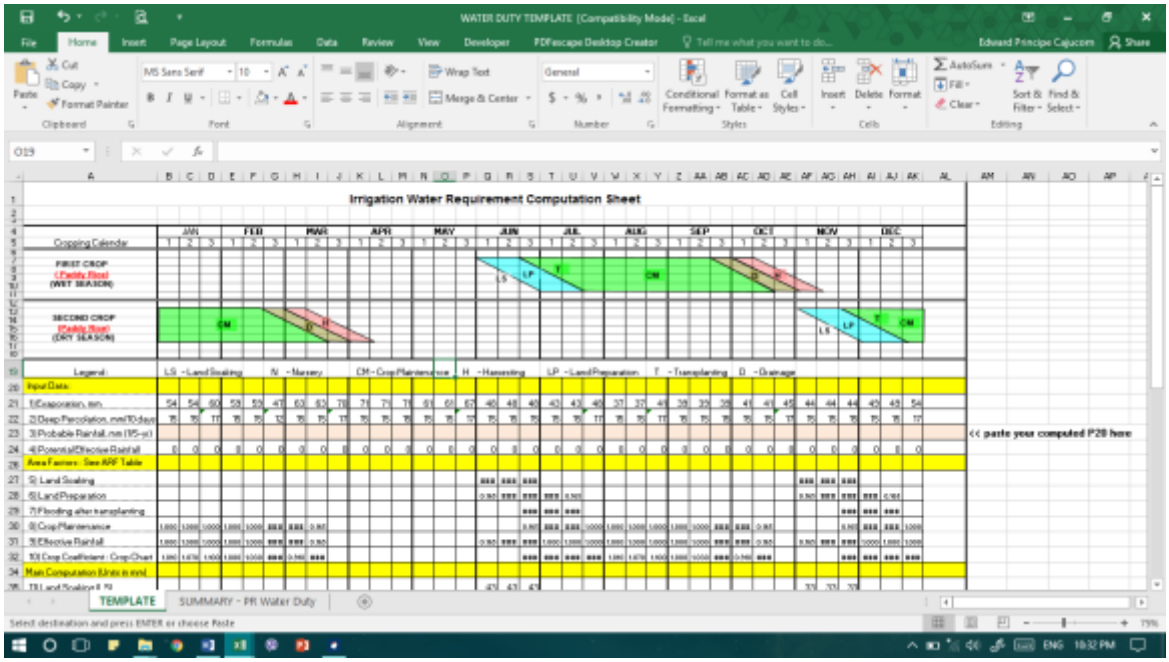


9. Go to “TENDAY” Sheet of the same workbook and get the following:
    a. Mean
    b. P20

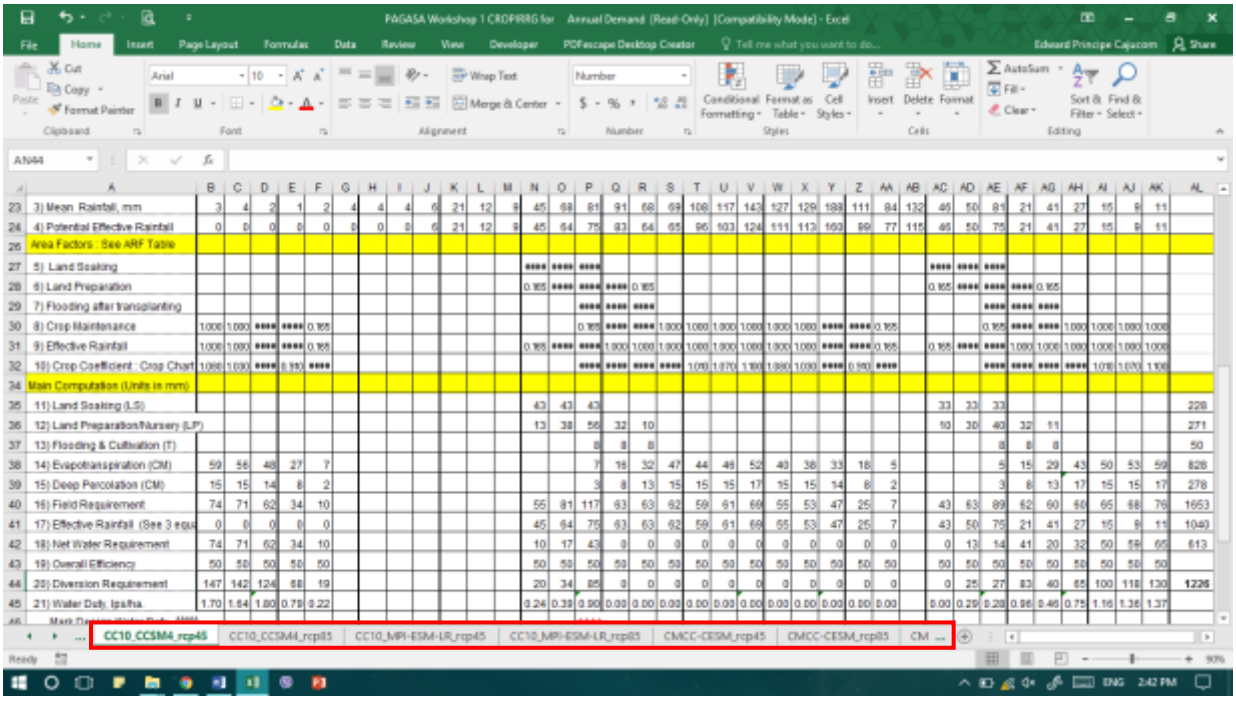


10. After having the Mean and P20, save it to “OUTPUT” folder and copy the “P20” values.

11. Inside the “INPUT” folder, open the “Cropping Calendar Template” and paste your computed “P20” values to “Probable Rainfall, mm (1/5-yr)” located at the Row 23 Columns B-AK.



12. Rename the sheet name of your excel file with the name of the GCM you are using. For the benefit of the next GCM to be computed, duplicate the active sheet and delete the values you pasted to “Probable Rainfall, mm (1/5-yr)” located at the Row 23 Columns B-AK.



13. Copy the computed “Water Duty, lps/ha.” located at the Row 45 Columns B-AK and paste it to the Climate Data Summary located at the “RESULT” subfolder then, save.