

## EFAO's Farmer-led Research Program Workflow for Downloading and Graphing Weather Data

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### Sources of Historical Climate Information:

- Environment Canada: <http://climate.weather.gc.ca/>
  - Historical Data
  - Monthly Climate Summaries-includes all monthly average station data for province, download month by month
  - Canadian Climate Normals

### Data to be collected from online government sources:

- Norms for Ontario, year's averages, extreme events, comments from farmer
- Average weather data for Ontario based on all records
- Monthly averages for 2017
- A record of ALL variables and then we can decide on a few key variables to add to the Research Report (high, low, rainfall, etc)

### Weather variables available from data:

- Max Temperature
- Min Temperature
- Mean Temperature
- Total Rain
- Total Snow
- Total Precipitation
- Snow on Ground
- Direction of Max Gust
- Speed of Max Gust

## **Workflow:**

1. Identify location of farms using google and google maps. Record address and latitude and longitude of farms in degree, minute, seconds format in a spreadsheet.
2. Identify weather station from Environmental Canada website closest to farm. Use the *Search by Proximity* function for the latitude and longitude of farm. Record information on station (Station name, time frame for records, distance from farm, recording interval) in the spreadsheet, using the following tips:
  - a. Select closest weather station with data in year of the farm trials (since some weather stations have stopped collecting recent data) and the most historical data (some weather stations have been collecting weather data for longer than others).
  - b. Plot coordinates of farm *and* weather station on Google Earth for desktop as you record data. This creates a good visual for reference.

- c. Skip ahead to Step 5 to check if chosen weather station has Canadian Climate Normal Data. If not, choose the next closest weather station that does and continue with Step 3.
  - d. Link to search for weather stations:  
[http://climate.weather.gc.ca/historical\\_data/search\\_historic\\_data\\_e.html](http://climate.weather.gc.ca/historical_data/search_historic_data_e.html)
3. Download raw time series data for each weather station. This is available in monthly downloads of data. There will have 12 different downloads for one year that will have to be compiled into one spreadsheets for each farm. *This is very time consuming. If you can automate this step that would be very helpful.* Keep raw data sheets in folder for future reference in case something needs to be checked. Link for data downloads:  
[http://climate.weather.gc.ca/prods\\_servs/cdn\\_climate\\_summary\\_e.html](http://climate.weather.gc.ca/prods_servs/cdn_climate_summary_e.html)
4. Input raw data for all weather variables into separate google spreadsheets for each farm/weather station (there are 13 different spreadsheets for 2017 farm trials). Each spreadsheet will include raw data and plots of required variables (monthly averages, historical monthly averages etc.)
5. Download Canadian Climate Normals for each farm. There are three options for years: 1981-2010, 1971-2000 and 1961-1990. Only data from 1981-2010 was used since it contained both temperature and precipitation data. Keep a copy of raw data in folder and copy results into spreadsheets for each farm. This could be time consuming if there are lots of farms but does not take as long as Step 3. Link for data downloads:  
[http://climate.weather.gc.ca/climate\\_normals/index\\_e.html](http://climate.weather.gc.ca/climate_normals/index_e.html)
6. In Excel, create the required plots of the data. *This is time consuming because each farm needs to be plotted separately. If there is a way to automate this step it would be very helpful.* The following weather plots were plotted for each farm:
  - i. 2017 Vs Historical Weather Data:
    1. Min Temp
    2. Max Temp
    3. Average Temp
    4. Total Monthly Precipitation
  - ii. Plot from Historical Climate Weather DataTo ensure, the correct data is referenced for each chart, check one data point manually from each series on each plot to make sure it was correct.
7. Save all plots as image files to insert in research reports.

**Note:** Another potential format for plotting the weather data going forward is showing years on the x-axis and the weather variable (average temperature or precipitation) on the y-axis. One of these plots could be made for every season. However, this might be very time consuming because the weather data would have to be individually downloaded for every month of every year.