Working Papers of the Finnish Forest Research Institute 38: 61–65

Interactive Forest Planning with NIPF Owners

Jouni Pykäläinen[1)], Mikko Kurttila[2)] & Timo Pukkala[3)]

1-2) Finnish Forest Research Institute, Joensuu Research Unit
3) University of Joensuu, Faculty of Forestry

1 Basic principles of interactive planning

The participants of non-industrial private forest (NIPF) planning typically include the forest owner and the planning consultant. The computer interface of the forest planning software may also be seen as a participant that quickly answers computational questions related to the production of the forest. When additional human participants are involved the process may be called participatory planning.

A planning model is an important technical instrument in modern forest planning. It consists of the treatment alternatives for forest stands, on one hand, and the landowner's forest management objectives, on the other hand. Solution of the planning model is a forest plan which fulfills the owner's forest management objectives in the best possible way. In interactive forest planning, defining the planning model and solving it are alternated until the decision maker is satisfied with the result and selects one of the solutions to be his final plan (e.g. Pykäläinen 2000). Instead of defining his preferences *a priori*, the forest owner learns them during the planning process. The forest owner's preferences are therefore an important output of the planning process.

Interactive planning is needed in planning situations where it is too difficult to define the planning model *a priori*. Interactive forest planning is required when (i) the forest management goals are fuzzy for the forest owner, (ii) the production possibilities of the planning area are not known well enough in advance, (iii) the effects of producing different products from the forest can not be defined accurately enough in advance and/or (iv) the forest owner is not able to express his preferences so that they could be included in the planning model due to limitations of the planning method. This paper presents some examples of interactive private forest planning and some ideas for improving human-computer and interpersonal interaction in private forest planning.

2 Planning examples and experiences

The first interactive planning example (Pykäläinen 2000) is actually a hybrid process of qualitative and quantitative goal analysis, and prior and progressive articulation of preferences. The interactive process outlined below was tested with 22 real forest owners and holdings in eastern Finland. The tested planning process can be divided into six steps:

Step 1. The forest owner and the planning consultant get familiar with the present state of forest by using a visual computer interface (Pukkala 2004).
Step 2. The planning consultant interviews the forest owner. He uses a thematic interview ap proach where the owner's forest management goals are identified (Pykäläinen 2000). The owner may also give more or less exact spatial and temporal specifications for the goals for example by prohibiting certain treatments from certain stands.

Step 3. Based on the results of the thematic interview, and feedback from calculations, the planning consultant and the owner define the forest owner's planning model.
Step 4. The planning model is solved by using a heuristic optimization algorithm (Pukkala & Kangas 1996).
Step 5. The forest owner evaluates the solution of the planning model. If the forest owner is satisfied with the result, the process proceeds to Step 6. Otherwise, the process goes back to Step 3.
Step 6. The forest owner accepts the forest plan.

Forest owners' feedback (19 respondents) considering the planning process was collected by an inquiry. The major results of the inquiry were as follows: (i) the produced forest plans fulfilled the owners needs very well in 26 %, quite well in 53 % and neither well nor badly in 21 % of the cases, (ii) 89 % of the owners became more interested in forestry, 63 % of the owners felt they learned something, (iii) 89 % of the owners would like to take part in planning in the same way in the future, and (iv) majority of the owners preferred the method applied in the study as compared to the present way of Finnish forest planning. None of the owners preferred the present method over the method used in the case study. 42 % of the owners did not express their opinion about this question.

Our second planning example illustrates possibilities of using Internet based multi-criteria decision support tool called MESTA (Pasanen et al. 2005) in interactive planning with NIPF owners. MESTA is a decision support method for discrete choice situations, i.e. the forest owner can investigate and compare a limited number of forest plan alternatives prepared beforehand. In MESTA, subjectively defined acceptance levels divide alternatives into acceptable and not acceptable with respect to each decision criterion (Figure 1). The limits are adjusted holistically as long as one alternative that has been accepted with respect to all criteria is found. In this process, the decision maker is forced to adjust his/her goals and acceptance limits to be in line with the production possibilities of the planning area. Improved understanding and a well argued solution for the decision problem are the most important results of the process.

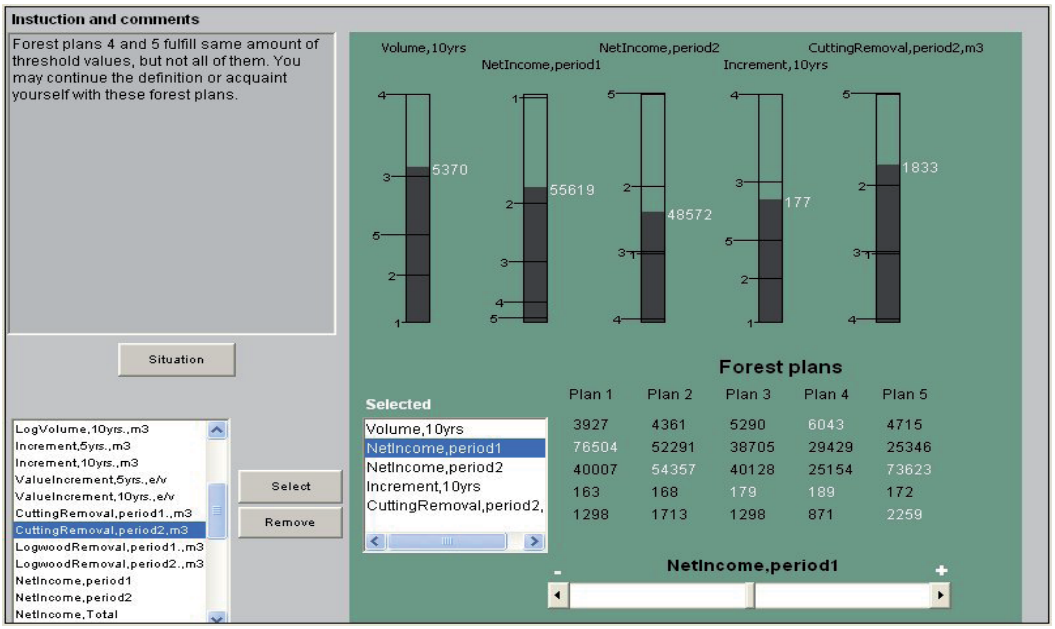

Figure 1. MESTA -planning interface.

In MESTA, the production possibilities are depicted through predefined discrete alternatives. Therefore, the alternatives must be produced carefully so that they are efficient and different from each other. To create a relevant set of alternative plans, some kind of preference information needs to be collected from the forest owners before the preparation of alternatives.

The experiences of using MESTA with trial forest owners were encouraging (Pasanen et al. 2005). In the trial use of the Mesta service the goal selection phase carried out by private forest owners, the creation of alternative forest plans by the planning consultant and the verbal and graphical description succeeded satisfactorily. The Mesta Internet application also functioned properly after the reported problems had been solved. The part of the Internet application most difficult for the forest owners was the setting of the acceptance limits, which only three owners out of eight experienced easy. Six owners said that they learnt something when they used the Mesta service. MESTA has been also used in strategic participatory planning of state owned forests and it has been found to be a good tool for supporting negotiation between different parties.

3 Promoting human-computer and interpersonal interaction

Optimization interfaces and visualization are central parts of interactive planning with NIPF owners. A good interface allows direct possibilities to make if-then analysis. For example, these analysis can be carried out so that the user changes the importance of his forest management goals and sees immediately the effects of changing the importance on the current achievement of the goals (Figure 2).

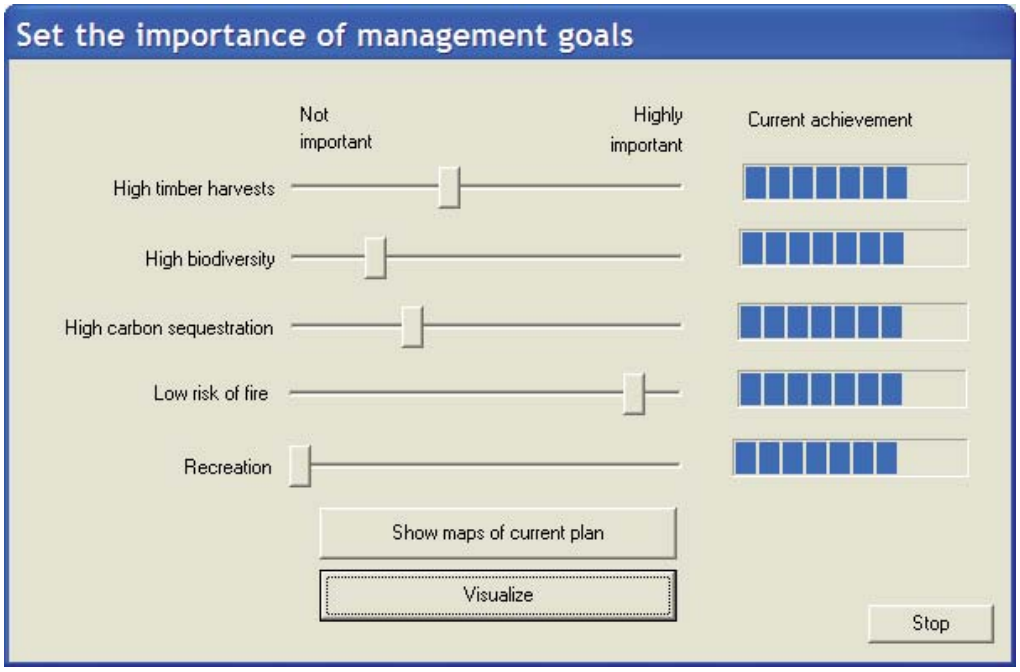

Figure 2. Example of an interactive optimization interface.

In addition, forest visualization can be used for improving communication and understanding of the results of planning as a part of interactive planning. At its best, forest visualization is integrated to interactive optimization so that effects of alternative plans on the forest resource can be instantly seen on the computer screen. Visualizations may also be offered to the forest owners over the Internet. For example, Virtual Reality Modeling Language (VRML) could be used for that purpose (Figure 3).

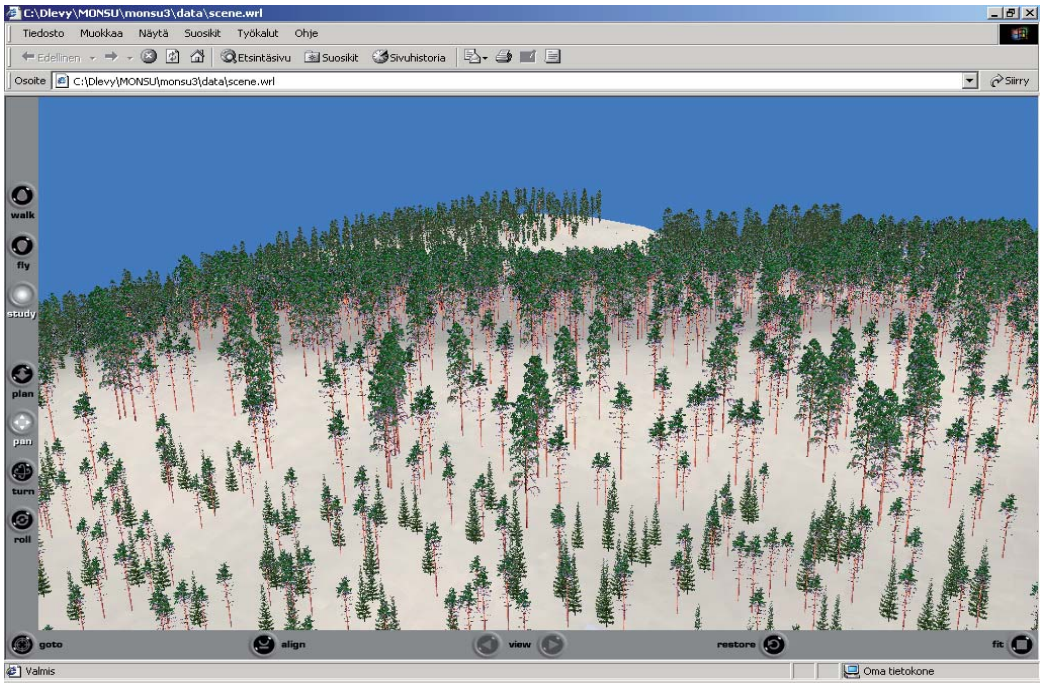

Figure 3. VRML visualization of forest landscape.

Even though technical tools are important parts of modern interactive planning, the planning process should be adapted according to forest owners' preferred ways to grasp and process information. For example, some forest owners do not necessarily want to take part in interactive optimization, and more conversational and qualitative planning approach could better serve these owners. An interesting topic for future research is to develop methods for selecting the best planning process for different owners.

References

Pasanen, K., Kurttila, M., Pykäläinen, J., Kangas, J. & Leskinen, P. 2005. MESTA - Non-industrial private forest owners' decision-support environment for the evaluation of alternative forest plans over the internet. International Journal of Information Technology & Decision Making 4(4): 601-620.

Pukkala, T. 2004. Monsu-metsäsuunnitteluohjelmisto. Versio 4. Ohjelmiston toiminta ja käyttö. 53 s.

Pukkala, T. & Kangas, J. 1996. A heuristic optimization method for forest planning and decision making. Scandinavian Journal of Forest Reserach 3: 533-544.

Pykäläinen, J. 2000. Defining forest owner's forest-management goals by means of a thematic interview in interactive forest planning. Silva Fennica 34(1): 47-59.