European Forestry Dynamics Model

The European Forestry Dynamics Model was developed in R [1]. In its current version, it is designed to model even-aged forests. Using a specification of management as input, EFDM simulates the development of the forest and estimates volume of wood harvested.

This estimate can be broken down per category modelled, for example species; site quality; management regime; etc. EFDM was jointly developed by the Natural Resources Institute Finland [2] and the Swedish University of Agricultural Sciences [3] for the European Commission's Joint Research Centre in the framework of the Specific Contract 10 under FWC388432 in 2013, and was further enhanced under Specific Contract 14 of the same FWC under the expertise of the same developing team. The model is currently functional.

EFDM was conceived as a flexible system for harmonized forestry modelling for all European countries. It is intended to process data from National Forest Inventories. This data is not standardized, nor is it necessarily available outside of its parent country, hence the need for a modular system such as EFDM.

EFDM is in its early stages. With the help of a growing community of users, we hope it will become a full-fledged software tool in the near future. In addition to software taking care of the core functionally of the model, there are components calculating the final felled or thinned volume of wood over a given time period; it also contains of a series of functions, helping user set up their input data.

Theoretical background

The EFDM is built around a basic matrix structure, defined by a set of fixed states, between which “units” of forest move over time. The core of the matrix structure is the dynamic state-space, which is defined by two variables: volume and age. Different dynamic state-spaces can be set up for different forest types, which could be defined by the modeller using variables as site quality, geographical region, species (group), owner type etc. All dynamics within the model take place inside the different “dynamic state-spaces”, thus no shifts between the forestry types are currently modelled. However an area could theoretically move from one forestry type to another, for example, as a result of forest regeneration with a different tree species.

At every simulation step, the distribution of the forest area in the state-space changes. The change is driven by the transition probabilities. Transitions are made within one time step in EFDM in the following sequence: first, the areas in each cell of the state-space are split according to activity probabilities. In the next step, the distributions of the areas in the activity-specific state-space are
modified according to transition probabilities for that activity. In the last step, the activity-specific state-spaces are merged back into one, and their growth progresses without any "memory" of the activities that have been applied. The resulting distribution of forest area in the state-space describes the state of the forest after one time step. In the next cycle, the model then applies the the activities probabilities on the "new" state-space.

License

The EFDM package is now available as free software licensed under the *European* Union Public Licence (EUPL) v1.1. EUPLv1.1 is compatible with several free software licenses.

Reference Material

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Reference material in printable format is available on the software repository under "documents" [6]

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