Bayesian Network Evaluation Notes

*Expert 3*

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

Deep percolation and capillary rise were missing as influences on volumetric soil moisture content. These have an influence comparable to the nodes currently influencing volumetric soil moisture content.

The model currently does take run-off of water from the ground surface into account, by having slope as an influence on soil moisture infiltration but misses run-on.

The amount of water evaporation in the soil is negligible when the surface is covered.

The way the nodes are going to be discretized has a big influence on the availability of probabilities. For some nodes, it might be wise to let the discretization depend on the available data.

The amount of nutrient absorbed scales with the amount of photosynthesis. Therefore, a correlation between plant available nutrients and photosynthesis should be drawn instead of the arc from plant available nutrients to plant growth.

Plant damage now entails any negative plant growth factors. This can be split up into more nodes. A plant can be damaged, but also stressed by, for example, salinity.

Competition is missing from the model. Competition can come from weeds competing for water, sunlight and nutrients, but also from nearby trees. Planting density therefore also plays a role in competition.

Atmospheric pressure and altitude are not that important to plant growth. These can be omitted.

This model would compete with models that make numerical approximations of tree growth and vary the input variables to get a sense of the statistics involved, as these are currently used within Land Life Company. It is hard to say how these models compare without the probabilities filled in.

The applicability of this model outside of Land Life Company depends heavily on the discretization and conditional probabilities.