



USER GUIDE

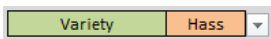
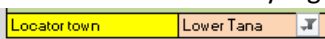
Time-to-Harvest (TTH) Calculator for Avocado in Kenya

A guide to maturity and harvest date of avocado in Kenya

The calculator gives a prediction of the date when the main crop avocado will reach a target dry matter content for fresh fruit or processing. That is, when it is time to harvest. The predictions are based on cumulative Growing Degree Days (GDD)¹,

The following notes are a simple guide to working through the calculator to obtain the information you need to guide decisions on harvest date.

This tool gives a valuable guide to the **likely** date of harvest maturity in each village area. Actual dry matters should be cross-checked by dry matter testing of fruit from representative orchards in each district in the weeks leading up to harvest.

When using the programme only two kinds of cells are active. The PINK cells use a 'pull-down' menu to select the data entry e.g to choose the variety  or to choose a Locator Town . Most of the other cells are 'locked' to prevent users from damaging the program's outputs and structure.

The tool is Excel™ based and has eight worksheets that have different functions and provide different kinds of information. They are:

- Entry page

¹ Dry-matter (DM%) predictions are based on an empirical relationship between DM% and the the cumulative number of 'growing-degrees-days' (GDD) for each village as calculated from the 1st of November. The model uses the daily average temperature from a reference climate station at Thika as its base (<https://www.meteoblue.com/en/weather/archive>). The GDDs are calculated for each village using the average daily temperature from Thika (at a reference elevation of 1450 meters above sea level), with a correction for the environmental lapse rate (=0.65 °C for every 100 m difference in elevation) and then we subtract the 'base temperature' of 10 °C (below which we assume no growth is taking place). The resultant daily values are progressively summed to give cumulative GDDs for any locality.

- Western Region
- Central Highlands Region
- Eastern Region
- Search of Sub-Regions
- Search of Villages
- Exporters entry
- Fruit sample data

Note: The village names used in the model are those given in Google Maps. The model can only find and do calculations for village names that are show in Google Maps and entered in the model. It is possible that there may be local variants of the names. If the exact village name cannot be found it is possible to cross check or confirm the local name or spelling with the model name by checking the location of the village on the map or finding the altitude using a GPS app on a smart phone.

How to use the ‘Time To Harvest’ Prediction Tool

1. ‘Home Page’ Worksheet

What it does

This page is the entry point for the prediction model. The information entered here are used as the basis calculations throughout the other worksheets of the tool.

Action needed

- Click on the pink boxes
- Using the drop down menus
 - Select the ‘Variety’ (Hass or Fuerte)
 - Select the ‘Purpose’ (Fresh fruit or processing)
 - Select the ‘Date’. This is the date you are interested in to see how the dry matter in the area is tracking. It can be the current date, a date in the future or a date in the past.
 - You can also choose an alternative dry matter that you may be interested in. Predicted dates for reaching that dry matter will show when interrogated in the Region maps

To change any of these inputs in the subsequent work sheets the User must return to the Entry page and change the values here.

2. 'Regions' Worksheets

What they do

A series of four maps covering different avocado growing regions are provided with this tool. These maps provide you with a way to find the nearest town ('Locator Town') to the area you are interested in. There are a total of 47 Locator Towns in the model.

The main features of the maps are:

- The Region maps cover the main avocado growing areas in the Central Highlands and Western Kenya.
- All the maps provide the same type of information
- They are derived from Google Maps which does not show County boundaries
- Instead, each map has a number of Locator Towns that serve as a geographic guide to locate villages of interest.
- All villages within a 25km radius of each Locator Town are shown on the maps as yellow dots
- The yellow dots are the locations of individual villages. In all there are about 5800 villages marked across all of the regions
- There is some overlap between the areas associated with adjacent Locator Towns so that some villages can be sourced from different Locator Towns and they may also occur on different maps. Also, there are some instances when villages in widely different areas have the same name. The correct village of interest can be located by its geographical location on the map.
- These maps provide a range of general information for the Locator Towns and the areas immediately surrounding them.
- The data shown against the locator towns in the Region maps are averages of the date for all of the villages within a 25 km radius of the locator town. Differences in altitude within each area will mean that there will be variations between the locator town averages and the specific villages

Action needed

- Select the worksheet of the Region you are interested in (Western Region, Central Highlands Region, Eastern Region).
- The green cells at the top left of the worksheet are linked to selections on the Entry Page and show:
 - The variety selected in the Entry Sheet
 - The date selected in the Entry Sheet
 - The 'purpose' can be selected here from the dropdown Display Data menu
- Click in the pink 'Display Data' cell a range of information relating to see the drop down menu. The choices are:
 - Elevation – height in meters above sea level. Towns at higher elevations have slower rates of fruit maturity than towns at lower elevations.
 - Date Fresh - this is the predicted date the average fruit dry matter content at that site reaches the target level for fresh fruit at the Locator Town
 - Date process - this is the predicted date the average fruit dry matter content at that site reaches the target level for process at the Locator Town
 - % DM (at the date selected in the Entry Page)

- Locator Town – the names of the Locator Towns appear in the flags
- Temperature – this is the long term annual average temperature for the Locator Town
- GDD (total) – the annual total Growing Degree Days for each Locator Town
- GDD (to date) – cumulative Growing Degree Days up to the date selected in the Home Page)
- When any of those choices is selected the relevant information will show in the flagged label beside each of the Locator Towns
- These maps are a very useful guide for a general overview of progress towards maturity in the different areas.
- However there can be significant altitude differences even within an area associated with each Locator Town that will affect the maturity date.
- Once the Locator Town has been found, proceed to the ‘Search of Sub-Regions’ worksheet to identify the predicted harvest dates for villages within the different Sub-Regions (i.e. within 25 km radius) of each Locator Town.

3. ‘Search of Sub-Regions’ Worksheet

What it does

The ‘Sub-Regions’ are based on the Locator Towns. Each sub-region lists all villages within a circle of 25 km radius of each Locator Town. Because the circles of adjacent Locator Towns sometimes overlap, the same village may appear in more than one Sub-Region list of villages.

The “Search of Sub-Regions” worksheet provides a range of information for the Locator Town and all towns and villages within each sub-region.

Actions needed

This sheet allows you to search for information in two ways:

1. Locate the Sub-Region by searching for the Locator Town then find the village

- Use the drop down menu the Locator Town pink button this will show the full list of Locator Towns in the model. Note: this list is not sorted alphabetically so you may also need to enter the ‘search box within the list-menu’ and type the first few letters of the Locator Town.)
- Select the Locator Town for the general area you are interested in. You can find this name from the ‘Region’ maps.
- The names of every village within that sub-region are displayed with: latitude, longitude, calculated GDD and DM for the date selected in the Entry Page, and predicted dates of maturity for fresh and process fruit.
- The ‘DM (now)’ column is colour coded (refer to the colour key above) and provides a quick visual guide on status of maturity of fruit at each either fresh fruit or processing.

2. Search for a single village within a Sub-Region

The pink “Village” cell within the table allows you to search for a single village in the Sub-Region. Because of the operational function of Excel™ the ‘village’ search list contains **all** of the villages listed in the model and not just those in the Sub-Region.

To bring up a specific village:

- Set the 'Locator Town' search menu to 'All'
- Go to the search menu in the pink 'Village' box
- Find the village of interest by typing the first few letters of the wanted village in the text box
- If there are more than one villages of the same name in the list they will all show.
- Select the village for the area you are interested
- Press OK
- The single village and associated data will show in the table

NOTE. To return to the Locator Town function after using the village search function:

- Open the drop down menu for 'Village'
- Select "Clear filter from 'Village'".
- This will allow you to select another Locator Town and its associated villages.

4. 'Search of Villages' Worksheet

What it does

The "Search of Villages" worksheet provides fruit-maturity estimates for **all** villages identified as being from the avocado growing regions of Kenya. The villages are listed in alphabetical order.

The "Villages" worksheet provides estimates for the average dry-matter content on the day of interest (as selected from the Home page) as well as dates for harvesting of fresh and processed fruit from the village of interest.

Actions needed

To find information for a specific village

- Go to 'Select your village' and open the dropdown menu.
- Search for a named village (either from the alphabetical list or by typing the first few letters of the village name into the 'Search' box).
- Click OK
- The location of the village will be shown on the map and the Sub-Region Locator Town will be shown under the Locator Town box.
- The predicted maturity dates are shown in the chart
- The graph shows the calculated dry matter accumulation for that village and target DMs for fresh fruit and processing (horizontal lines). The bars on the graph give an estimate of the variability around the predicted date
- In some cases several villages of the same name appear. There are two main reasons for this
 - There may be villages of the same name in different Regions or Sub-Regions
 - Because of overlapping of the Sub-Regions the same village may appear to be in two adjacent Sub-Regions.
- This can be clarified in several ways

- If they are same village they will have the same altitude and appear in the same position on the map
- Check the general geographic position of the village on the map
- Check the position of the Locator Towns on the map.
- Check the positions of the Locator Towns on the Regional Maps

Note: If the geographic location of a village name is cross-checked using the 'Locator Town' Search, use the 'Clear Filter from Location' function in the 'Locator Town' menu before searching for another village.

5. 'Exporters Entry' Sheet

What it does.

The worksheet named "Exporter's Entry" is a place where you can enter your own information about supply farms.

Provided you have the correct name of the nearest village to the supply farm, or the altitude of the farm, then you can make their own quick reference list of farms with predicted dates for maturity for export or processing.

You can enter information in all the white cells in the sheet

As noted earlier the spelling of village names is taken from Google Earth. The spelling has to be correct for the model to recognise and respond to it.

Actions needed

There are two 'Quick test' functions in the Sheet.

1. An altitude based quick test

Because the model works on long term average temperatures the predictions for all farms at the same altitude will always be the same.

- Go to the 'Quick Test' chart
- Enter an altitude for a farm or nearest village
- The model will show predicted maturity dates for the variety entered in the Home Page Sheet

2. Village based quick test

Either:

- Enter Grower code (if there is one), name and village in the appropriate columns
- The location of the village will show as a blue dot on the map and the relevant information will show in the grey boxes

Or (If you do not know the village or it is not in the model)

- Enter the Grower details as before
- Enter the **altitude** of the farm or nearest village in the white Altitude column
- The average temperature and predicted harvest dates will show in the grey columns
- This option is very useful for generating harvest predictions when villages are missing from the model.

NB. There are a number of free altitude apps for smart phones that can be used for determining the altitudes of individual farms.

6. Fruit Sample Data sheet

The worksheet named “Fruit Sample Data” is a place where you can enter your own information about fruit dry-matter samples taken from ‘monitor’ farms.

Monitor farms are ones that have been chosen in different districts for consistent fruit quality and management and where long term data (over many seasons) are either available or are planned for.

Returning to the same farm, and even the same trees on that a farm, is the best way to capture the seasonal trends.

What it does.

The datasheet enables the User to compare model outputs of fruit dry matter content (%) against DM measurements to either track fruit development or to make comparisons with high-quality data e.g. to determine how the season is tracking relative to an average year.

Provided you have the correct name of the nearest village to the supply farm, or the altitude of the farm, then you can make their own predictions of the fruit dry-matter content for the monitor farm.

You can enter information in all the white cells in the sheet. Some entries are optional (i.e. Farm Code and Farmer’s name) but other entries are vital (i.e. sample date, village name and variety). We have assumed the monitor farm will be close to one of the named villages so there is no place to enter the altitude.

As noted earlier the spelling of village names is taken from Google Earth. The spelling has to be correct for the model to recognise and respond to it.

Actions needed

To generate an estimate of fruit dry matter for a given day, the User must enter values in the white cells of the ‘Fruit Sample Data’ worksheet. The minimum inputs required to generate an estimate are the date, the village name and the variety.

Additional inputs are needed for the mean and the range (optional) if you want to compare the predictions against the actual DM data.

Comparisons are useful to check the quality of the test data (for example is it tracking as expected with time, or is it within the expected range) and to check DM progress.

The comparison can go one of three ways.

- The test data are higher than predicted (more than 2 DM units higher)
- The test data are lower than predicted (more than 2 DM units lower)

- The test data are pretty close to predicted (within 2 DM units)

There are many explanations why these differences may occur. They may include:

- Inconsistent sampling testing methods for sequential testing on monitor farms
- Longer than normal spread in flowering
- Fruit from the wrong flowering season e.g. 2nd flowering, not the main season
- Wrong village entered
- Wrong date entered
- Local microclimate effects
- Abnormal weather events