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A Bayesian Belief Network approach to assess the potential of non wood forest products for small scale forest owners

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It is an integral element of the European understanding of sustainable forest management to foster the design and marketing of forest products, non-wood forest products (NWFPs) and services that go beyond the production of timber. Despite the relevance of NWFPs in Europe, forest management and planning methods have been traditionally tailored towards wood and wood products, because most forest management models and silviculture techniques were developed to ensure a sustained production of timber. Although several approaches exist which explicitly consider NWFPs as management objectives in forest planning, specific models are needed for the assessment of their production potential in different environmental contexts and for different management regimes.

Empirical data supporting a comprehensive assessment of the potential of NWFPs are rare, thus making development of statistical models particularly problematic. However, the complex causal relationships between the sustained production of NWFPs, the available ecological resources, as well as the organizational and the market potential of forest management regimes are well suited for knowledge-based expert models. Bayesian belief networks (BBNs) are a kind of probabilistic graphical model that have become very popular to practitioners and scientists mainly due to the powerful probability theory involved, which makes BBNs suitable to deal with a wide range of environmental problems. In this contribution we present the development of a Bayesian belief network to assess the potential of NWFPs for small scale forest owners. A three stage iterative process with stakeholder and expert participation was used to develop the Bayesian Network within the frame of the StarTree Project. The group of participants varied in the stages of the modelling process. A core team, consisting of one technical expert and two domain experts was responsible for the entire modelling process as well as for the first prototype of the network structure, including nodes and relationships. A top-level causal network, was further decomposed to sub level networks. Stakeholder participation including a group of experts from different related subject areas was used in model verification and validation. We demonstrate that BBNs can be used to transfer expert knowledge from science to practice and thus have the ability to contribute to improved problem understanding of non-expert decision makers for a sustainable production of NWFPs.