



# **Explanation of differences associated with entering soil moisture values compared to Soil Order**

## **6.2.0**

**Technical Note 8**

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**Prepared by D M Wheeler<sup>1</sup> N Watkins<sup>1</sup> and L Lilburne<sup>2</sup>**

**<sup>1</sup> AgResearch Ltd.**

**<sup>2</sup> Landcare Research Ltd.**

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## **What is the current recommendation around entering Soil description in OVERSEER?**

With the recent release of OVERSEER 6.2.0 in April 2015, the recommendation for entering Soil description was changed in the Best Practice Data Input Standards. The current recommendation is:

1. Farm-specific soil map, produced by a trained soil pedologist (enter soil description to the level of specific soil moisture values if provided).
2. Soil moisture values or Soil Order. This information is obtainable from the S-map Online Factsheets – section “Soil information for OVERSEER (page 3)”. This section of the S-map Factsheet will provide Soil Order and texture values and where there is enough data in the National Soils Database to make reliable predictions; soil moisture values will be provided. Where soil moisture values are provided these should be entered. In some cases there is not enough data available for certain soils to provide this level of information, in which case S-map Online Factsheets will provide the appropriate Soil Order and soil profile characteristics instead to be entered into OVERSEER.

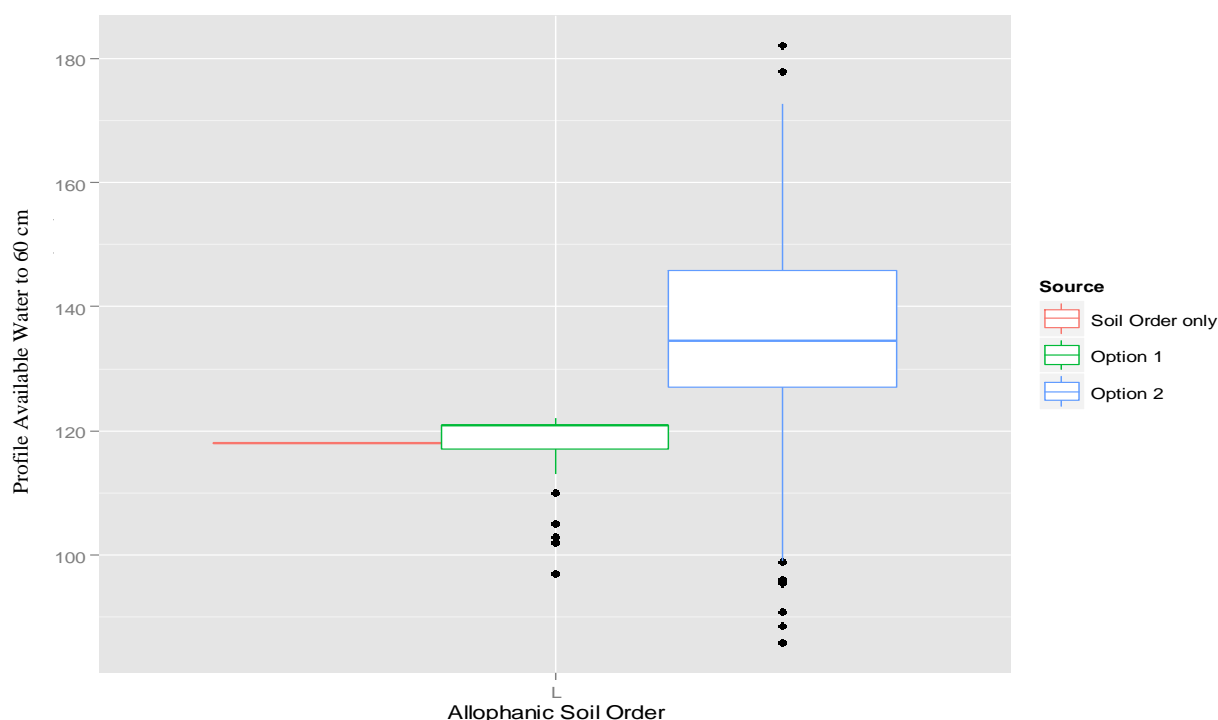
## **Why has the recommendation changed?**

Within OVERSEER, nitrogen (N) leaching is a function of N deposited as urine, determined from stock numbers, production and management, and drainage, which is influenced by climate and soil properties. The soil property that has the largest influence on drainage is profile available water (PAW), which is estimated as the difference between soil water contents at field capacity and wilting point.

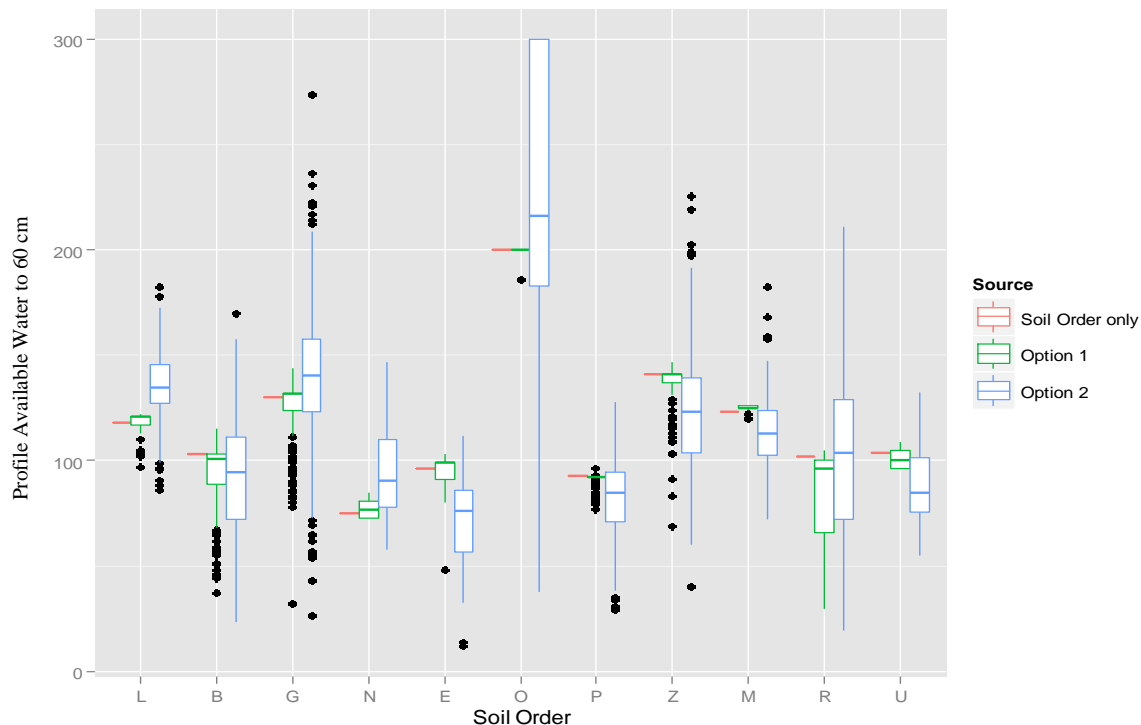
In a review of OVERSEER soil input data carried out by Landcare Research, it was noted that for a given Soil Order in OVERSEER, there is a single PAW assigned to each Soil Order. When associated soil modifiers available in OVERSEER are used (e.g. type and depth to a non-standard layer) the range in PAW increases. In S-map Online, there are many soil siblings within a given Soil Order. The soil water properties of many of these siblings are known so PAW can be estimated. The range in estimated PAW is larger than obtained by OVERSEER when using the Soil Order option. This is illustrated in Figure 1 for an Allophanic soil.

Similar results are seen across all Soil Orders (Figure 2). The range in PAW based on S-map derived soil water contents (option 2) is larger than those based on Soil Order, or Soil Order plus modifiers (option 1). In other words, Soil Order either on its own or with the OVERSEER soil modifiers is not a good predictor of PAW.

Given this, Landcare Research has undertaken further development of the S-map Online Factsheets to provide the relevant soil moisture values for a wide range of soils where there is sufficient information (page 3 of the S-Map Factsheets. This data and other useful soil values (e.g. clay content) can now be obtained via [S-map Online](#) and can be manually entered into the soil moisture values option under the Soil description page in OVERSEER. As a result the Best Practice Data Input Standards were changed to recommend using soil water contents as these are more likely to reflect the soil's actual PAW.



**Figure 1:** Range of PAW for an Allophanic soil. The red line is the single PAW based on Soil Order, the green box is the range in PAW estimated from Soil Order plus modifiers (option 1) and the blue box is based on soil water contents from the S-map data base (option 2).



**Figure 2:** Range of PAW for 11 Soil Orders. The red line is the single PAW based on Soil Order, the green box is the range in PAW estimated from Soil Order plus modifiers (option 1) and the blue box is based on soil water contents from S-map data base (option 2).

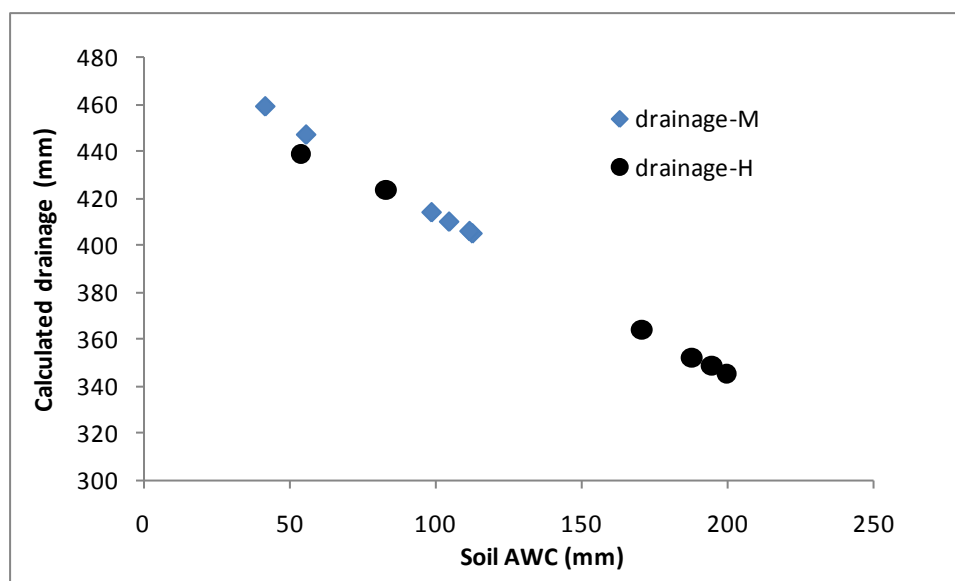
### What is the consequence of this change?

The recommendation to enter soil moisture values when available is likely to result in two consequences:

#### 1. Drainage

For a given site, drainage increases as PAW decreases. An example is shown in Figure 3.

Given that the range in PAW that can be estimated from S-map derived soil water contents covers a wider range than Soil Order plus modifiers, changing data sources is therefore likely to result in changes in drainage. If the difference between PAW estimates obtained using Soil Order plus modifiers and S-map derived soil water contents is large, then this is likely to result in large differences in drainage.



**Figure 3:** Relationship between soil AWC (now called PAW) and calculated drainage for the same rainfall outputs, using OVERSEER. 'M' and 'H' relate to medium and heavy textured soils used in the calculations.

## 2. Outputs such as N leaching may change.

As noted earlier, a key driver of N leaching is drainage. Hence if drainage changes N leaching will change. If the difference between PAW from Soil Order plus modifiers and S-map derived soil water contents is large, then this is likely to result in large differences in N leaching.

Care is needed when using soil moisture data. Unusual results have occurred when entering some soil moisture value combinations. This is likely to be a consequence of the original model calibration and evaluation being done with a limited range of trial data, with a limited number of soils. Consequently, some soil moisture data combinations can result in high denitrification rates and low N leaching rates that are considered to be anomalous. These are more likely to occur when clay content is high, or the difference between soil water content at field capacity and saturation is small. If this occurs, it is recommended that the Soil Order option be used instead of soil moisture values.