Bayesian Network Evaluation Notes

*Expert 1*

This document contains the notes of the evaluation of the Bayesian network with a domain expert. It first briefly describes the introduction to Bayesian network given to the domain expert. Second, the questions asked for the evaluation are given. The last part of the evaluation contains the notes made during the evaluation.

The Bayesian network used for evaluation can be found [here](https://github.com/tjanmaat/Thesis/tree/master/Bayesian_Networks) (<https://github.com/tjanmaat/Thesis/tree/master/Bayesian_Networks>). It is named ‘Figure18\_Network3.xdsl’.

# Bayesian Network Introduction

First, Bayesian networks were introduced to the domain expert. This was done through the following steps:

* Explain that arcs indicate correlation between nodes.
* Explain that each node has state and conditional probabilities.
* Show how this works by taking nodes CarbonSupplementUse and SoilOrganicMatterContent as an example.
* Note difference between correlation and causality.

# Questions

For 3 to 5 nodes, the conditional probability table was opened, and the following questions were asked:

* Do other nodes in this network directly influence this node?
* Is the influence of one of the influencers of this node negligible?
* Are the conditional probabilities given here obtainable?

The following questions were asked about the network as a whole:

* Do you think this model would be applicable outside LLC? Why (not)?
* Do you see any discrepancies in level of detail in this model?
* Do you have any remarks?

# Notes

The amount of soil water available to the plant is also influenced by the amount of water evaporating from the soil and the genus. The soil water retention capacity depends on the porosity of the soil.

It would be more informative to use wilting point where permanent wilting point is being used. Wilting point depends on genus and therefore holds more information.

The gas balance is modelled in too little detail by only taking the atmospheric pressure. It is also influenced by the wind speed: as more particles pass a leaf, there is a bigger chance of them interacting with that leaf. Therefore, the plant available wind could be included, which would also add to consistency.

The nutrient uptake orchestrates photosynthesis. Therefore, the arcs from plant nutrient uptake to plant growth should instead go to photosynthesis.

The ratio between root and shoot growth depends on genus and climate. Different plant genera have different root-to-shoot ratios and plant can adjust these depending on the climate. This should be reflected in the relations between plant growth, tree height and stem diameter. Also, if using a shelter influences stem diameter, it should also influence tree height, as the relation between shelter and stem diameter reflects the influence of the shelter on the root-to-shoot ratio.

Using the cocoon influences irrigation. This relation does not only hold around planting due to the water added when placing the cocoon, but also in the long run as after the cocoon disintegrates, a hole is left were run-off water accumulates.

Weeds are missing from the model. They compete with trees for water, sunlight and nutrients.

The influence of mycorrhiza is modelled poorly. They influence the plant available nutrients directly and their effectiveness depends on the acidity of the soil. The root volume determines how easily the mycorrhiza and the plant can find each other.

It would be nice if this model would also include plant survival and vigour, as these are interesting to predict as well.

This model would be well applicable outside of Land Life Company.