



# Truffle Grower App

iOS application for truffle  
orchard management



# Agenda

- Introduction
- Application layout
- Monitoring tree health
- Truffle hunting and harvesting
- Truffle processing and grading
- Analysing data
- Integrating weather stations
- Orchard configuration

# INTRODUCTION



# Truffle Grower objective

Improve the health, quality and productivity of truffle orchards:

- Record data relating to orchard operations and environmental conditions
- Reveal patterns in tree health or truffle production
- Review impact of cultural practices on truffle quality



# Assist with workflows

Support key orchard management activities :

- Monitoring tree health
- Truffle hunting and harvesting
- Truffle processing and grading



# Work with data

## Analyse and export data:

- Analyse truffle production and quality data
- Share orchard data with other app users
- Work with data externally to the app (export to **Excel, Numbers, etc**)

# APPLICATION LAYOUT



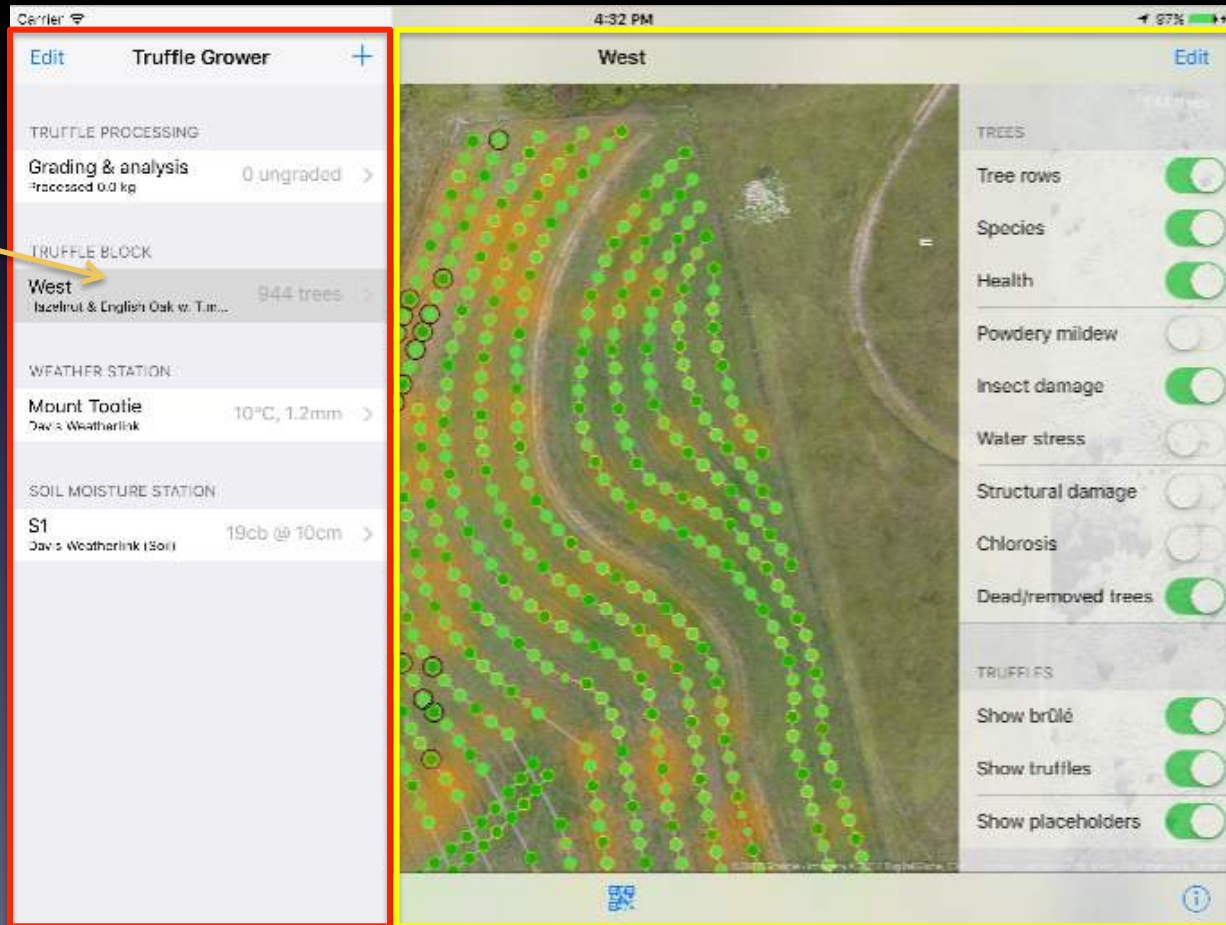
# Truffle Grower layout

The application is arranged into a summary panel and a detail view

Selecting an item in the summary panel loads its detail



Summary panel



Detail view displays the selected item







# Summary panel

The summary panel provides an overview of the truffle enterprise:

- Each orchard block
- Temperature and rainfall reported by each weather station
- Moisture reading from each soil station
- Number of truffles waiting to be processed



Add a new orchard block, weather station or soil station

Select truffle processing to grade truffles, or to analyse production trends

Select a block to either monitor tree health, or to hunt & harvest truffles

Select a weather or soil station to review climate data

# MONITOR TREE HEALTH



# Monitor tree health

- Collect measurements taken in the field
- Inspect trees systematically, or ad-hoc
- Scan a tree label to select the tree in the application
- Reveal block-wide patterns of health or symptoms
- Target follow-up treatment to specific trees or areas



Carrier 5:20 PM

Cancel Add Observation Save

TREE #110011, ROW A11

2 year old Hazelnut  
*Tetralinaoportunus*

Date of observation 6 July 2017

RECORD TREE HEIGHT

Height (m) 1.33 m

SELECT TREE HEALTH

Health excellent

OTHER OBSERVATIONS

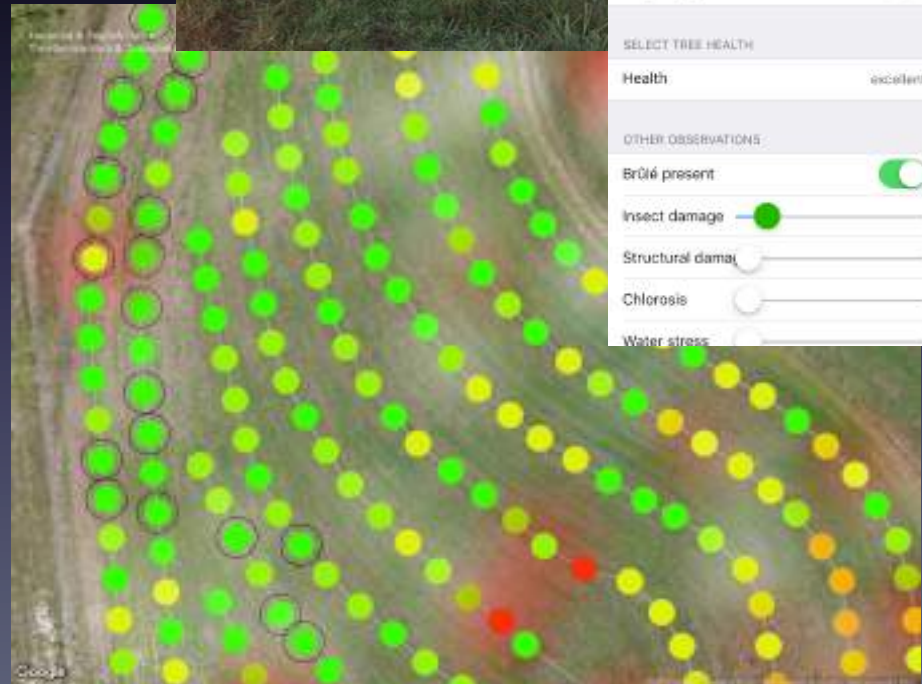
Birds present

Insect damage

Structural damage

Chlorosis

Water stress





# Block and tree details

The truffle **block detail** view is used to identify areas:

- With poorly growing trees or poor truffle production
- Producing undesirable truffle species
- Exhibiting specific health symptoms (powdery mildew, insect damage, etc)

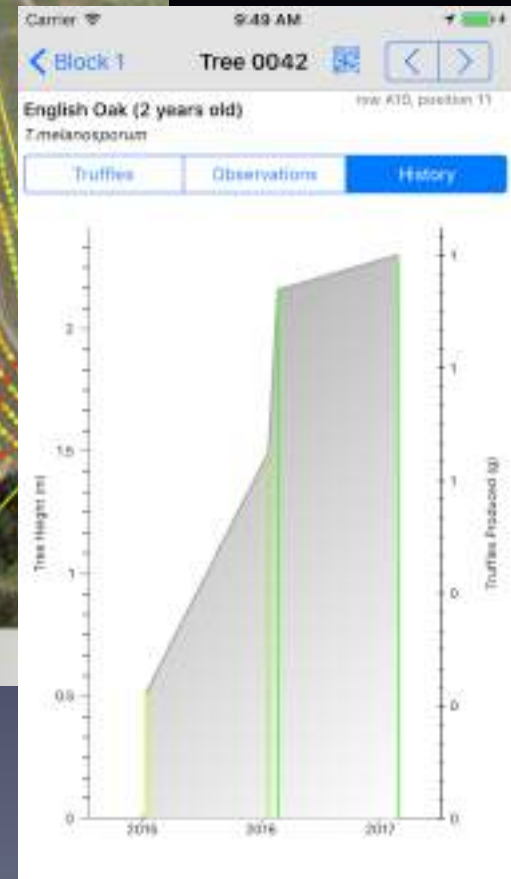
Drill down to see the **tree detail** views:

- Record new observations of tree health
- Tree growth and health history
- Truffle production history

Block detail



Tree detail





# Block detail view

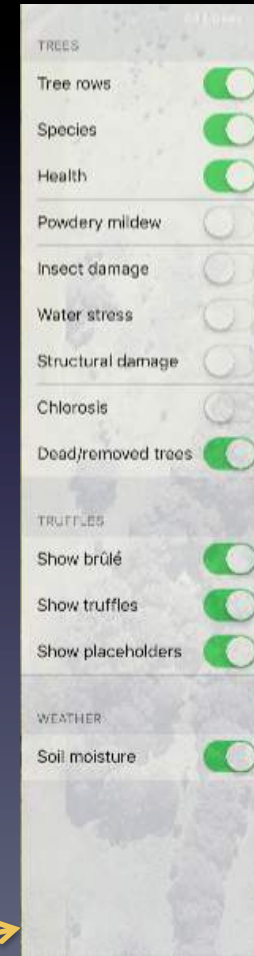
The block detail view provides a high level graphical depiction of the current state of the orchard block

Orchard data is shown over an interactive base map published by Google

A high-res image or plan of the block can overlay Google's base map imagery

Perform actions on the block, including:

- Print current view
- Generate labels
- Email block
- Duplicate block



Map options control what data the map shows



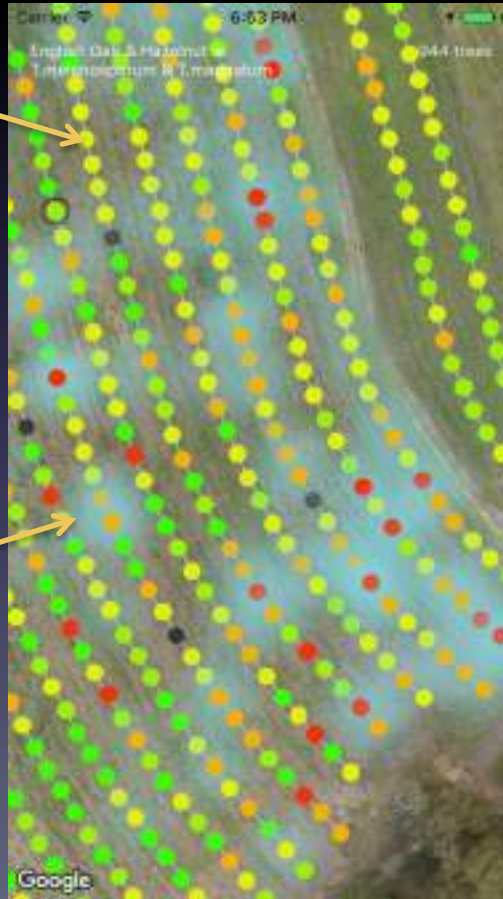
# Identify areas of poor health

Use the block view to find areas where trees are performing badly. In the image below of an orchard in NSW, the options are selected to show tree health but hide tree species. This highlights an area of poor health:



Area of concern

Zooming into this area and toggling map options shows that many trees in this area are exhibiting water stress (in areas indicated by the blue shading)



The trees in this part of the block were all planted last winter, and experienced a very dry summer

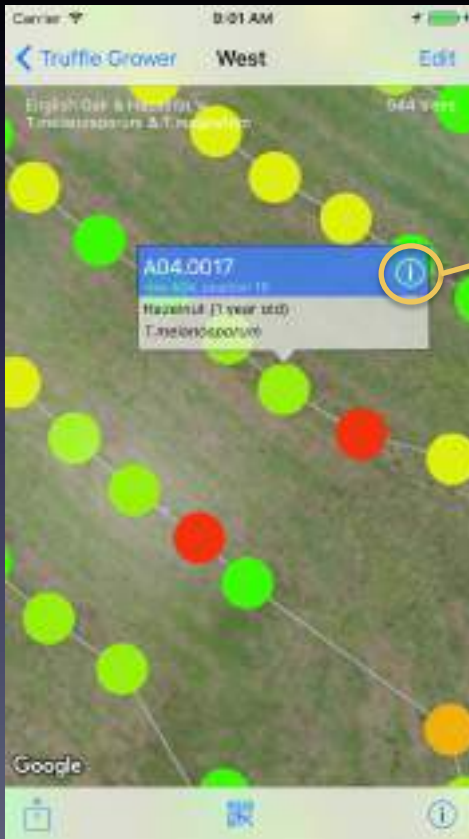
The trees will need extra attention to make sure they recover in the next growing season



# Select a tree – from block detail

Users work with a specific tree through its detail views. These can be called up either:

- From the block detail display, as shown below
- Using the tree label scanner

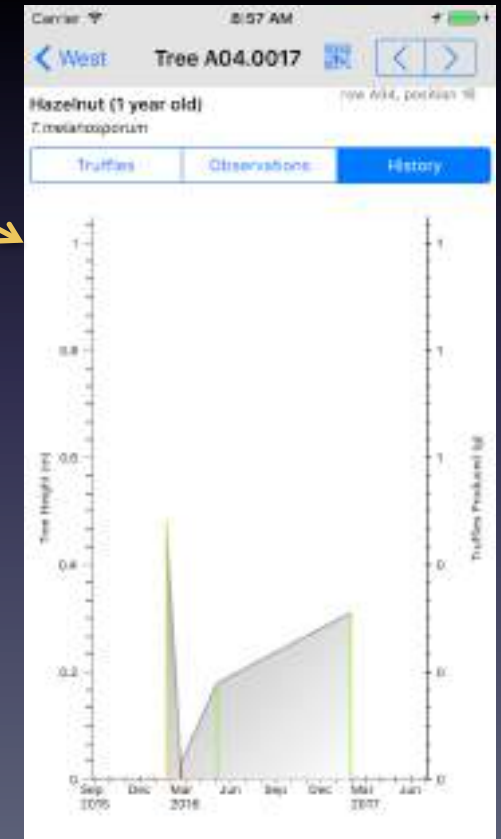


Block detail

Tap the tree,  
then press the  
detail button



Tree detail views





# Select a tree – using label scanner

Working in the field, it can be confusing to match a tree you are examining with an icon in the application. The Truffle Grower can help by creating tree labels that can be scanned to select a tree:

- While in the field, select the label scanner button
- Capture the tree's label in the camera view, and press the detected label name to highlight the tree in the block view
- Press the detail button to move to the tree detail view



Block detail



Label scanner



Tree detail





# Producing tree labels

Truffle Grower can generate tree labels that can be scanned in the field to select a tree:

- Generate a PDF file of tree labels using the **block detail's** 'print tree labels' action

*The file is formatted with one credit-card sized label per page*

- The resulting file can be sent by email for printing by a professional print service

*We used "sn@p" printing services in Waitara, NSW, to print the labels for our own orchard*

Block detail



Label preview



Send file to  
3<sup>rd</sup> party  
printing  
service



# Tree detail view

The tree detail view's Observations and History sections are used to review and record observations of the tree:

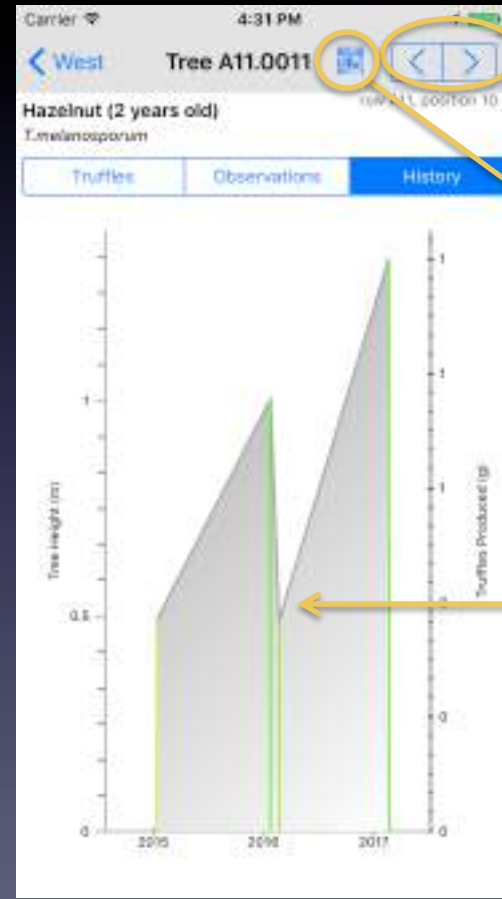
Return to block detail

Details of the selected tree

Each observation made of this tree is listed



Tree detail - observations



Tree detail - history

Change to the previous/next tree in the row

Scan a tree label to change to any tree in the block

An interactive chart shows tree height and health at each observation date



# Recording a new observation

Tree detail - observations

DATE	HEALTH	HEIGHT	SPURT	PEST MOLES	INSECT	CHLOR	WRING
23-02-17	excellent	1.33m	0%	0%	12%	0%	0%
21-02-18	good	0.40m	0%	0%	37%	0%	0%
23-01-18	excellent	1.00m	0%	0%	0%	0%	0%
11-01-15	average	0.40m	0%	0%	0%	0%	0%

Add a new observation

Sliders record a qualitative measure of the severity of specific health problems (0-100%)

Observation form

Cancel Add Observation Save

TREE A11.0011, ROW A11  
2 year old Hazelnut  
Trezlanosporum

Date of observation 6 July 2017

RECORD TREE HEIGHT  
Height (m) 1.33m

SELECT TREE HEALTH  
Health excellent

OTHER OBSERVATIONS  
Brûlé present   
Insect damage   
Structural damage   
Chlorosis   
Water stress

Check the date

Initial values are taken from the last observation of the tree.

Update with new values

Scrolling the form shows the full list of categories.



# Monitor tree health - summary

Block detail is used to view tree data over the entire block

- Data is presented graphically on an interactive map
- The map shows the latest observation of each tree

Tree detail is used to enter new observations for trees in the block

- Tree history can also be seen
- The label scanner can be used to simplify use “in the field”

Block detail



Tree detail

The screenshot shows the 'Tree detail' screen for 'Tree A11.0011', a 'Hazelnut (2 years old)'. It has tabs for 'Truffles', 'Observations', and 'History'. The 'Observations' tab is active, displaying a table of tree observations.

TREE OBSERVATIONS								
Date	Health	Height	Strut	Pest/Mites	Trust	Chin	Wiring	
23-02-17	excellent	1.13m	0%	0%	12%	0%	0%	
21-02-18	good	0.40m	0%	0%	37%	0%	0%	
23-01-18	excellent	1.00m	0%	0%	0%	0%	0%	
11-01-18	average	0.40m	0%	0%	0%	0%	0%	

# TRUFFLE HUNTING & HARVESTING



# Truffle hunting and harvesting

- Mark the location of potential truffles in the orchard as they are detected
- Return to a marker when the truffle is ready to be harvested
- Record each truffle's location and depth as it is harvested
- Truffles are given an id when harvested to track them through to processing and grading





# Marking a truffle location

As truffles are discovered, their location is added directly to the application using the **tree detail** of the tree nearest to the truffle

Tree detail - truffles



Press on the chart to add a new marker relative to the tree



Tree row and distance guides help determine the location

Tree detail - truffles



Truffle markers are represented by a dashed circle

The new marker is highlighted and row selected



# Harvesting a truffle

Truffle placeholders are drawn on the block overview display, enabling harvesters to easily find them in the field. When harvesting the truffles:

- Select the nearest tree to the truffle location – either by scanning the tree label or selecting the tree from the block detail
- Identify the placeholder to replace, or press on the chart to harvest a truffle without using a placeholder
- As the truffle is uncovered, record the depth to the top of the truffle
- Clusters of truffles at the same location should be treated as a single truffle until they are processed. *The truffles can be split when processing*
- Make a note of the truffle id, and keep a copy of the id with the truffle until it is processed. *Truffles id can be written on the snap-lock bag holding the truffles*





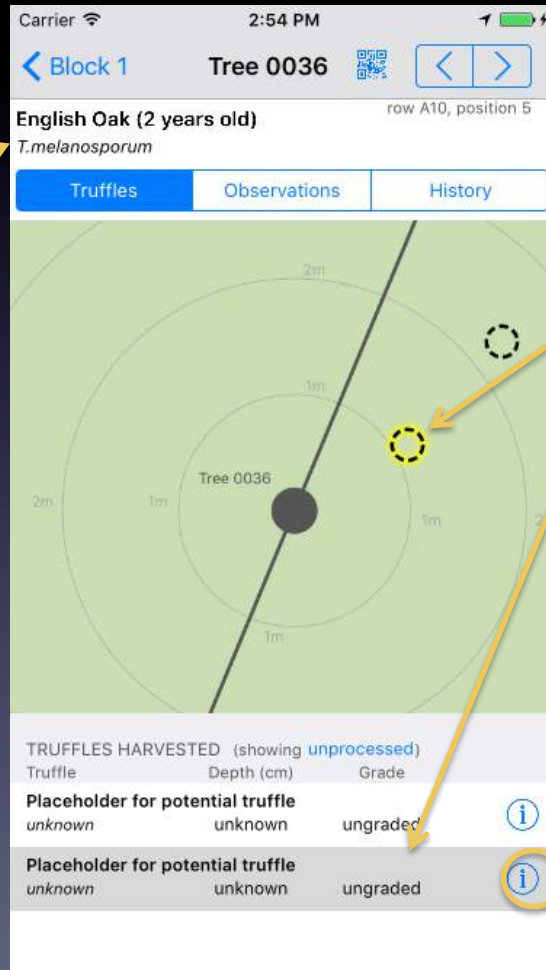
# Harvesting truffles – replace marker

## Block detail



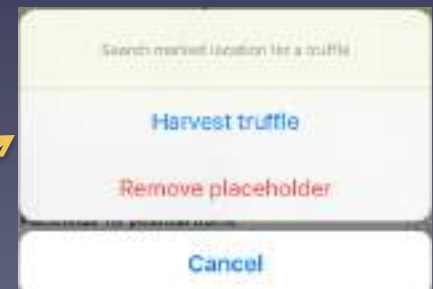
Truffle placeholders are small circles on the block detail view

## Tree detail - truffles



Tap the placeholder being harvested to highlight the truffle row

Use the details button to either harvest a truffle or remove the placeholder





# Harvesting truffles – enter data

When harvesting truffles, the truffle depth must be recorded. Other properties are optional at this stage

Carrier 3:08 PM

Cancel Harvest Truffle Add

Truffle id 11-07-17/Block 1/0036/1

Harvested on 11 July 2017

HARVEST DETAILS

Depth (cm) Enter truffle depth (cm)

Species T.melanosporum >

Grade Select a truffle grade

Weight (g) Truffle portion kept (g)

LOCATION

Host tree 0036

Offset from tree 1.1 m, 60°

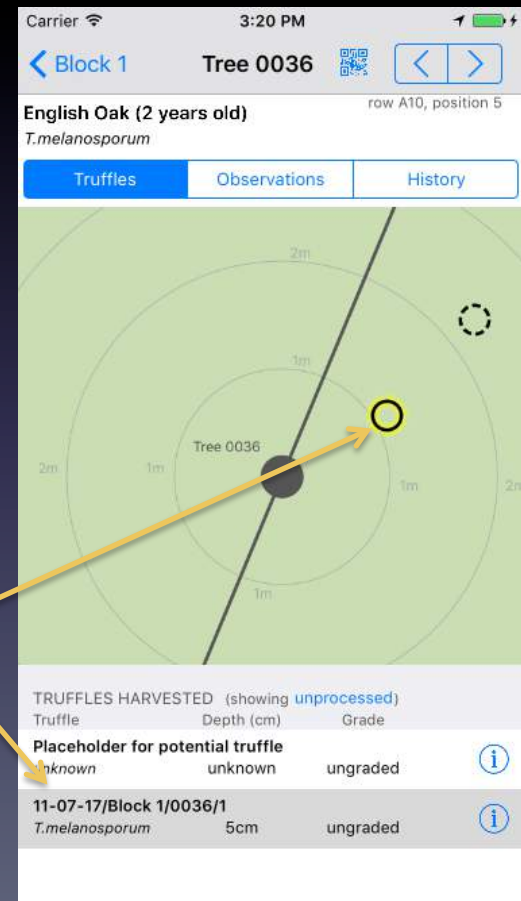
NOTES

The unique id should be kept with the truffle until it has been processed. The id format is: *date/block name/tree name/#*

Depth is a required field. Record the depth in cm to the top of the truffle

Species, grade and weight estimates are optional while harvesting

Harvested truffles appear as empty circles in the chart and with their id in the truffle list





# Truffles in the block detail

Truffles that have been harvested appear in the block detail as small circles with varying colour



Truffles are red if they are of an unexpected species

Truffles are shown as a filled circle with a colour indicating their species

Truffle placeholders are drawn as small empty circles

Brûlés are indicated by large empty circles around a tree



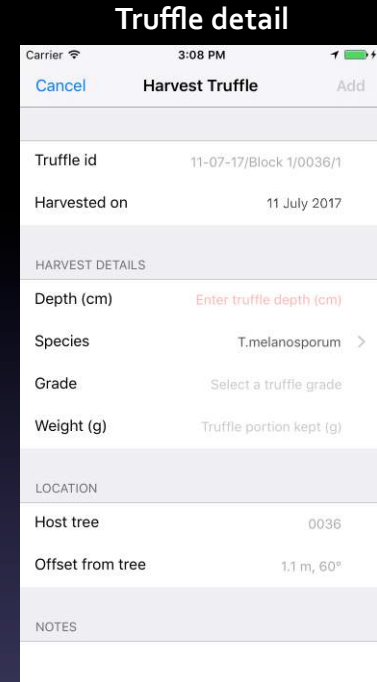
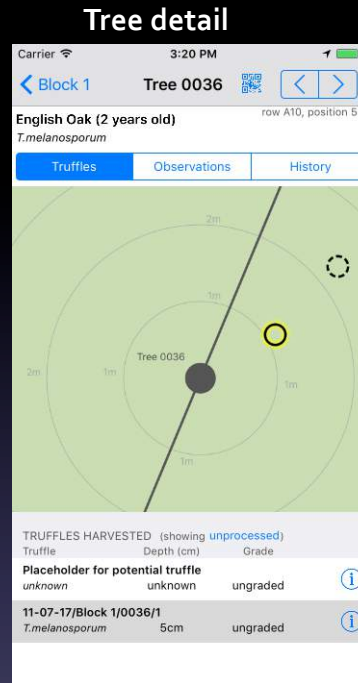
# Hunting and harvesting - summary

Tree detail is used to add truffles and truffle placeholders

- Press on the **truffles** chart to add a truffle or placeholder
- When harvesting a truffle, the depth is a required measurement
- The truffle's id should be recorded and kept with the harvested truffle
- Keep composite truffles together (as one) until processing

Block detail will show all placeholders and harvested truffles

- Use map options to hide/show truffles, placeholders and brûlés



Block detail

# TRUFFLE PROCESSING & GRADING



# Truffle grading

Once a truffle is harvested, its details are stored and tracked as it is processed and graded:

- The truffle's id is used to match the truffle being processed to its entry in the 'Ungraded' list
- Processing a truffle involves cleaning, weighing and grading the truffle
- The amount of truffle discarded is recorded, together with the discard reason
- Sometimes a truffle will be split into more than one piece during processing

The screenshot displays the 'Truffle Grading' interface. The top navigation bar includes 'Truffle Grower', 'Grading', and 'Analysis'. The main content is divided into two sections: 'UNGRADED TRUFFLES' and 'GRADED TRUFFLES'. The 'UNGRADED TRUFFLES' section lists truffles with their IDs, species, and grades. The 'GRADED TRUFFLES' section lists truffles with their IDs, species, grades, and discarded amounts. A modal dialog is open over the 'UNGRADED TRUFFLES' section, showing a 'Grade Truffle' screen. The modal has a 'Truffle id' field with the value '11-07-17/Block 1/0036/1'. Below this, there are fields for 'Species' (T.melanosporum), 'Grade' (Select a truffle grade), and 'Weight (g)' (Truffle portion kept (g)). At the bottom of the modal, there are buttons for 'Cancel', 'Grade Truffle', and 'Process'. The background application shows a list of truffles with their respective grades and weights.

Truffle	Grade	Weight (g)
11-07-17/test/1/1 T.magnatum	ungraded	unknown
22-05-17/test/3/1 T.melanosporum	ungraded	
22-05-17/pete's/8/1 T.magnatum	ungraded	
22-05-17/pete's/8/2 T.magnatum	ungraded	
27-03-17/pete's/3/2 T.melanosporum	ungraded	
31-07-16/pete's/4/2 T.melanosporum	ungraded	
11-07-16/pete's/8/1 T.magnatum	ungraded	
06-06-16/pete's/6/1 T.melanosporum	ungraded	

Truffle	Grade	Discarded Amount
23-07-17/pete's/9/1 T.melanosporum	Grade 1	Discarded (g) 2 g
22-08-16/pete's/10/1 T.melanosporum	Grade 1	Reason Choose a discard reason

Modal Dialog: Grade Truffle

Truffle id: 11-07-17/Block 1/0036/1

Species: T.melanosporum

Grade: Select a truffle grade

Weight (g): Truffle portion kept (g)

Buttons: Cancel, Grade Truffle, Process



# Grading view

## Grading truffles view

Recall summary panel

Carrier 5:35 PM 100% **Truffle Grower** Grading **Analysis**

UNGRADED TRUFFLES							
Truffle	Grade	Weight (g)	Dissected	Block	Host tree	Depth (cm)	Offset (m, °)
22-05-17/pete's/8/2 T.magnatum	ungraded	unknown		pete's	8	15cm	1.6 m, 48°
22-05-17/pete's/8/1 T.magnatum	ungraded	unknown		pete's	8	10cm	1.0 m, 6°
27-03-17/pete's/3/2 T.melanosporum	ungraded	unknown		pete's	3	12cm	1.0 m, 215°
31-07-16/pete's/4/2 T.melanosporum	ungraded	unknown		pete's	4	12cm	1.9 m, 132°
11-07-16/pete's/8/1 T.magnatum	ungraded	unknown		pete's	8	21cm	1.5 m, 107°
06-05-16/pete's/6/1 T.melanosporum	ungraded	unknown		pete's	6	20cm	2.1 m, 112°
GRADED TRUFFLES							
Truffle	Grade	Weight (g)	Dissected	Block	Host tree	Depth (cm)	Offset (m, °)
22-08-16/pete's/10/1 T.melanosporum	Grade 1	21g	2g (Insect da...	pete's	10	12cm	1.7 m, 54°
20-08-16/pete's/3/1 T.melanosporum	Grade 1	53g	12g (Harvesti...	pete's	3	25cm	1.1 m, 131°
31-07-16/pete's/4/1 T.melanosporum	Extra	43g		pete's	4	20cm	1.5 m, 211°
22-08-16/pete's/1/1 T.melanosporum	Bits	21g	15g (Insect da...	pete's	1	12cm	1.4 m, 312°
11-06-16/pete's/8/1 T.magnatum	Extra	23g		pete's	8	12cm	1.2 m, 310°
07-06-16/pete's/8/1 T.magnatum	Grade 1	50g	12g (Insect da...	pete's	8	5cm	1.3 m, 198°
01-06-16/pete's/7/1							

Analyse production data

Truffles to be graded  
*Select an entry to grade the truffle*

Truffles already processed  
*Select an entry to view or unprocess*

Export the truffle data



# Grading a truffle

Truffles are graded according to the [UNECE Standard FFV-53](#), concerning the quality control of truffles. Truffles are placed into the following categories:

Extra	Whole truffle with regular shape, nicked only for inspection Mature (firm, strong aroma, defined marbling, black gleba) and over 20g weight
Grade 1	Whole, or cut to order/to remove a defect. Cut surface should be less than remaining natural surface Sound but may have irregular shape/crevices or minor surface imperfections Mature and over 10g weight
Grade 2	Any size or shape, including pieces cut from larger truffles Mature, or sufficiently mature to have good aroma, with black or brown gleba
Bits	An additional category provided for those "Grade 2" pieces the grader feels are unsaleable
Discard	Any truffle that is entirely unusable





# Grading a truffle

Grade truffle view

Carrier 3:08 PM

Cancel Grade Truffle Process

Truffle id 11-07-17/Block 1/0036/1

GRADING DATA

Species T.melanosporum >

Grade Select a truffle grade

Weight (g) Truffle portion kept (g)

DISCARDED AMOUNT

Discarded (g) 2 g

Reason Choose a discard reason

HARVEST DETAILS

Harvested on 11 July 2017

Block Block 1

Split

When all required data has been entered, process the truffle to mark it as 'graded'

Enter species, grade and weight of the truffle portion to keep

Record any amount discarded, and provide the discard reason

Splitting the truffle creates a duplicate truffle record in the "unprocessed" truffles list. The new truffle is created with its own unique **Truffle id**



# Truffle grading - summary

- Harvested truffles appear initially as 'ungraded' truffles in the grading view
- After cleaning and processing the truffle, it is assigned a grade based on the UNECE Standard FFV-53
- The weight of any portion discarded is recorded, together with the discard reason
- A truffle may be split into one or more additional pieces, each of which is then treated as a unique truffle
- Once a truffle has been graded it will be moved to the 'graded' truffles category in the grading view

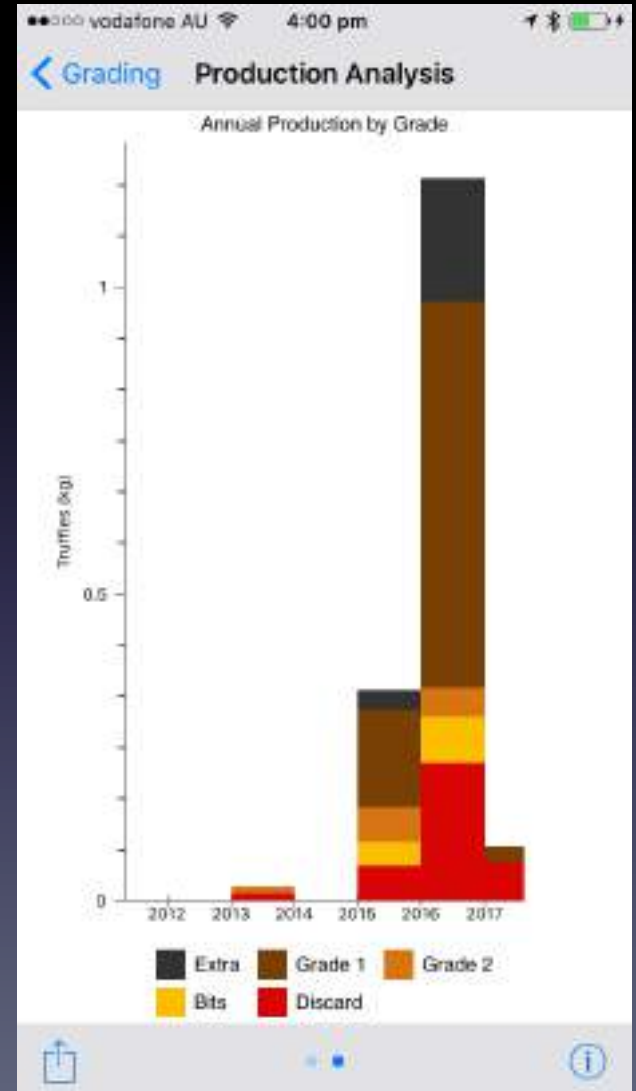
**ANALYSE DATA**



# Analyse data

Visualise production data using powerful interactive graphs:

- Identify trends in quality and production
- Break down discarded truffles to determine trends in the reasons for product loss
- Change the data interval to examine weekly, monthly or annual production
- Integrate weather and soil moisture data from your weather stations

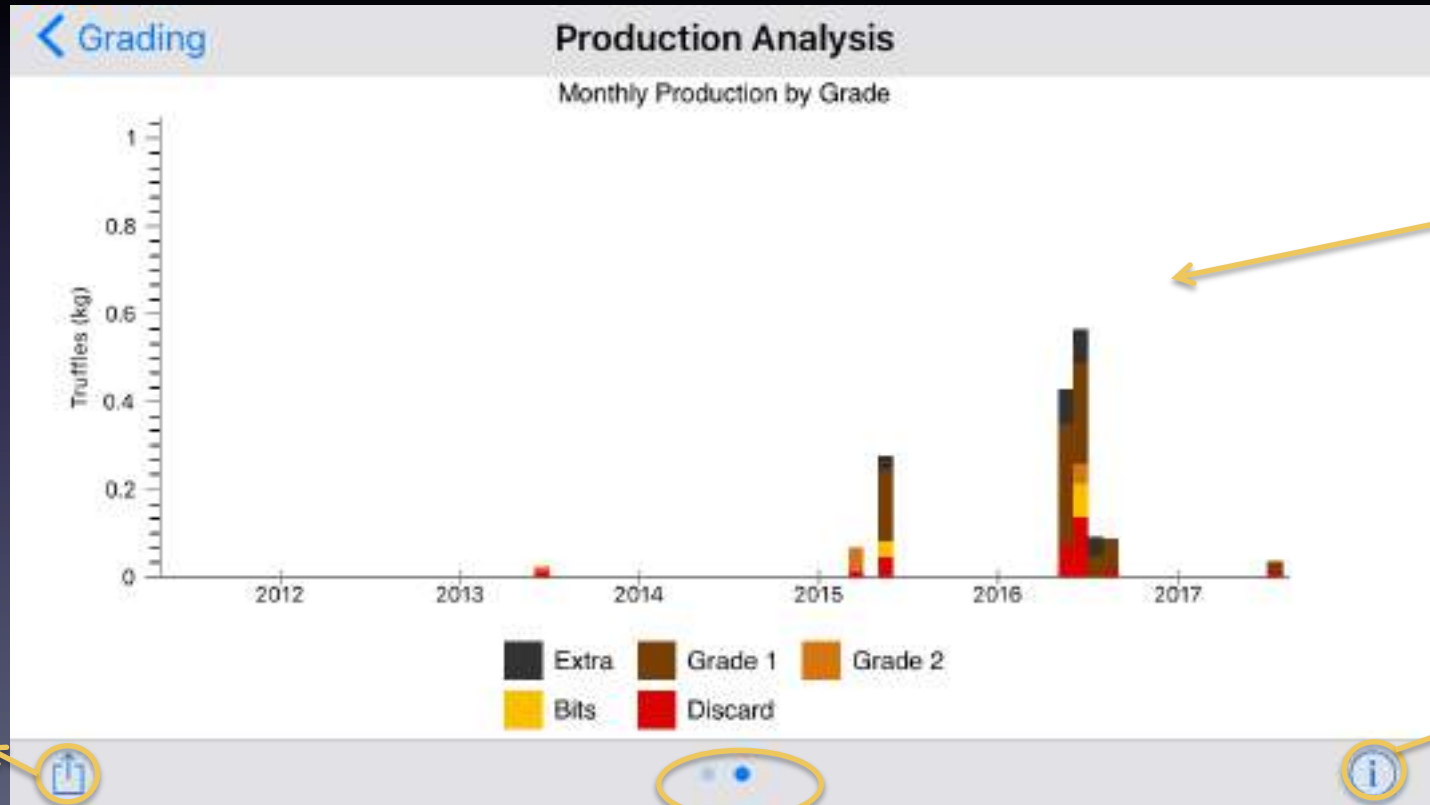




# Production by interval

The production by interval chart allows users to examine trends in production or discard reason over the lifetime of the truffle orchard

Production aggregated over an interval



Zoom or scroll interactive chart

Show or hide the chart options

Print the chart

Cycle through chart types



# Production by interval - options

**Chart options**

ANALYSE

Truffle grade Discard reason

DATA INTERVAL

Weekly Monthly Yearly

WEATHER STATION

Mount Tootie

Rainfall

Temperature

SOIL STATION PROBE

S1 (10cm)

Moisture

Split production totals by truffle grade or focus on discard reasons

Change the data interval over which production is aggregated

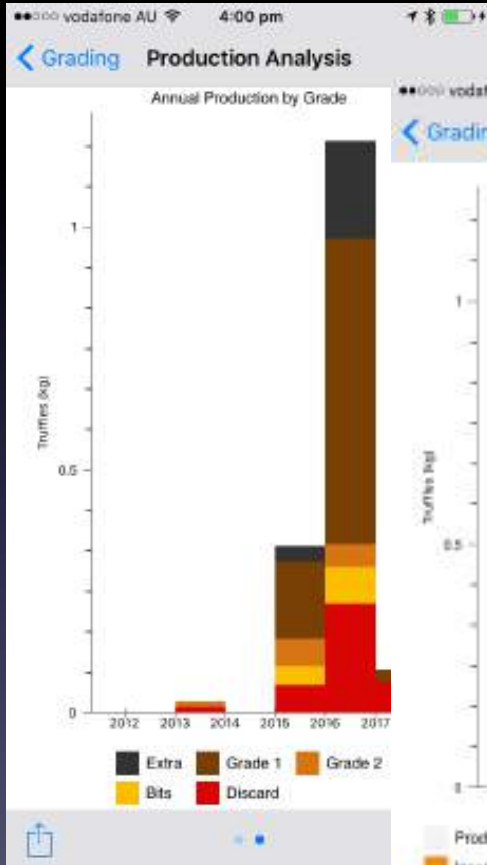
Select a weather station to drive rainfall and temperature data on the plot.  
*Note: this option is only visible if a weather station is configured*

Select a soil station probe to drive soil moisture trend on the plot.  
*Note: this option is only visible if a soil station is configured*

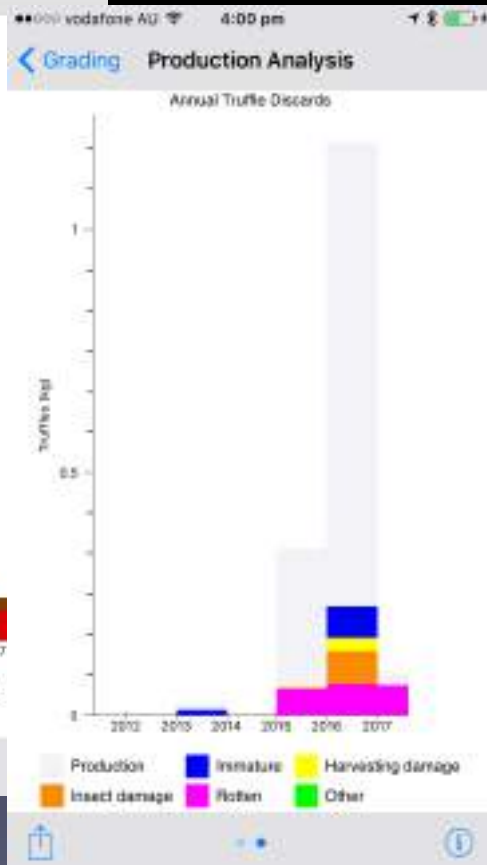


# Production by interval - examples

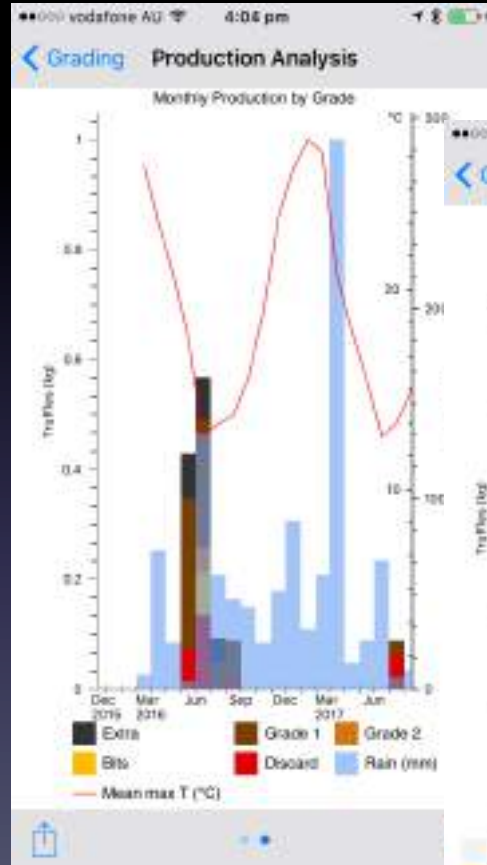
Focus on truffle grade



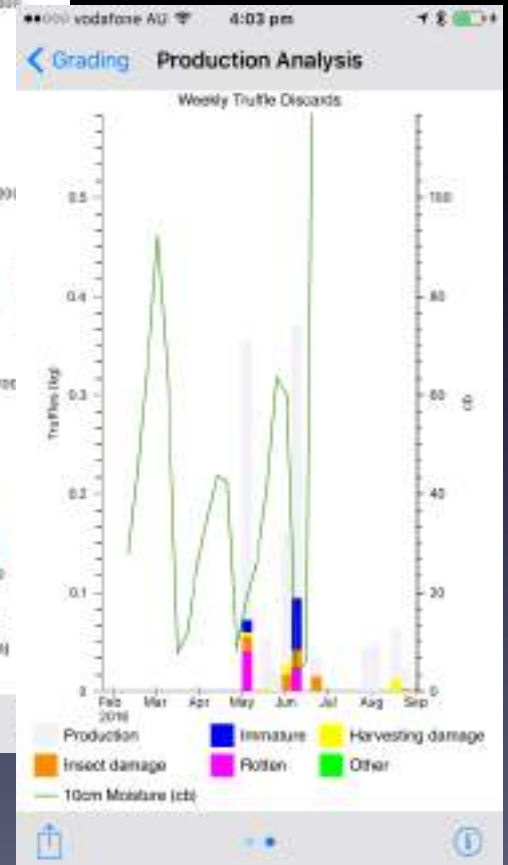
Discard reason



Weather and production



Soil moisture and discard reasons

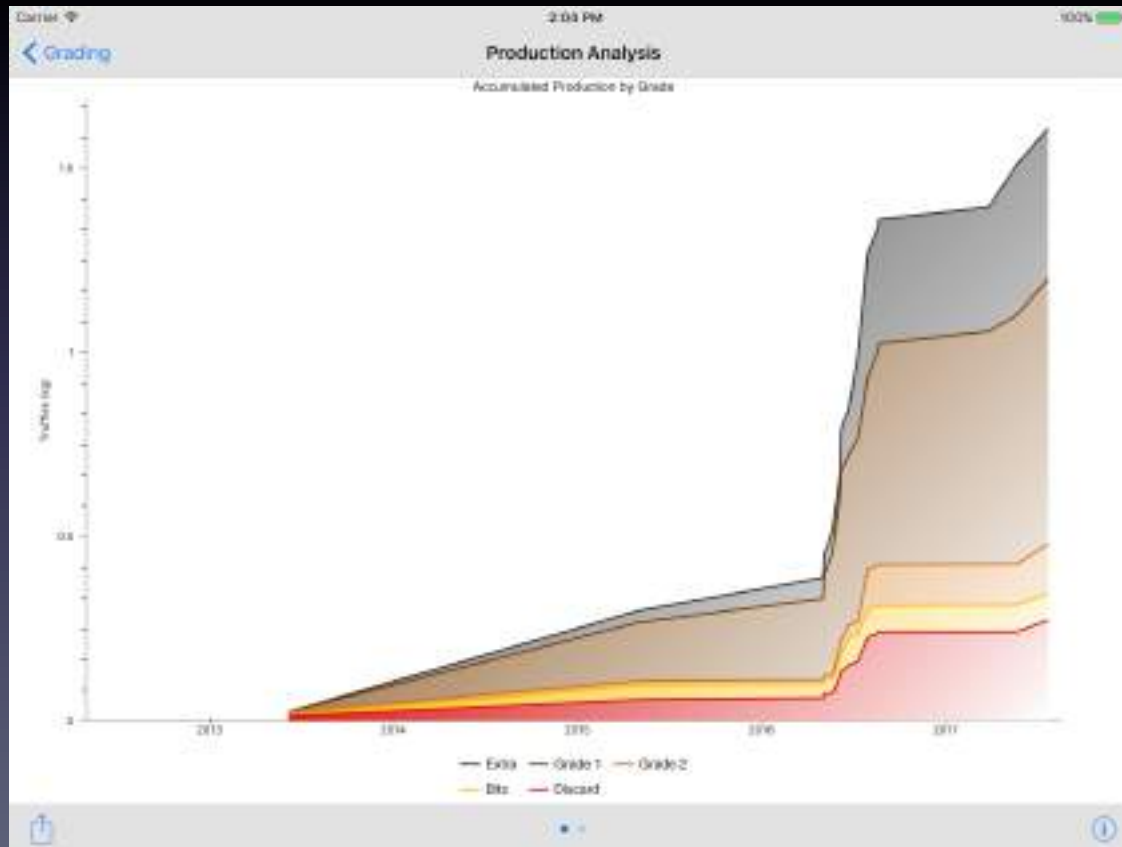




# Accumulated production

An accumulated production is provided to show the total production over the lifetime of the orchard

Production accumulated over the orchard's lifetime

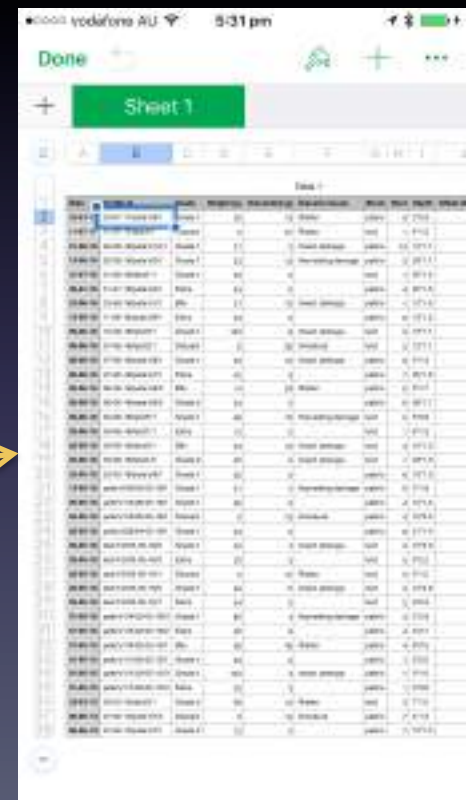
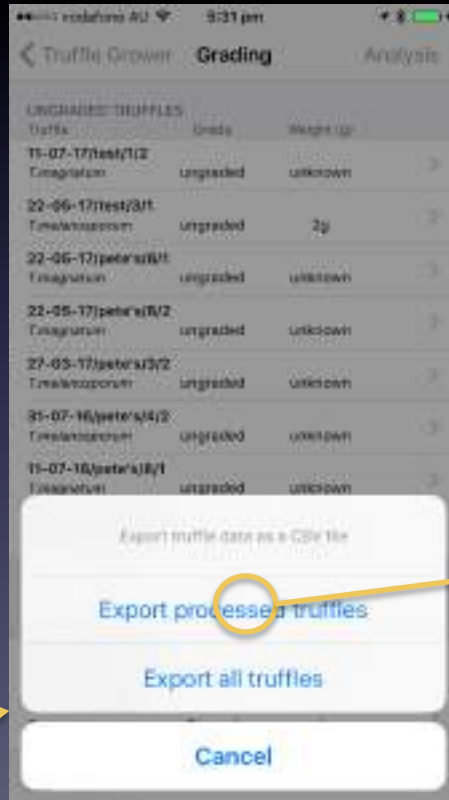






# Export production data

Export truffle production as a CSV (comma separated values) file to spreadsheets such as Excel or Numbers for further processing





# Email block data

Email truffle block data to another user from the block detail view's action list

- Data is attached to the email as a 'truffle grower data' file, with extension '.tgd'
- Opening a 'tgd' file on a device with Truffle Grower installed creates a copy of the truffle block
- This feature can be used to create a backup of all block data, including tree and row layout, tree observations and truffles harvested
- If a block matching the 'tgd' file already exists on the device, it will not be overwritten. A new block will be created containing the imported data
- By default the new block's truffles are not included in the grading and analysis views

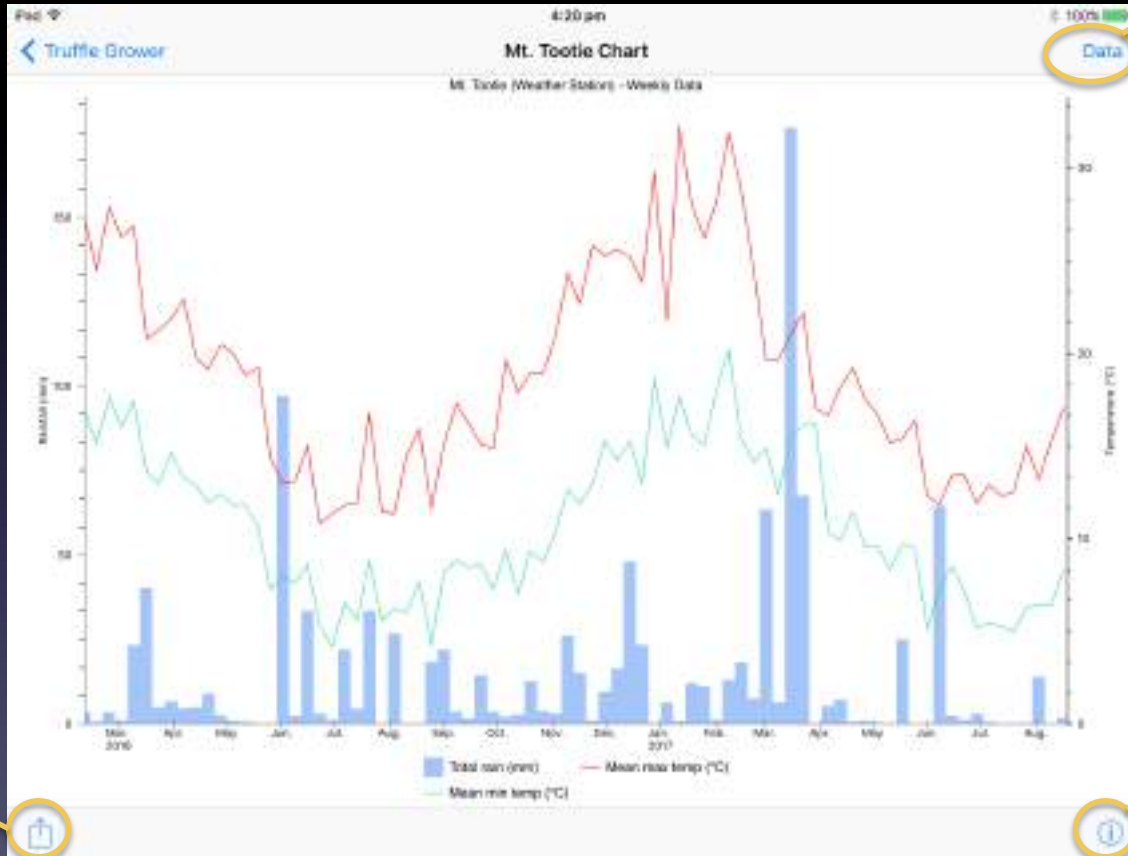
*To include the blocks truffles, edit the block's configuration on the summary panel and set the option 'Include in truffle processing'*

# WEATHER DEVICES



# Weather station view

Weather station chart



View daily weather data in a table

Chart options

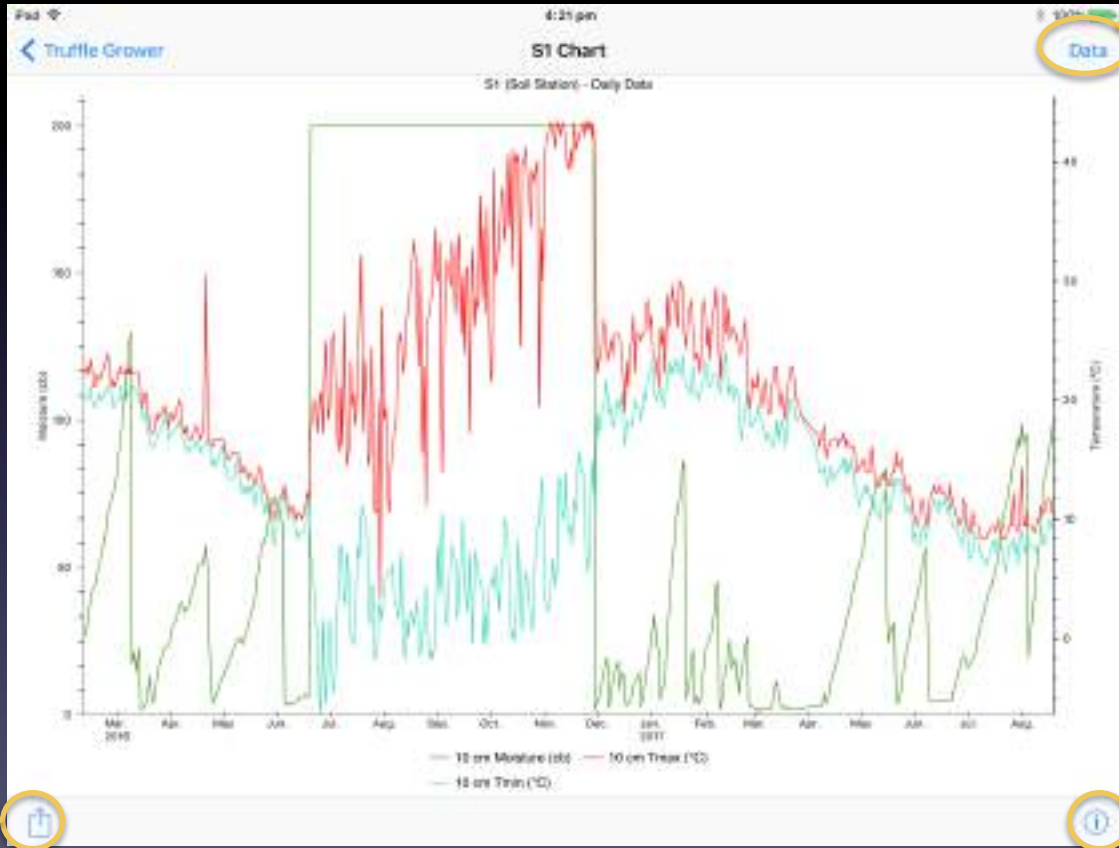
Perform actions:

- Print chart
- Export daily weather data



# Soil station view

Soil station chart



View daily soil station data in a table

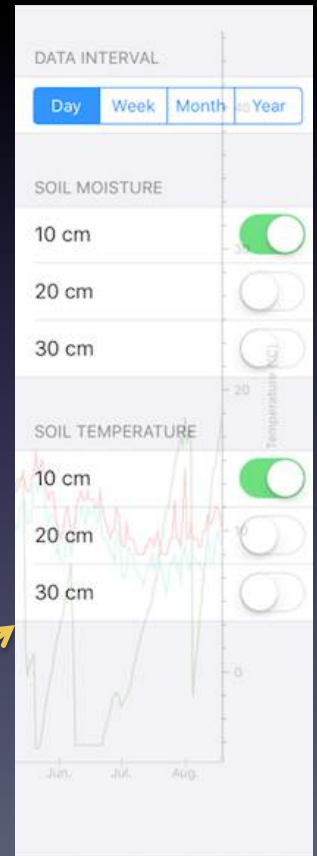


Chart options

Perform actions:

- Print chart
- Export daily soil station data

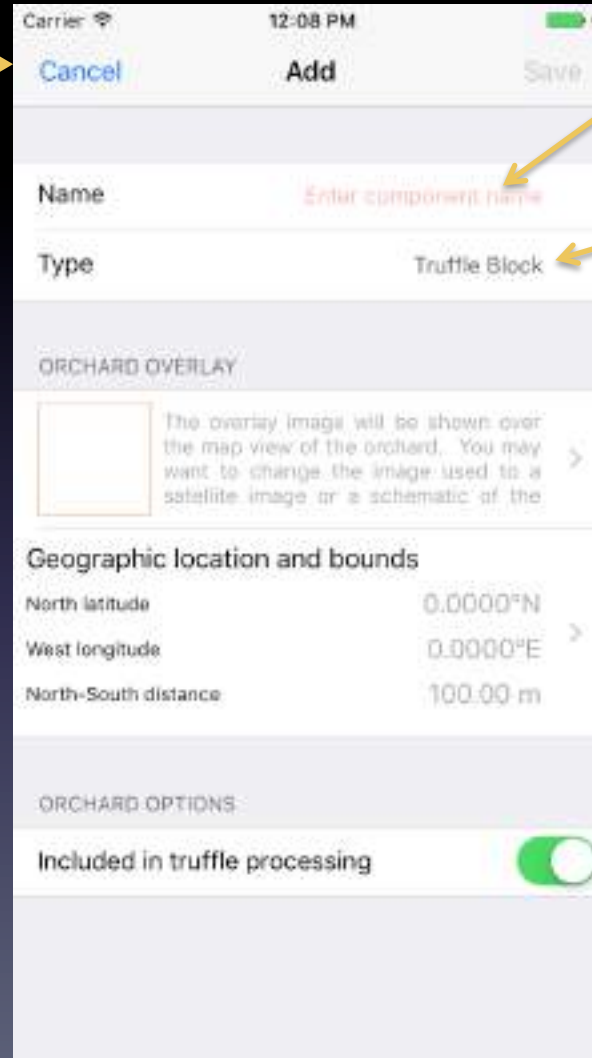
**CONFIGURATION**



# Add a new component



Add a new orchard block, weather station or soil station



Enter a name for the new component

Select the type of component to add

Enter settings specific to the type of component being added



# Add an orchard block


Carrier 12:08 PM

Cancel Add Save

Name *Enter component name*

Type Truffle Block

ORCHARD OVERLAY

 The overlay image will be shown over the map view of the orchard. You may want to change the image used to a satellite image or a schematic of the

Geographic location and bounds

North latitude 0.0000°N

West longitude 0.0000°E

North-South distance 100.00 m

ORCHARD OPTIONS

Included in truffle processing

Set type to:  
**Truffle Block**

Optionally, select an image from your iOS device to use as an orchard overlay. This image will be shown over a base map driven by Google Maps. Typically you would choose a high resolution image of your orchard to use as the overlay. *The default image used is a transparent square with an orange border*

Select the location to open a map view used to position the overlay correctly over the base map

Indicate whether truffles harvested within the block are to be included in the application's processing and analysis system. *You may choose not to include truffles if the block is being edited, or if it is a copy of an existing block*





# Davis weather and soil stations

## IMPORTANT:

Truffle Grower v1.0 provides support for Davis *WeatherlinkIP* weather and soil stations only. Support may be extended to additional device types and manufacturers in future versions.



## Davis weather and soil stations

*Vantage Pro2* and *6345* soil moisture stations



[weatherlink.com](http://weatherlink.com)

Each *weatherlink* account supports one console



## Console

Uploads data from one weather station and up to 4 moisture probes to *weatherlink.com*



## Truffle Grower

Accesses data via *weatherlink* accounts



# Add a weather station

Carrier 2:03 PM

Cancel Add Save

Name Orchard

Type Weather Station

WEATHER STATION

Location Select location >

Device Davis Weatherlink

Username Enter weatherlink.com username

Password Enter weatherlink.com password

Choose a station name

Set type to: **Weather Station**

Select the station's location by pressing on a map showing the orchard blocks

Select the type of weather station.  
*At present, only Davis weatherlink stations are supported*

Provide device specific connection details:  
*For Davis weatherlink stations, enter the weatherlink.com username and password the station uses to upload data*



# Add a soil station

Carrier 2:24 PM

Cancel Add Save

Name Soil1

Type Soil Moisture Station

SOIL STATION

Location 33.4641°S, 150.4966°E >

Device Davis Weatherlink (Soil)

Weather station Mount Tootie

SOIL PROBES

1	<input checked="" type="checkbox"/>	10.0 cm
2	<input checked="" type="checkbox"/>	20.0 cm
3	<input type="checkbox"/>	30.0 cm
4	<input type="checkbox"/>	40.0 cm

Choose a station name

Set type to: **Soil Moisture Station**

Select the station's location by pressing on a map showing the orchard blocks

Select the type of weather station.  
*At present, only Davis Weatherlink (Soil) devices are supported*

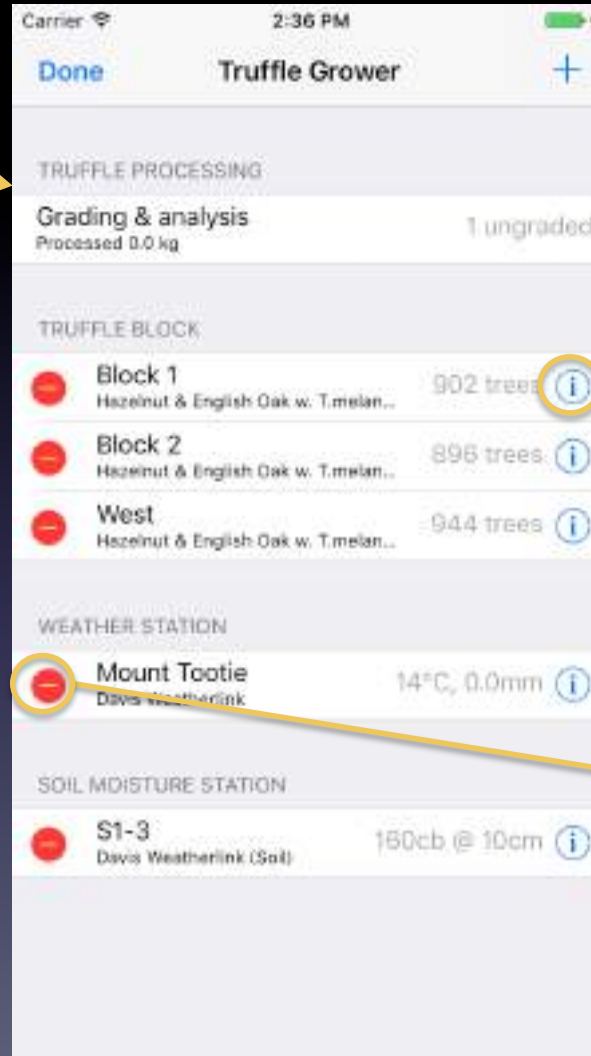
Select the weather station that collects the soil station probe data

Enable up to 4 probes for the soil station  
*The probe number matches the weatherlink.com sensor number*

Modify the depth at which each probe is buried



# Edit an existing component



View or edit the properties of an existing item

Delete an existing item



# Edit an orchard block view

When first created, an orchard block will have no trees. Trees are added by editing the orchard block view:

- Edit the view to add, modify or move trees, then save or cancel the changes
- Trees are added by pressing on the map
- Trees can be moved by dragging them
- Selected tree shows reference marks for distances
- The default species and other tree properties are defined by the template tree
- Trees are assigned to rows
- Rows can be edited/renamed



# Edit an orchard block

Block detail



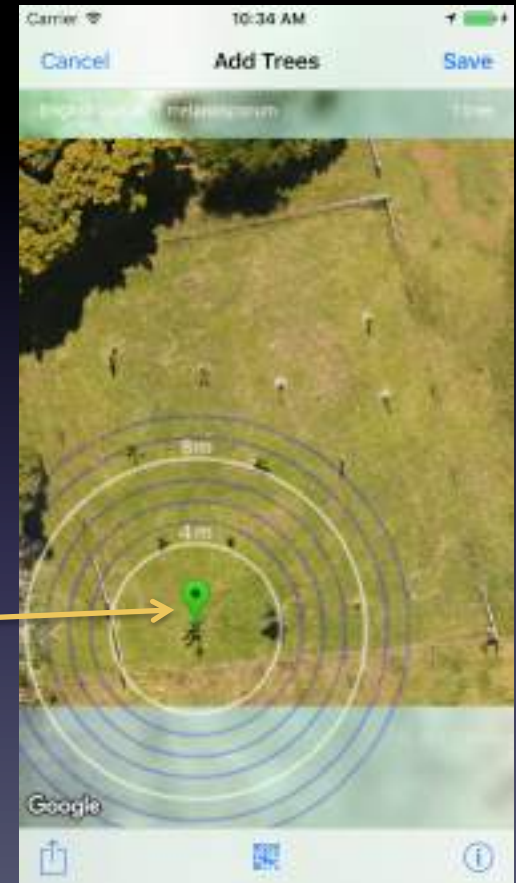
Edit the block to add  
move or modify trees

Edit block



Pressing on the map places  
a new tree marker

Edit block



The tree position can be  
adjusted by dragging the  
marker

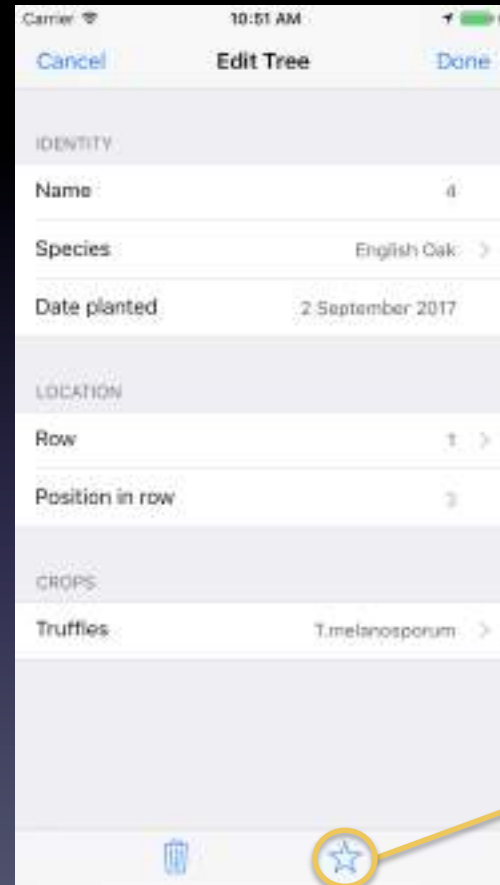


# Edit a tree's properties



To change tree properties, select the tree and request details

Trees are created with default values for row, species, truffle variety, etc



Change name, species and date planted

Select tree row

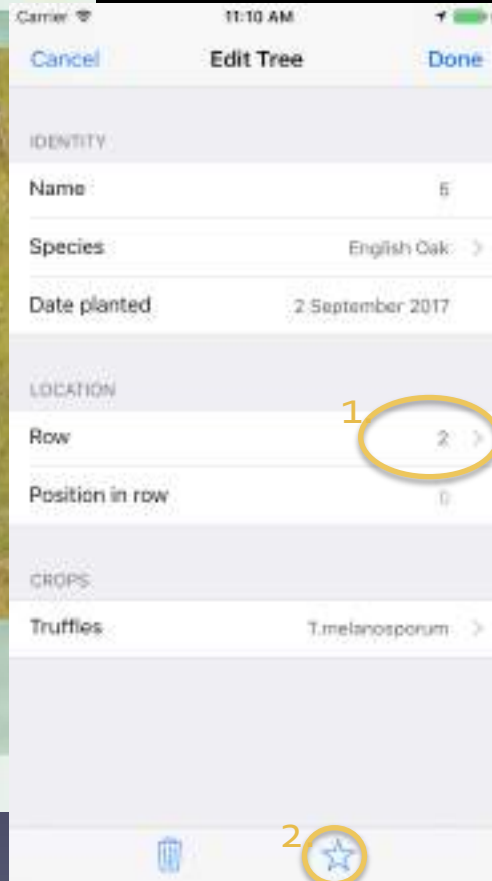
Select truffle species with which the tree is inoculated

Make this tree the template tree  
*The template tree provides default values for new trees*



# Creating new tree rows

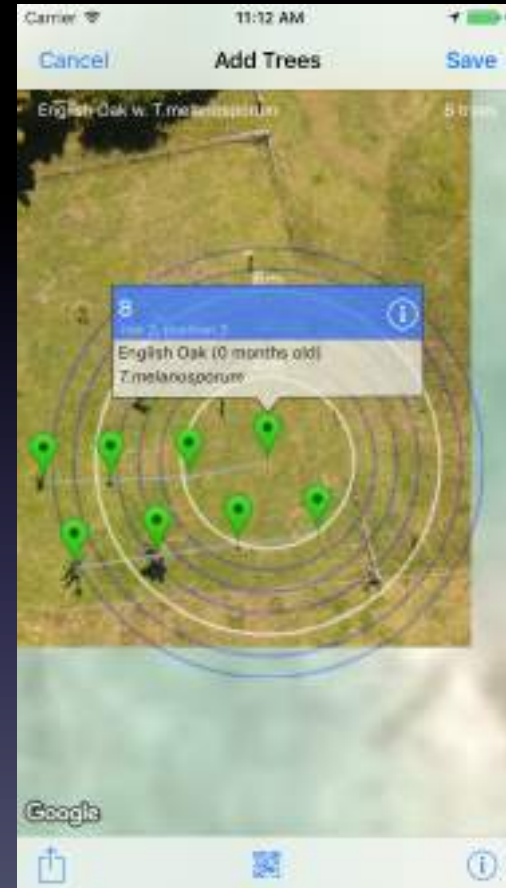
Edit block



To create a new row,  
add the first tree in the  
new row and select its  
properties

1. Change the tree's row, and
2. Set it as the new template

Edit block



Add the rest of the trees in  
the new row by pressing on  
the map and adjusting their  
position





# Edit an orchard block

An orchard's trees and rows are created by editing the orchard block detail view:

- Tree markers are added by pressing on the map and moved by dragging
- Selected tree shows a distance indicator
- A tree template is used to define the default row, species and truffle property values for new trees
- Rows can be edited/renamed
- An action is provided to rename all trees in a row based on a name pattern and row position



# Questions & support

Truffle Grower FAQ, examples and other information:

[www.huffcap-apps.com](http://www.huffcap-apps.com)

Support queries:

[support@huffcap-apps.com](mailto:support@huffcap-apps.com)