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The use of uncertain information in the hierarchical forest planning process

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Background

This qualitative study aimed to map what information is used in the forest planning process at large forest owning companies, how it is used, its level of uncertainty, and currently employed strategies to handle forest information uncertainty. An additional aim was to assess the status of the paradigm on the forest planning hierarchy in forestry.

Methods

We used data from semi-structured interviews with representatives of six large forest companies in Sweden. The total area in the sample represented more than 30 % (7.8 million ha) of the productive forest land in the country.

Main results

Our results show that the forest planning process is a hierarchical system of decisions where the information used in the different planning stages is of varying quality. All data supported that the traditional hierarchical planning paradigm still plays a vital role in practical forestry. The most central source of information in the whole forest planning process is the forest stand database (forest inventory). Its information includes uncertainties arising from various sources, including subjective field measurements, aerial image interpretation and guessing. However, the use of remote sensing estimates to feed the registers is increasing, which will probably improve the overall quality of the registers. Another important finding is that forest companies tend not to use decision support systems or optimisation models to solve planning problems outside the scope of strategic planning; thus, most planning is done by hand, e.g. in a GIS. Furthermore, we identified six main strategies that forest companies employ to control or handle uncertainties in forest information: 1) lock the future by deciding on a plan that should be followed, which means that the company can forget about the uncertainties and pretend that the plan is certain. 2) utilise a buffer or extra inventory like the planning reserve to increase the degrees of freedom, making the plan more implementable. 3) control or update forest information that highly impacts the downstream planning process or production. Updating is done automatically, for example, with LIDAR estimates and manually as in the inventory by harvest area planners. 4) re-plan the actions in the immediate future to make up for differences between the plan and realised outcome. This strategy is the same as the concept of adaptive planning. 5) look backwards to decide the future, with the best example being how the companies procure harvesting resources by looking at the previous years' harvest levels instead of the contents of the tactical plan, and 6) ignore the uncertainty, either intendedly or unintendedly

Conclusions

The results from this study increase our understanding of contemporary forest planning practices and will be helpful in the development of decision support systems and methods for information collection.