

How to use the Terranimo[®] light simulation model

In order to be able to access the Terranimo program, you must open an internet browser (e.g., Internet Explorer, Firefox, Google Chrome or Safari) and enter www.terranimoch in the address bar.

On the home page, choose the desired language (D, F, E) as required in the upper right and then click on the Terranimo light version (Fig. 1).

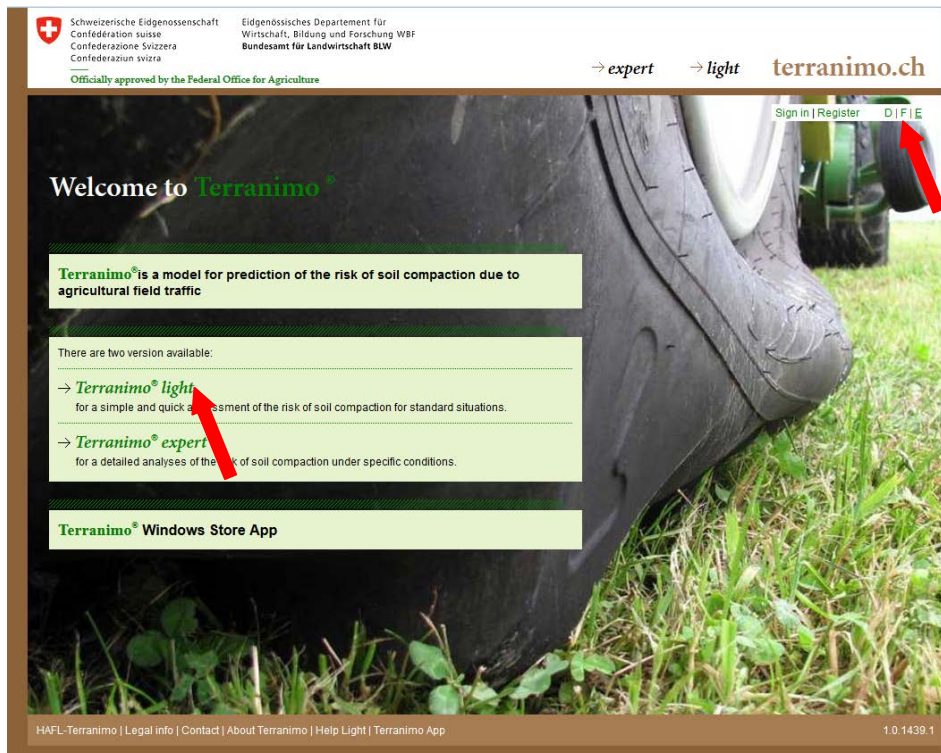


Fig. 1

Inputting the necessary parameters for calculating the soil compaction risk

The machine (vehicle) data are input in a first step. These data consist of the wheel load and the tyre pressure, from which the soil stress will then be calculated. If the exact values (kg or bar) are known, you can record them directly in the input field or set them using the slider (■) (Fig. 2).

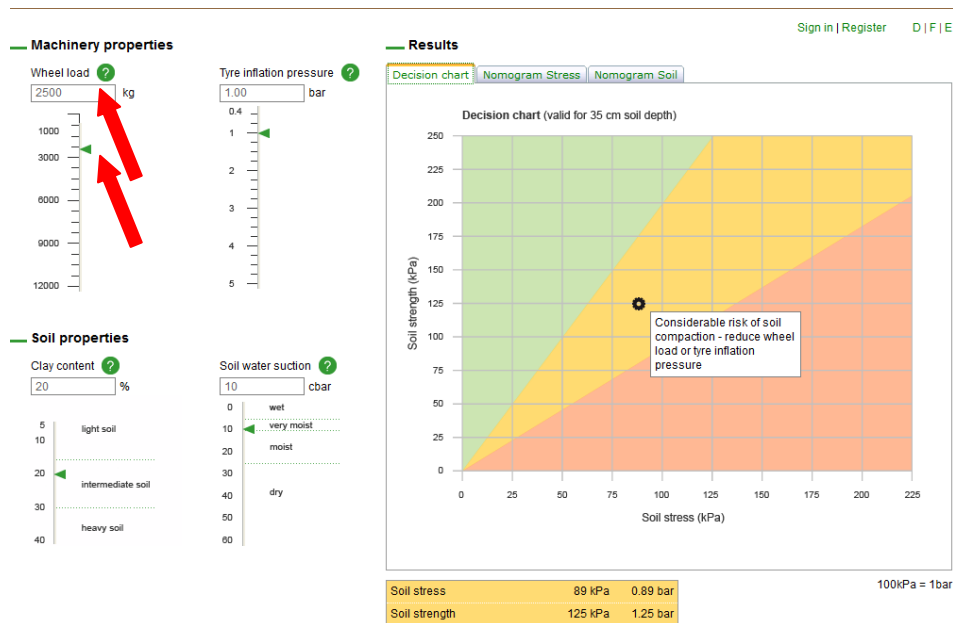


Fig. 2

If no precise machine data are available, they can be roughly estimated using input help. To do so, click on the ? button and the *Machine Data Help Table* will appear in a new window (Fig. 3). In the drop-down menu in the top left of this window, you can select the machine or a typical task (e.g., tractor, potato harvest, sowing, etc.). A table with additional items (vehicle, tyre dimensions, wheel load, tyre pressure) will then appear, in which a check should be placed beside the category that applies. The selected setting must be confirmed by clicking on the "Accept" button (the window will close).

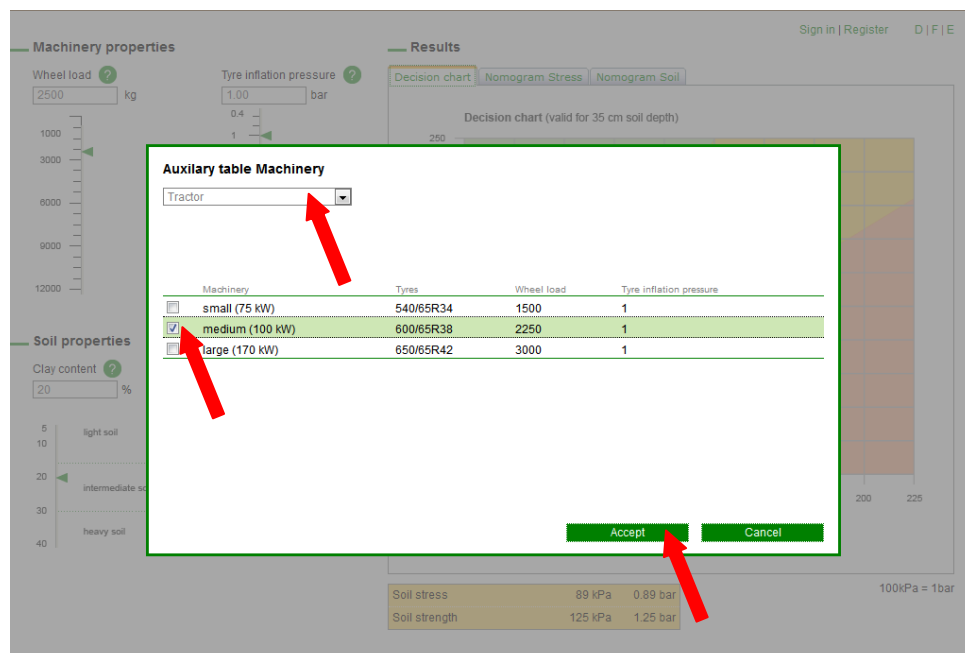


Fig. 3

The machine selection made under *Wheel Load* will also automatically fill in a default value for *Tyre Pressure*. You can make changes at any time via the input field or the slider.

Under *Results* you can select the *Pressure Nomogramm* tab, where the selected configuration is illustrated in the diagram as a small wheel (Fig. 4). In the example illustrated, for a wheel load of 2500 kg and a tyre pressure of 1 bar, a soil stress (calculated at a depth of 35 cm) of 89 kPa (0.89 bar) can be read on the graph (arrow 1) as well as in the table fields below the graph (arrow 2).

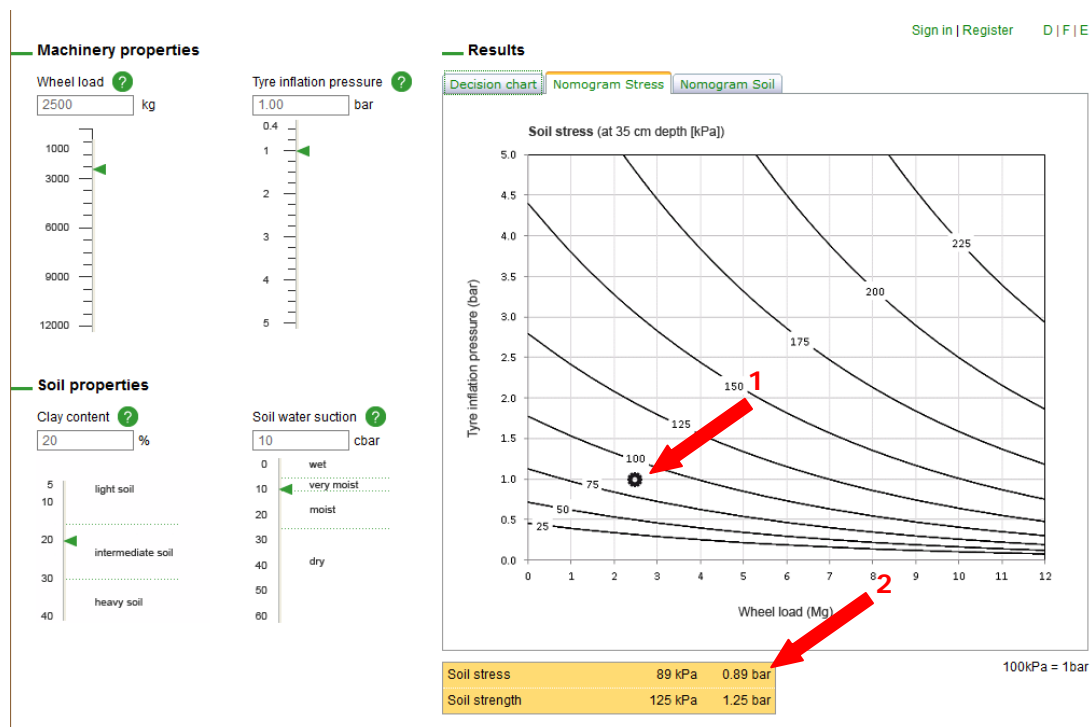


Fig. 4

Once the machine data have been recorded, as a second step it is necessary to provide the soil data (clay content and water suction) for determining soil strength (Fig. 5). These data are input according to the same principle as for the machine data, either via the input field, the slider, or via a help window opened by clicking on the button.

Tip: If you are a user in Switzerland, you can use the clay content from the obligatory proof of ecological performance (ÖLN) soil analyses. If the latter are not readily available, a selection can be made from three categories in the help window (Fig. 5).

Matric potential (water suction) is an indicator for soil moisture (low matric potential = wet soil, high matric potential = dry soil) and it can be measured with instruments known as tensiometers. In actual practice, however, the latter are not widespread. Hence there is a help window available for this as well (click on).

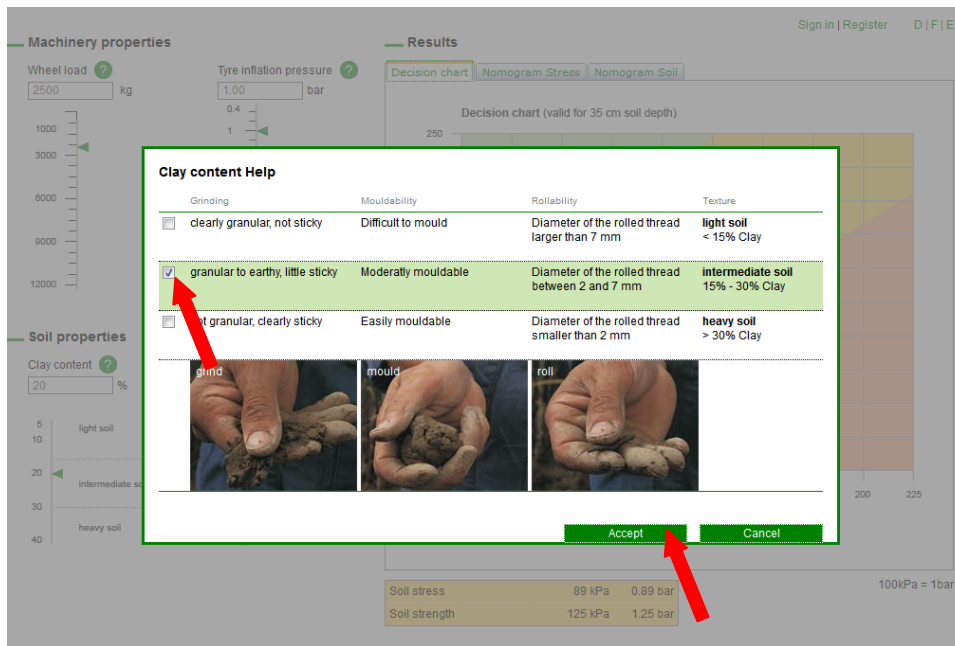


Fig. 5

Under *Results*, you can select the *Soil Nomogramm* tab, where the selected configuration is illustrated in the diagram as a small wheel (Fig. 6). In the example, for a clay content of 20% and a matric potential of 15 cbar a soil strength of 157 kPa can be read from the graph (arrow 1). This value is also indicated in table fields below the graph (arrow 2).

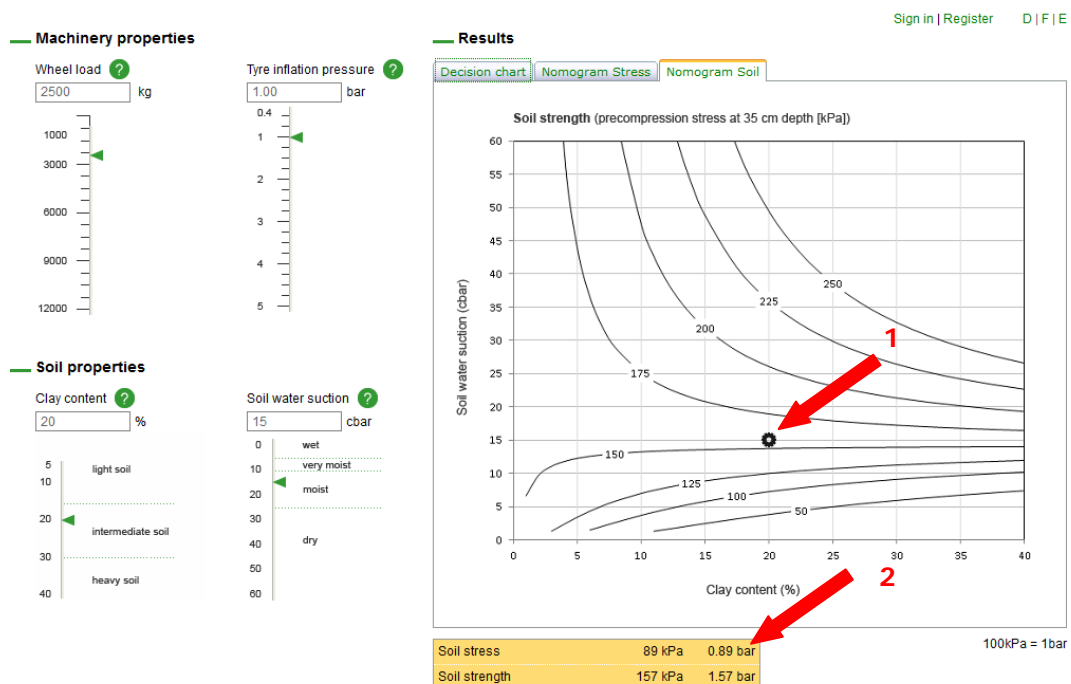


Fig. 6

Reading the soil compaction risk and interpreting the results

Once the machine data and the soil data have been determined, the compaction risk and the corresponding note on drivability can be read under "Results" on the *Decision Chart* tab (Fig. 7).

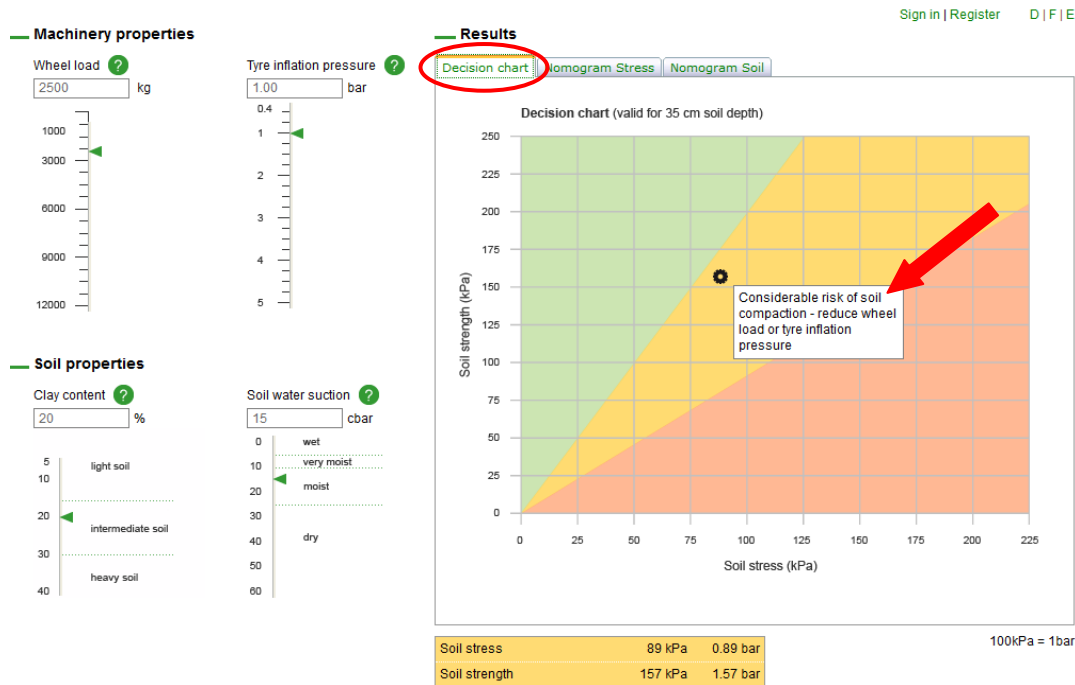


Fig. 7

The result in the decision chart (Fig. 7) is interpreted as follows:

Green:

This area indicates that there is no risk of compaction, i.e., the chosen vehicle can be driven on the soil in its present moisture state without any hazard of compaction.

Yellow:

The yellow area indicates the critical transition zone with a considerable risk of compaction. In this case knowledge of additional soil properties will allow a more precise risk assessment. For example, the risk will decrease in stony (> 10% stones in the subsoil) and in well-structured soils (owing to, e.g., sustainable tillage, extensive root penetration, high humus content or good lime supply). In each case all possible means of stress reduction (e.g., lowering tyre pressure – in which case the tyre guides of the manufacturers should be consulted, only filling hoppers partially, or mounting twin tyres) should be implemented. The effect of the measure implemented can be validated with the help of the decision chart after appropriately adjusting the input data.

Red:

The red area indicates that compaction damage to the subsoil is to be expected. One must refrain from driving on the soil unless suitable immediate measures can be taken to reduce the compaction hazard to the yellow level (e.g., reducing the wheel load or tyre pressure).

Explanation of the border lines:

Green-yellow border:

Soil stress = 50% of the soil strength. According to the current level of knowledge, this border represents the transition from completely elastic behaviour to initial plastic deformation of the soil structure under a stress.

Yellow-red border:

Soil stress = 110% of the soil strength. If the soil stress exceeds the soil strength (increased by a range of tolerance), previous wheeling test findings indicate that considerable plastic deformation (and thus soil compaction damage) is to be expected.

Detailed information on how to interpret the results of the model can be found in chapter 4 of the Guidelines for Soil Protection in Agriculture of the Swiss Federal Offices for the Environment (FOEN) and Agriculture (FOAG).