

Map User Notes: Onions Suitability Map (Using Climate Futures Projections)

Summary:

The mapping aims to classify land suitable for growing Onions according to seven suitability classes: “1.0 Well suited”, “1.1 Well suited (with soil management)”, “2.0 Suitable”, “2.1 Suitable (with soil management)”, “3.0 Moderately suitable”, “3.1 Moderately suitable (with soil management)”, and “4.0 Unsuitable”. These are produced from a set of pre-determined rules in accordance to a suitability matrix (refer to page 3) developed from reviewing existing literature in conjunction with industry consultation and ground-truthing. They are based on soil and climatic influences on Onion production using data garnered from soil cores and temperature logger records collected from hundreds of site locations across the state. The mapping assumes water for crop irrigation is available and therefore not a limiting factor to production.

[Climate Futures](#) projections were incorporated into the suitability mapping framework to assess projected changes to frost, heat and rainfall severity for years [2030](#) and [2050](#) (refer to [metadata](#) for more information). This compliments the current [Onions Suitability Map](#) developed as part of the ‘[Water for Profit](#)’ program which was based on recent historical climate observations (Refer [here](#) for more information).

How is suitability determined?

The overall suitability rating is determined using a most-limiting-factor approach, where the lowest rated parameter becomes the overall suitability rating. As an example, a location may possess the following characteristics:

<u>Soil/Climate parameter</u>	<u>Threshold</u>	<u>Rating</u>
Soil depth:	>25cm	(Well suited)
pH:	>6	(Well suited)
Electrical conductivity (dS/m):	2-4	(Suitable)
Drainage:	Very poor	(Unsuitable)
Stones:	<2%	(Well suited)
Slope:	<5%	(Well suited)
Exchangeable calcium:	>2000ppm	(Well suited)
Exchangeable magnesium:	>120ppm	(Well suited)
Heat risk (at harvest):	<1/10 years	(Well suited)
Risk of High Rainfall (at harvest):	<1/5 years	(Well suited)
Frost risk (November):	<2/5years	(Well suited)
Overall rating:		4.0 Unsuitable

In this case, the overall suitability is classified as “4.0 Unsuitable” due to ‘*Very poor (Unsuitable)*’ soil drainage therefore limiting suitability due to this classification. Alternatively, if for example, soil drainage were rated ‘*Well drained (Well suited)*’, the overall rating would then revert to “2.0 Suitable”, due to the Electrical conductivity parameter ‘*2-4 (Suitable)*’ now limiting the rating to this classification (refer to suitability matrix on page 3 for rule-set). A “1.0 Well suited” rating is achieved if all attributes are rated ‘Well suited’. Note that designated conservation/protection areas as well as existing urbanised/residential zones and major waterbodies were automatically classified as “4.0 Unsuitable”.

Improving suitability (with soil management)

In some circumstances, suitability ratings can be improved if measures are applied to mitigate against certain ‘soft’ limitations/constraints. Addressing these constraints (also known as ‘Manageable constraints’) using practises such as, for example, applying agricultural lime to counteract acidic soils, can result in a parcel of land becoming more suitable for a given suitability classification. As an example, a location may possess the following characteristics:

<u>Soil/Climate parameter</u>	<u>Threshold</u>	<u>Rating</u>
Soil depth:	>25cm	(Well suited)
pH:	5.3-5.8*	(Moderately suitable)
Electrical conductivity (dS/m):	<2	(Well suited)
Drainage:	Well drained	(Well suited)
Stones:	<2%	(Well suited)
Slope:	<5%	(Well suited)
Exchangeable calcium:	>2000ppm	(Well suited)
Exchangeable magnesium:	>120ppm	(Well suited)
Heat risk (at harvest):	<110 years	(Well suited)
Risk of High Rainfall (at harvest):	<15 years	(Well suited)
Frost risk (November):	<25years	(Well suited)
Overall rating:		2.1 Suitable (with soil management)

In normal circumstances, the above rating would be determined as “3.0 Moderately suitable” due to pH limiting suitability to this classification. However, in this case, the overall suitability is reclassified to “2.1 Suitable (with soil management)” because the low pH rating, on most occasions, can be readily mitigated (e.g. by applying agricultural lime to neutralise soil acidity) therefore rendering the land more suitable for production. In this regard, the following ‘Manageable constraints’ can be actively managed/mitigated to allow improved Onion growing conditions.

- pH – Undertaking an active liming regime over several seasons can effectively reduce soil acidity over time. (refer: <http://dpiipwe.tas.gov.au/agriculture/land-management-and-soils/soil-management/soil-ph-liming>)
- Drainage – Installation of surface and sub-surface drainage lines can carry excess water off agricultural land and prevent water logging. (refer: <http://dpiipwe.tas.gov.au/agriculture/land-management-and-soils/soil-management/land-drainage>)
- Stones– Stone removal via machine and/or manual picking prior to planting can effectively improve the soil for crop production.
- Exchangeable calcium – Liming can increase calcium levels in the soil (and simultaneously increase pH levels for acidic soils).

Each manageable constraint (as mentioned above) is denoted by the symbol * in the suitability matrix (page 3) to indicate where management of soil impediments ought to be considered to improve growing conditions and meet the corresponding suitability rating. Note that ‘Manageable constraints’ can be identified in the attribute table of the map layer itself on LISTmap (refer to example on page 5 to identify how constraints are recognised in LISTmap).

Supplementary information for managing soils:

- Soil management website (DPIPWE): <http://dpiipwe.tas.gov.au/agriculture/land-management-and-soils/soil-management>
- Information for soil management for Tasmanian farmers: <http://dpiipwe.tas.gov.au/Documents/Soil-Guide.pdf>
- Information for managing Tasmania’s cropping soils: <http://dpiipwe.tas.gov.au/Documents/Managing-Tasmanias-Cropping-Soils-2000.pdf>

Supplementary information for growing Onions:

- Onion Growing Factsheet: http://dpiipwe.tas.gov.au/Documents/WfW-Onion_factsheet.pdf

Suitability Rule Matrix - Onions

Suitability rating	Soil depth	pH of top 15cm	Electrical conductivity (ECse) dS/m	Soil drainage	Stone abundance (>60mm diameter, top 15cm)	Slope (of land, % rise)	Exchangeable calcium	Exchangeable magnesium	Heat at harvest Chance of having >3 days where Tmax >31°C at harvest (January or February) <i>(using Climate Futures Projections)</i>	Rainfall at harvest Chance of having >3 days in any 7 day period with ≥ 5 mm rain/day (January – March) <i>(using Climate Futures Projections)</i>	Spring frost Chance of having at least 1 day where Tmin <0°C in November <i>(using Climate Futures Projections)</i>
1.0 Well suited	>25cm	>6	< 2	Well drained, Excessively well drained	<2%	<5%	>2000ppm	>120ppm	Occurs <1/10 years	Occurs <1/5 years	Occurs ≤2/5 years
1.1 Well suited (with soil management)	>25cm	>6	< 2	Moderately well drained*	<2%	<5%	>2000ppm	>120ppm	Occurs <1/10 years	Occurs <1/5 years	Occurs ≤2/5 years
2.0 Suitable	>25cm	>6	2-4	Moderately well drained	<2%	5-10%	>2000ppm	>120ppm	Occurs 1/10-2/10 years	Occurs 1/5-3/10 years	Occurs ≤2/5 years
2.1 Suitable (with soil management)	>25cm	5.8-6.0*	2-4	Imperfect*	2-10%*	5-10%	1000-2000ppm*	>120ppm	Occurs 1/10-2/10 years	Occurs 1/5-3/10 years	Occurs ≤2/5 years
3.0 Moderately suitable	20-25cm	5.8-6.0	2-4	Imperfect	2-10%	10-20%	1000-2000ppm	>120ppm	Occurs 2/10-3/10 years	Occurs 3/10-2/5 years	Occurs ≤2/5 years
3.1 Moderately suitable (with soil management)	20-25cm	5.3-5.8*	2-4	Poor*	10-20%*	10-20%	800-1000ppm*	110-120ppm*	Occurs 2/10-3/10 years	Occurs 3/10-2/5 years	Occurs ≤2/5 years
4.0 Unsuitable	<20cm	<5.3	>4	Very poorly drained	>20%	>20%	<800ppm	<110ppm	Occurs >3/10 years	Occurs >2/5 years	Occurs >2/5 years

Manageable constraints are denoted by the symbol *

Definitions of Suitability Classes (in relation to the suitability matrix)

1.0 Well suited: Land having no significant soil or climatic limitations to sustained production where risk of significant crop loss due to adverse conditions are unlikely.

1.1 Well suited (with soil management): Land having no significant soil or climatic limitations to sustained production where risk of significant crop loss due to adverse conditions are unlikely. However, minor soil impediments with regard to pH, exchangeable calcium, drainage and/or stone abundance ought to be managed if land is to be well suited for sustained production.

2.0 Suitable: Land having only minor soil or climatic limitations that will not significantly reduce productivity where any risk of crop loss is possible, but inherently low.

2.1 Suitable (with soil management): Land having only minor soil or climatic limitations that will not significantly reduce productivity where any risk of crop loss is possible, but inherently low. However, soil impediments with regard to pH, exchangeable calcium, drainage and/or stone abundance must be managed if land is to be suitable for sustained production. Failure to do so may result in an increased risk of crop loss.

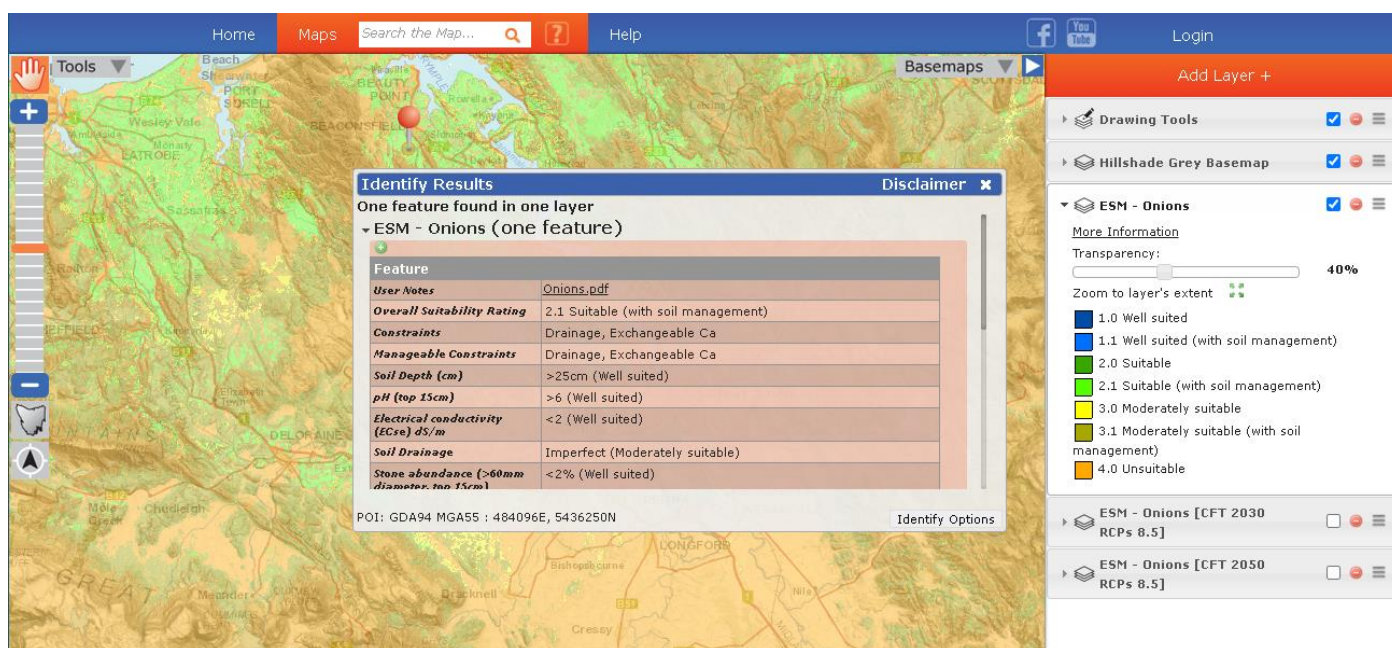
3.0 Moderately suitable: Land having soil or climatic limitations that is likely to impact on sustained productivity where risk of significant crop loss is possible in some years.

3.1 Moderately suitable (with soil management): Land having soil or climatic limitations that is likely to impact on sustained productivity where risk of significant crop loss is possible in some years. Major soil impediments with regard to pH, exchangeable calcium, drainage and/or stone abundance must be managed. Failure to do so may result in significant crop loss and would be considered marginal or even unsuitable for large-scale production if constraints were left unattended.

4.0 Unsuitable: Land having soil and climatic limitations that are too severe for sustained production and will so reduce benefits, or increase required inputs, that this expenditure may not justify. Risk of crop loss is high.

LISTmap instructions

The Onions suitability map is a digital layer that can be manually interrogated within [LISTmap](#). Any location can be enquired within Tasmania to provide location specific parameters pertaining to Onion suitability. To interrogate a location, simply click on any location whilst the Onion suitability layer is active in the table of contents panel and a window will appear listing important attributes. An example is given below:



The window provides information such as the “Overall Suitability Rating” as well as other useful information including:

- ‘Constraints’ - provides a list of attributes that limits a classification to a particular suitability rating;
- ‘Manageable Constraints’ - provides a lists of soft limitation attributes than should be managed in order to meet the suitability rating (refer to page 1 & 2).

In addition, information pertaining to each soil and climate attribute (according to the classifications provided in the suitability matrix on page 3) are also provided and appear below the overall suitability rating and constraint fields (as shown in the example above). This allows users to ‘drill down’ and view site-specific information regarding soil and climate requirements that relate to Onion production for any point of interest in Tasmania.

Vulnerable soils

Listed within the suitability layer (below the individual soil/climate fields) are ratings pertaining to soil vulnerability hazards including:

- Sodicty (ratings of high, moderate, low, nil);
- Salinity (ratings of high, moderate, low, nil);
- Water Erosion (ratings of extreme, very high, high, moderate, low, very low, nil);
- Water Logging (ratings of extreme, very high, high, moderate, low, very low, nil); and
- Wind Erosion (ratings of high, moderate, low, nil).

Information in regards to managing vulnerable soils can be obtained here:

https://nrmdatalibrary.dpiwve.tas.gov.au/FactSheets/WfW/ListMapUserNotes/Vulnerable_soils.pdf

Note that vulnerable soils categories are complementary material to the mapping and does not contribute to the “Overall Suitability Rating”.

Flood risk

Also listed within the suitability layer are categories relating to risk of flood inundation, as provided by flood plain layer within the LIST Hydrography dataset

(http://listdata.thelist.tas.gov.au/public/LIST_Hydrographic_Information.pdf).

Ratings of 'High', 'Moderate' or 'Nil' are listed that correspond to 'Severe', 'Moderate' or 'Nil' flooding potential.

Note that flood risk categories are complementary material to the mapping and does not contribute to the "Overall Suitability Rating".

Additional Information

For information about using LISTmap, please consult the help document:

<http://listdata.thelist.tas.gov.au/public/outgoing/sif/listmaphelp.pdf>

For technical information relating to the dataset, please consult the [metadata](#).

For information relating to irrigation investment, please consult the Investing in Irrigation web-portal:

<http://dpipwe.tas.gov.au/agriculture/investing-in-irrigation>

Contact

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Caution and Disclaimer

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