QGIS Plugin

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Introduction

1. Earlier point level script was developed to test the output for water balance model at different time steps(daily/hourly) for single point.
2. This script used the hourly weather parameters available from skymet.
3. Functionality for running the water balance model at aggregate level (cluster or village level) was missing.
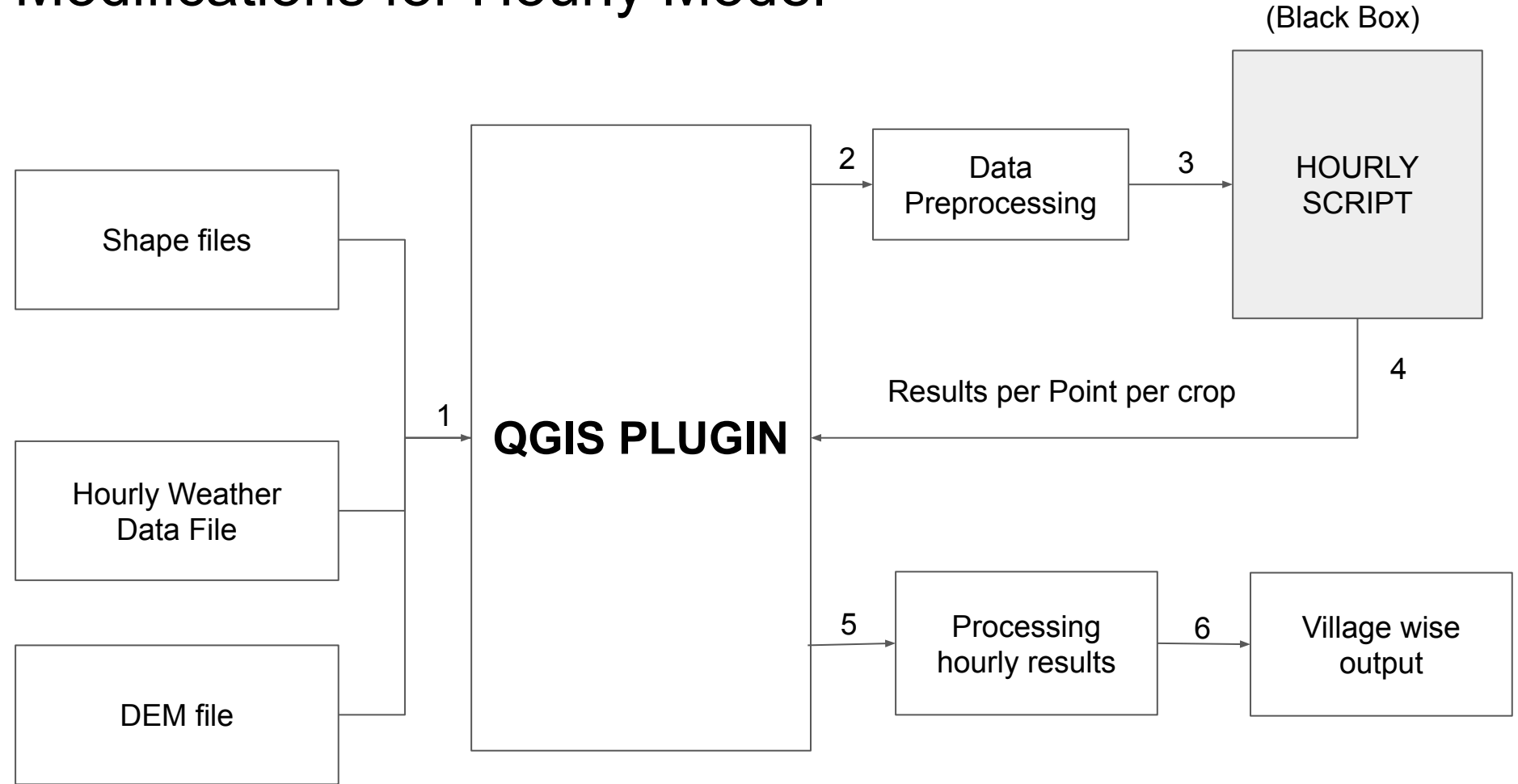
Objective

1. To incorporate the functionality of running the plugin at different time steps.
2. Make suitable changes in the output format as per needs.
3. Update code to latest Qgis version
4. Validate the results produced for hourly model

Existing Architecture
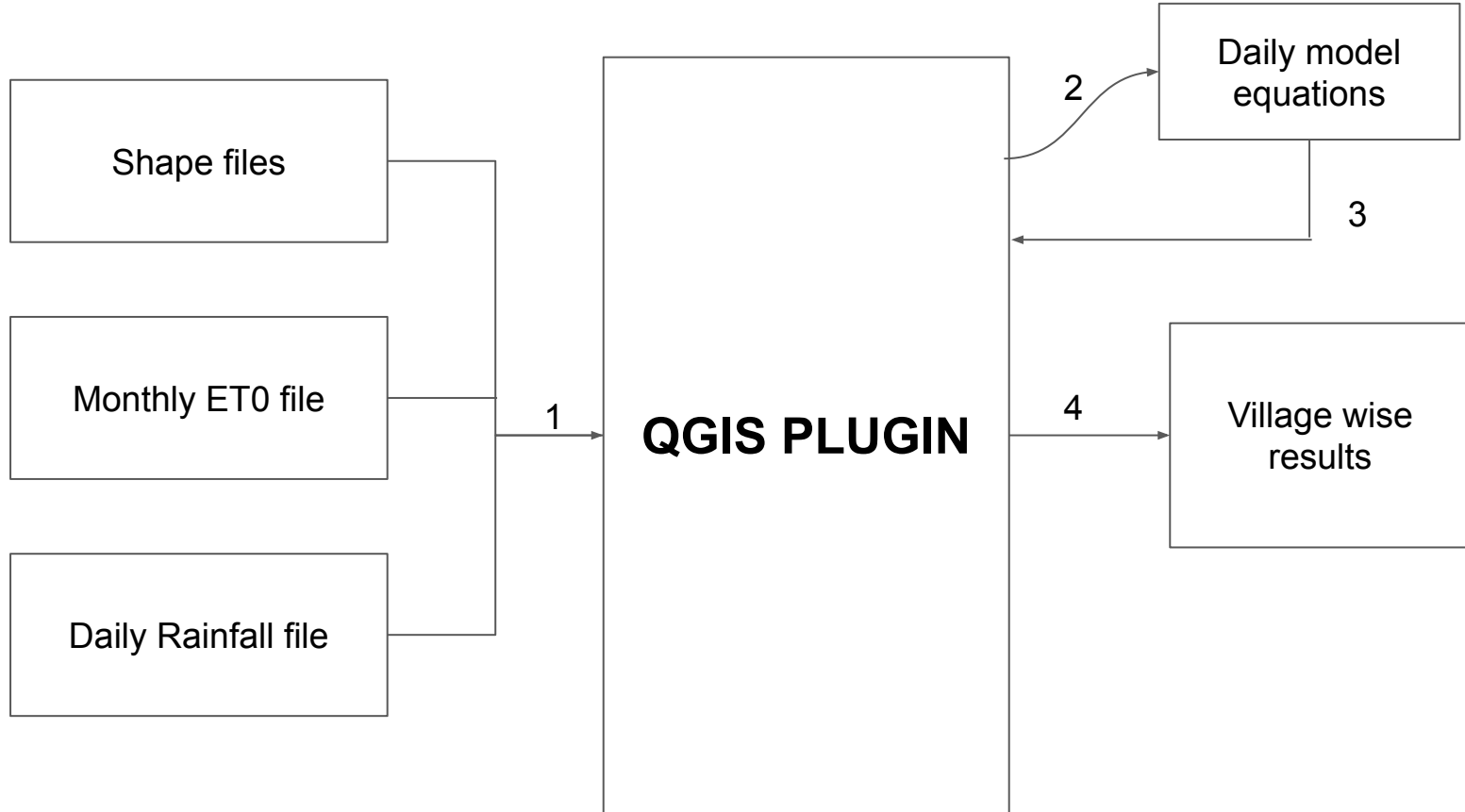
Modifications for Hourly Model

Changes

1. Input data representation is changed. The plugin expects the input data similar to the input data of the script.
2. Old run_model for each point was replaced by a new function, where the hourly script is called and results from the script are appended in the format which was required as per the existing plugin.
3. Script expects elevation at each point and DEM file is used for getting the elevation at the point.
4. The indexes for summarizing the results which were fixed earlier for daily model are now made variable as per the daily or hourly model.

UI Changes
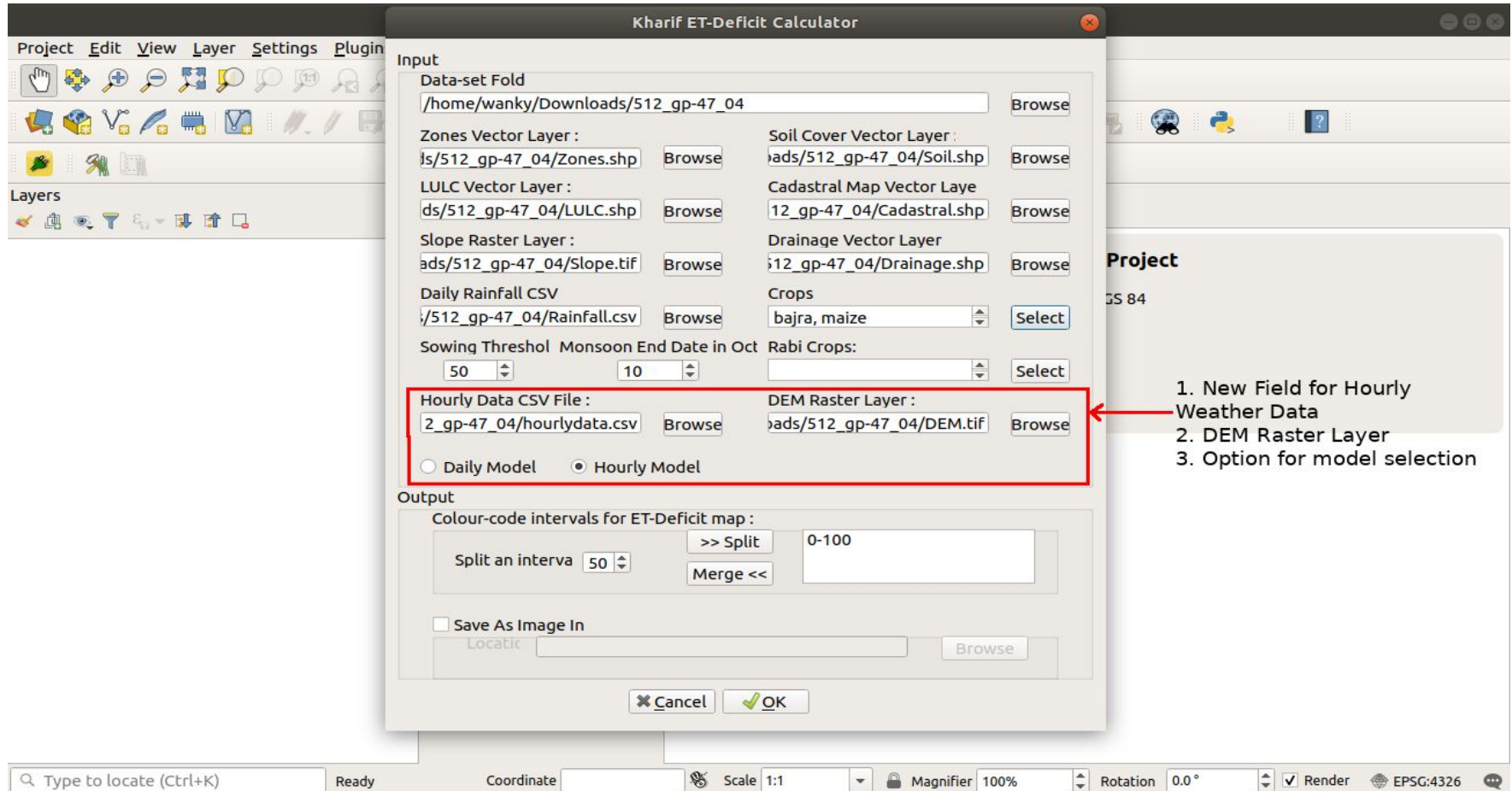
How results were verified?

1. Increased the spacing in configuration.py file (step=2000) so that at most 2 or 3 points lie within a zone.
2. Logged the results produced by the hourly script for every point and crop. This file is named after the properties like soil, depth, crop-name, etc.
3. Logged the attributes of the points lying within a zone. [eg. slope, depth, etc.]
4. Using the above two logs the village-wise results were verified by taking an average of the attribute values in point-wise result logs.
5. The point-wise logs for plugin were also matched with the output of script when run independently with exact parameters.

Sample output for a village

	Village Name	Census Code	Zone	Zone Area (ha)	Crops in English	Crops in Marathi	Crop Season and	Rainfall (mm)	Post Monsoon R	Rainfall crop end	PET Monsoon Er	AET Monsoon Er	Mon
1	Village Name	Census Code	Zone	Zone Area (ha)	Crops in English	Crops in Marathi	Crop Season and	Rainfall (mm)	Post Monsoon R	Rainfall crop end	PET Monsoon Er	AET Monsoon Er	Mon
2	Gondala	545833	zone-Gondala-1	251.3269620150	bajra	बाजरी	Kharif_Main	663.75	6.75	643.25	287.21	244.98	42.2
3	Gondala	545833	zone-Gondala-1	251.3269620150	cotton	कापूस	Long_kharif	663.75	6.75	664.75	555.11	340.77	214.
4	Gondala	545833	zone-Gondala-1	251.3269620150	forest	वनक्षेत्र	Landuse	663.75	6.75	670.5	450.99	433.47	17.5
5	Gondala	545833	zone-Gondala-1	251.3269620150	wasteland	पोटखराबा	Landuse	663.75	6.75	670.5	291.84	206.4	85.4
6	Gondala	545833	zone-Gondala-2	162.7939144111	bajra	बाजरी	Kharif_Main	663.75	6.75	643.25	287.21	210.39	76.8
7	Gondala	545833	zone-Gondala-2	162.7939144111	cotton	कापूस	Long_kharif	663.75	6.75	664.75	555.11	243.8	311.
8	Gondala	545833	zone-Gondala-2	162.7939144111	forest	वनक्षेत्र	Landuse	663.75	6.75	670.5	450.99	210.18	240.
9	Gondala	545833	zone-Gondala-2	162.7939144111	wasteland	पोटखराबा	Landuse	663.75	6.75	670.5	291.84	222.28	69.5
10	Gondala	545833	zone-Gondala-2	162.7939144111	scrub	गायरान	Landuse	663.75	6.75	670.5	323.45	225.73	97.7
11	Gondala	545833	zone-Gondala-3	354.5231363739	bajra	बाजरी	Kharif_Main	663.75	6.75	643.25	287.21	246.75	40.4
12	Gondala	545833	zone-Gondala-3	354.5231363739	cotton	कापूस	Long_kharif	663.75	6.75	664.75	555.11	341.57	213.
13	Gondala	545833	zone-Gondala-3	354.5231363739	wasteland	पोटखराबा	Landuse	663.75	6.75	670.5	291.84	222.25	69.5
14	Gondala	545833	zone-Gondala-3	354.5231363739	scrub	गायरान	Landuse	663.75	6.75	670.5	323.45	216.66	106.
15	Gondala	545833	zone-Gondala-4	270.8698126958	bajra	बाजरी	Kharif_Main	663.75	6.75	643.25	287.21	245.23	41.9
16	Gondala	545833	zone-Gondala-4	270.8698126958	cotton	कापूस	Long_kharif	663.75	6.75	664.75	555.11	334.91	220.
17	Gondala	545833	zone-Gondala-4	270.8698126958	wasteland	पोटखराबा	Landuse	663.75	6.75	670.5	291.84	206.38	85.4
18	Gondala	545833	zone-Gondala-4	270.8698126958	scrub	गायरान	Landuse	663.75	6.75	670.5	323.45	245.01	78.4
19													
20													
21													

Log file (per point per crop) - Returned from the black box script
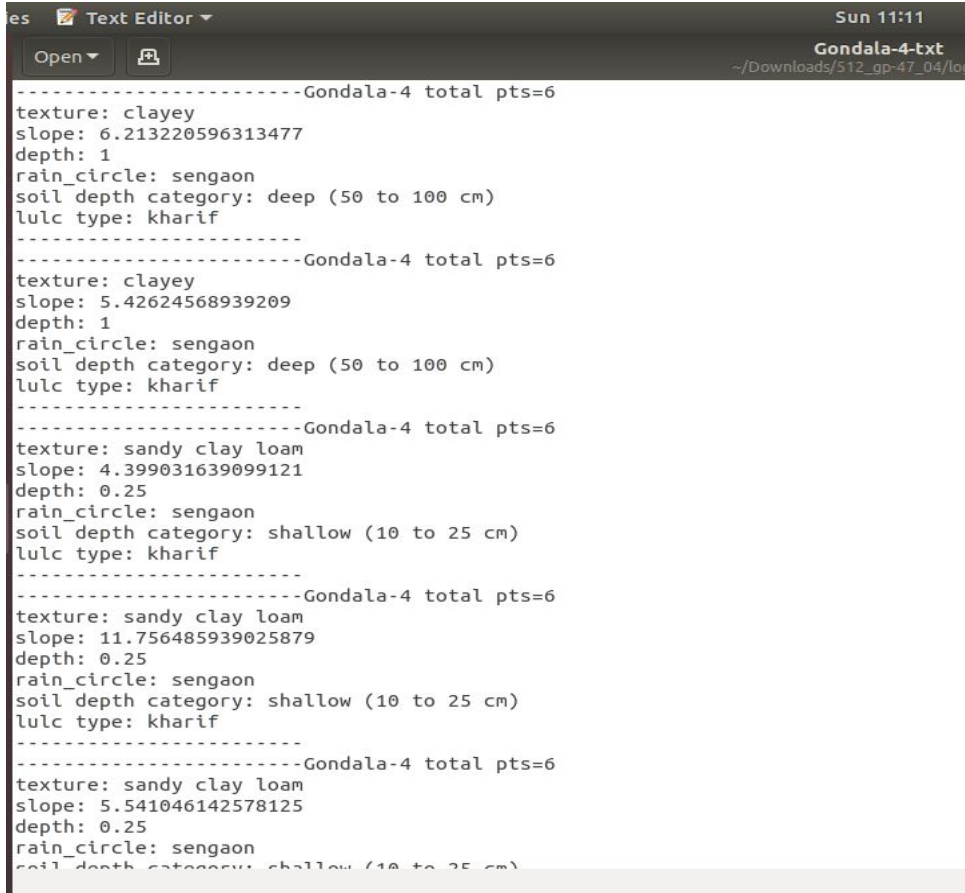
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Open ▾   *sengaon_bajra_CE-89_ME-132_clayey_slope-0-8114247...-0_1_deep--50-to-100-cm-_kharif_output_spread5-csv   Save

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Log file - Properties of points in a zone

- Fig shows a sample zone-file log that contains the total number of points lying inside the zone and the properties of the point. This log can be used to verify the result for a particular zone and crop in a village
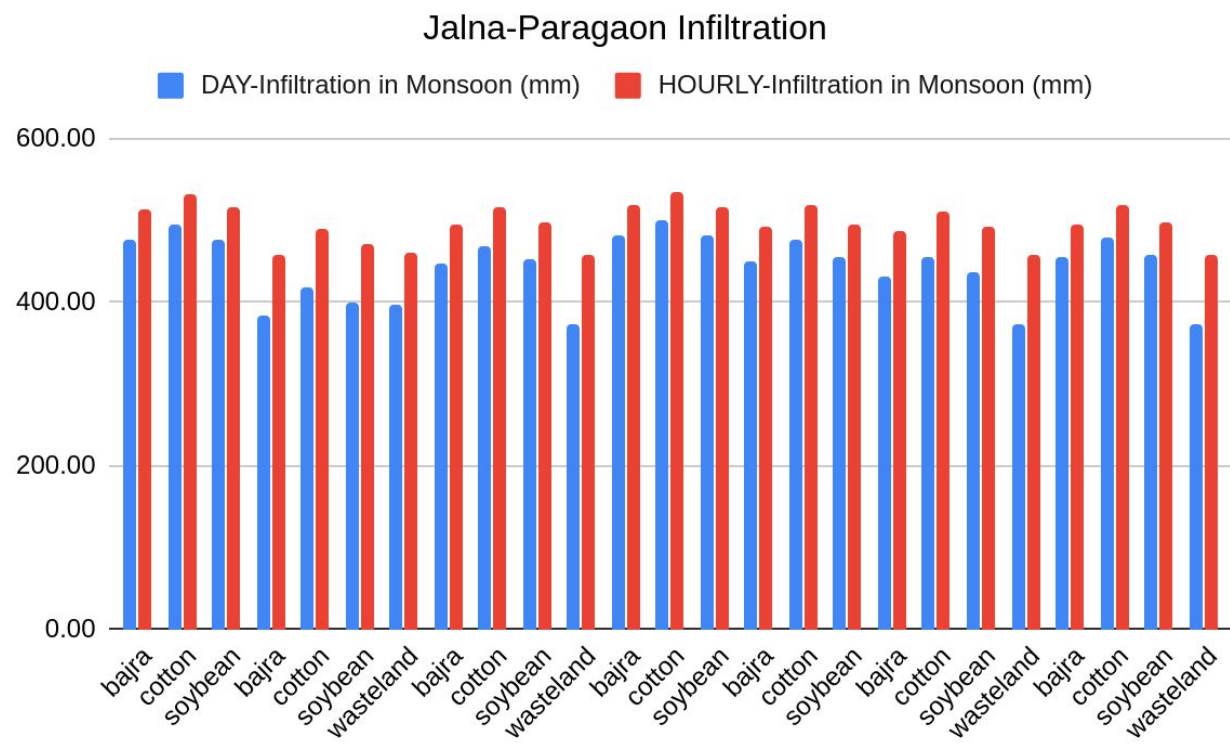
Sample Comparison: Daily vs Hourly model

AET

- The simulation was run on the dataset from Jalna district.

- The rainfall circles for the data were Ranjani and Partur.
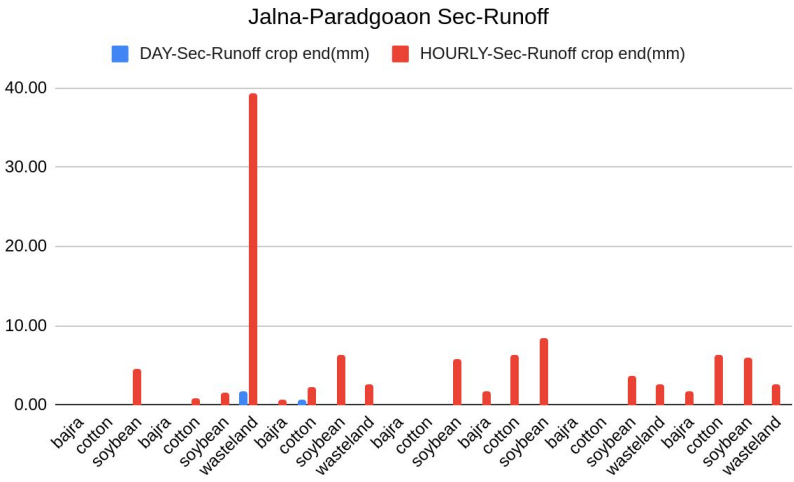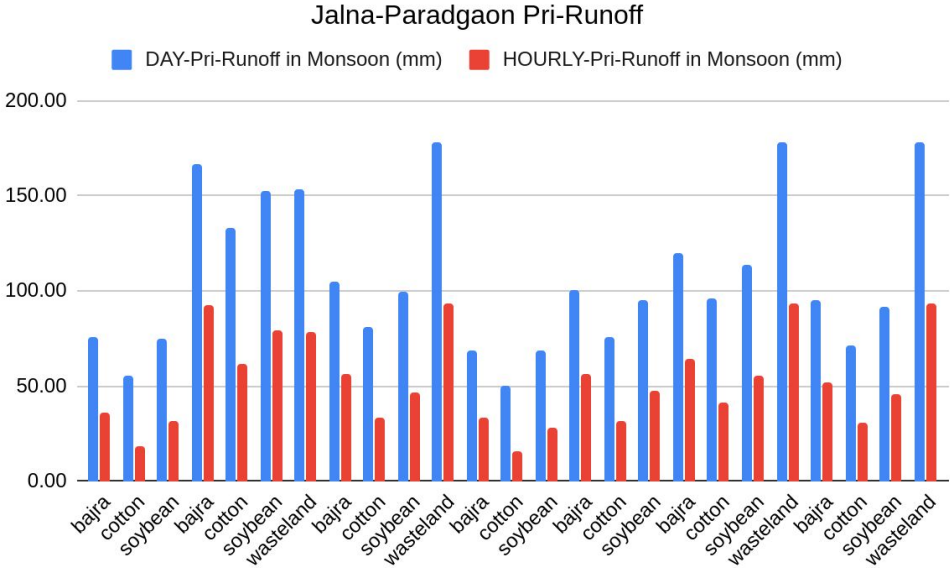
- The weather data was taken from the year 2019.

Jalna-Paradgaon AET Comparison
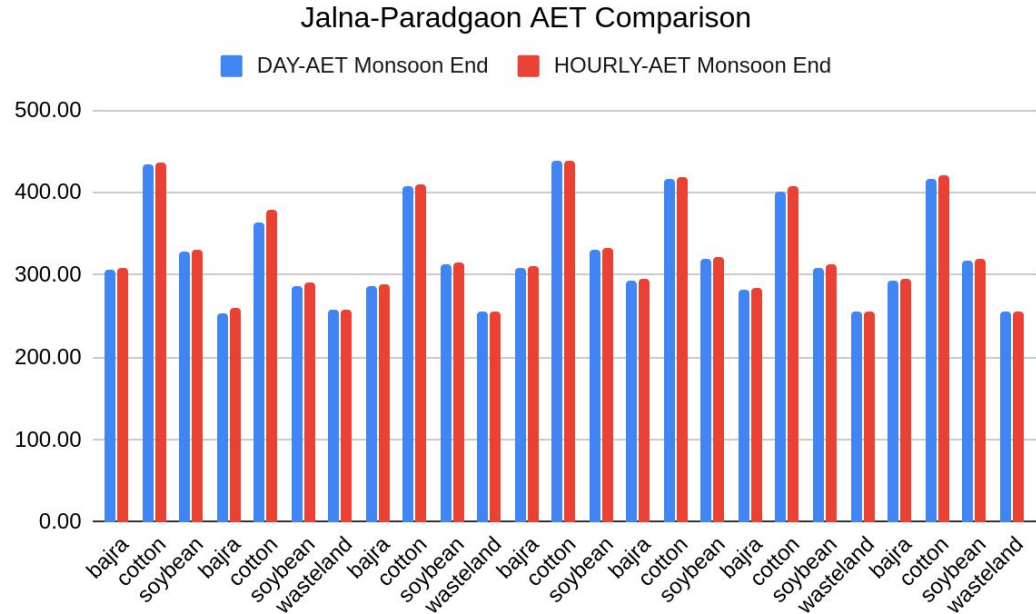
Sample Comparison: Daily vs Hourly model Infiltration

Jalna-Paragaon Infiltration

Sample Comparison: Daily vs Hourly model Runoff

Jalna-Paradgaon Pri-Runoff

Jalna-Paradgoaon Sec-Runoff

Sample Comparison: Daily vs Hourly model

Soil Moisture
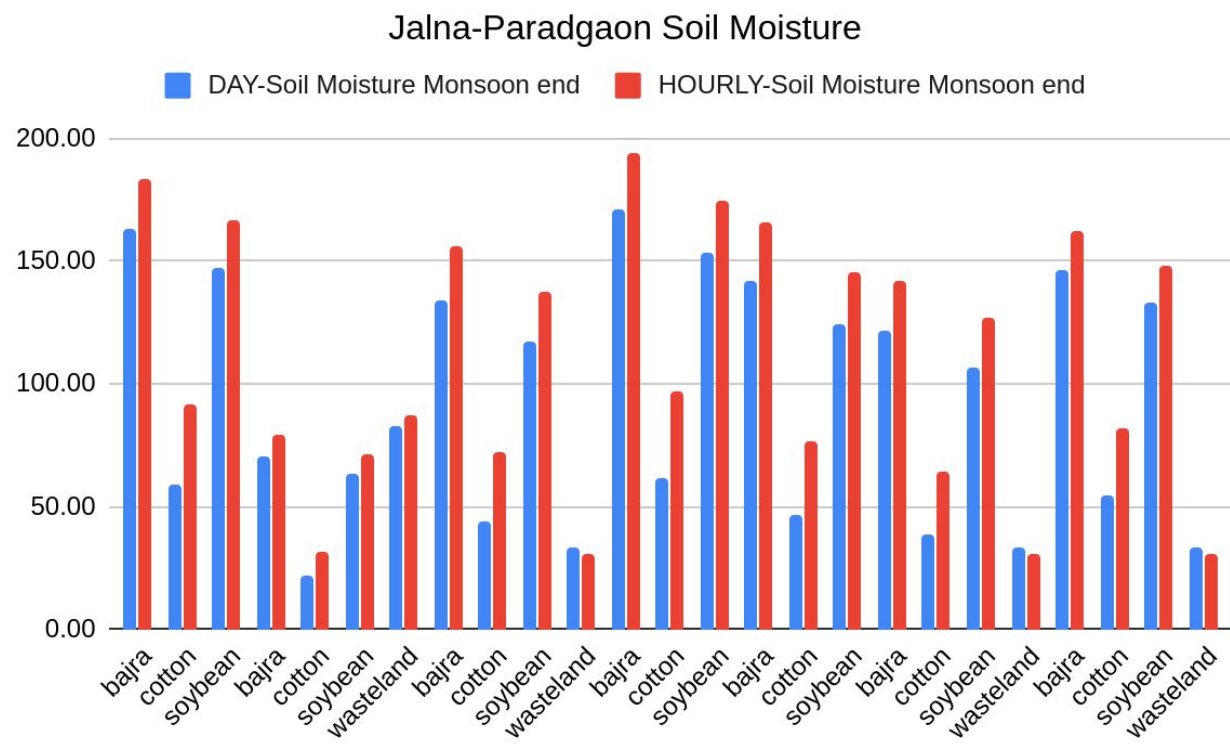
Sample Comparison: Daily vs Hourly model GW recharge

Jalna-Paradgaon Ground Water Recharge
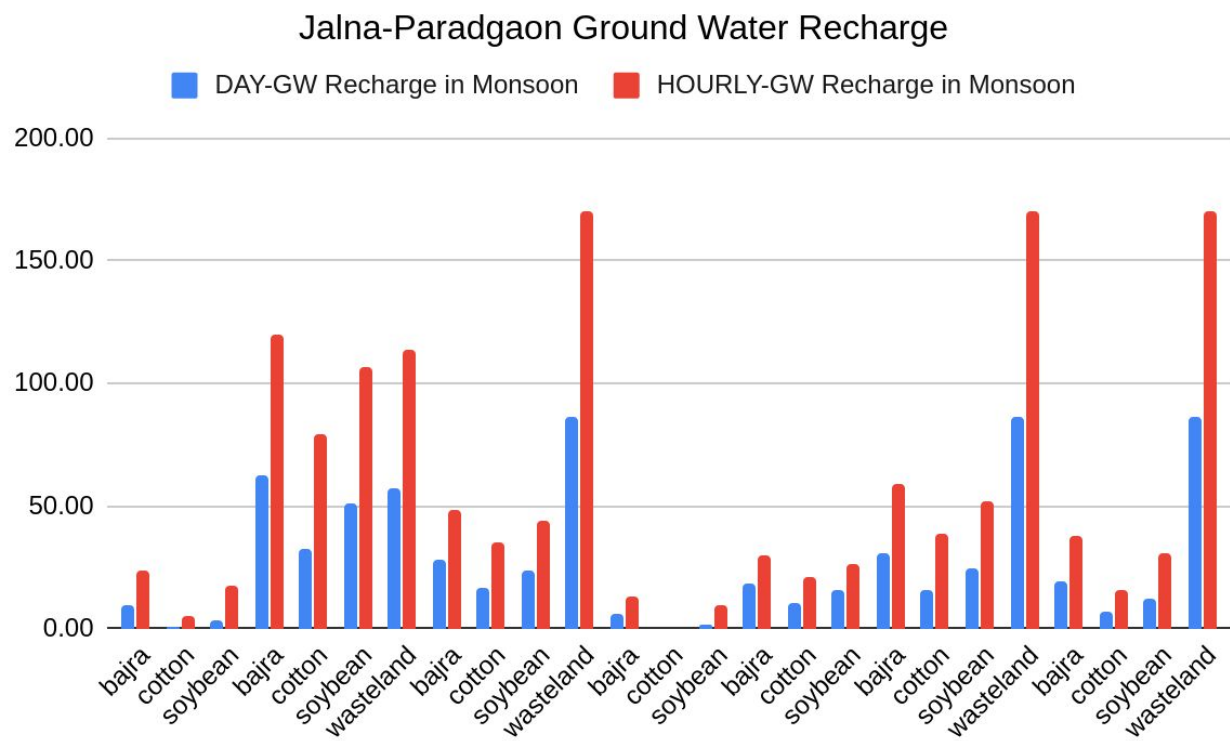
Updates

1. The plugin code was updated so that it can be used with QGIS3.
2. Added an option to select daily/hourly model to run.

# Percolation parameters for different soil type

Sr	Soil type	Clay loam	Silty loam	Clay
1	Total soil thickness (m)	0.25	0.25m	0.25m
2	Saturation % (mm)	0.4420 (110.5)	0.418 (104.5)	0.487 (121.75)
3	wilting point % (mm)	0.2060 (51.5)	0.105 (26.25)	0.303 (75.75)
4	FC % (mm)	0.3410 (85.25)	0.291 (72.75)	0.427 (106.75)
5	K_{sat} mm/hr	2.7	6.97	0.52
6	TT_{perc} hr	9.37	4.6	28.8
7	Daily Percolation factor	0.94	0.99	0.56
8	Hourly percolation factor	0.1	0.2	0.03
9	Hourly percolation factor*24	2.4	4.8	0.72

Aggregated percolation factor full day obtained from the hourly percolation factor is significantly higher as compared to the daily percolation factor. This has led to increase in the Groundwater recharge or deep percolation.

Percolation Function for clay loam(top) and clay (bottom)
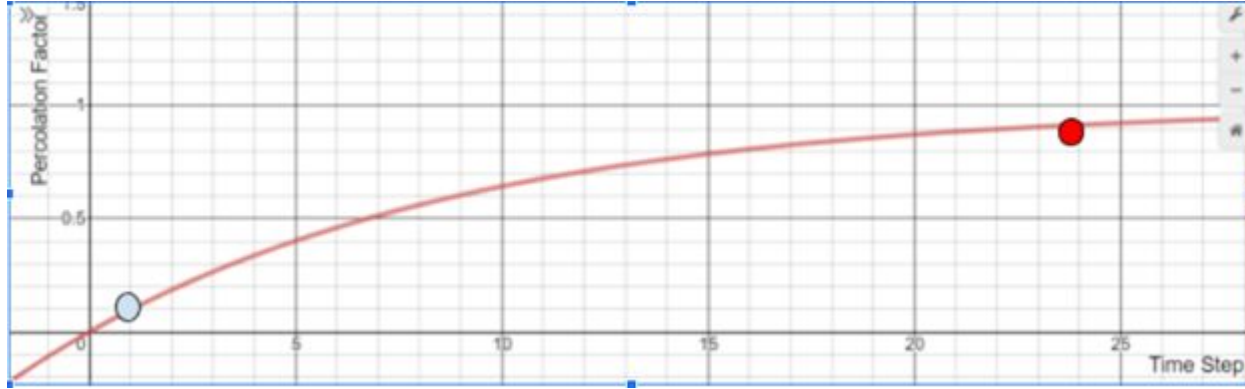
Blue dot represents the hourly percolation factor and red dot represents the daily percolation factor plotted on their respective percolation functions for given soil type.
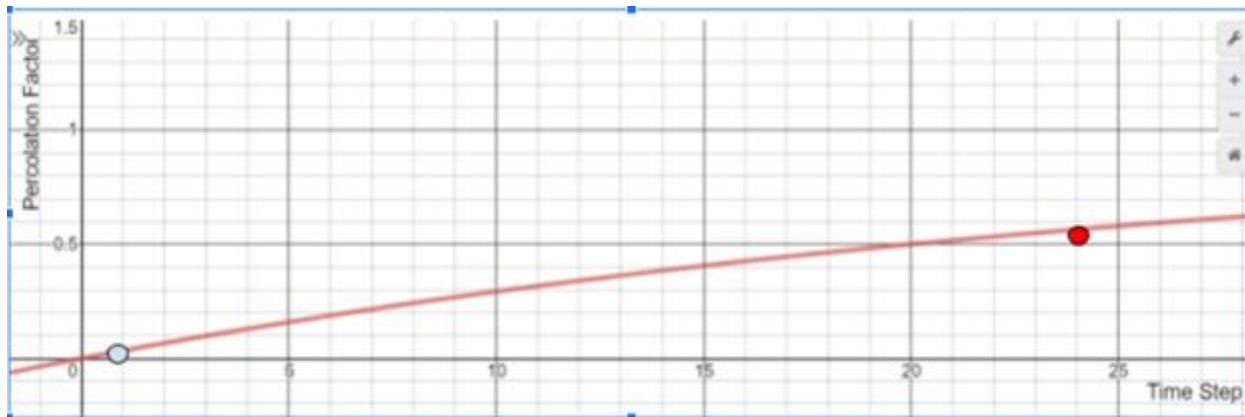
X axis time step

Y axis percolation factor

References:

1. Repository: https://gitlab.com/wankhade.aashish1/kharif_multicrop_plugin
2. Plugin manual, code & sample results :
   https://drive.google.com/file/d/1WTgcye_giCykbjsfwqaF_eZ9Jv3qnGCV/view?usp=sharing