



## Investigations with large-scale forest lysimeter research of the lowlands of Northeast Germany – Results and consequences for the choice of tree species and forest management

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### Introduction

At present about 28 % - i.e. 1.9 million hectares - of the Northeast German Lowlands are covered with forests. The Lowlands are among the driest and at the same time the most densely wooded regions in Germany. The low annual precipitation between 500 and 600 mm and the light sandy soils with their low water storage capacity and a high porosity lead to a limited water availability. Therefore the hydrological functions of forests play an important role in the fields of regional water budget, water supply and water distribution.

### Experimental sites

Lysimeters are suitable measuring instruments in the fields of granular soils and loose rocks to investigate evaporation and seepage water. The usage of lysimeter of different construction has a tradition of more than 100 years in this region. To investigate the water consumption of different tree species, lysimeters were installed at Britz near Eberswalde under comparable site conditions. In the early 1970s nine large-scale lysimeters were built with an area of 100 m<sup>2</sup> and a depth of 5 m each. In 1974 the lysimeters were planted, together with their environment, with Scots pine (*Pinus sylvestris* L.), common beech (*Fagus sylvatica* L.), larch (*Larix decidua* L.) and Douglas-fir (*Pseudotsuga menziesii* [Mirb.] FRANCO) as experimental stands of 0.5 ha each according to the usual management practices. Therefore the "Large-scale lysimeters of Britz" are unparalleled in Europe.

It was the initial aim of the experiment to find out the influence of the species and age of the growing stock growing on identical sandy soil under comparable weather conditions on both natural groundwater recharge and evaporation.

Future forests in the north-eastern lowlands of Germany shall be mixed stands with as large a number of different species as possible. And this is also the aim of forest conversion in Land Brandenburg. The programme requires scientific attendance and foundation. In particular it shall be examined how the hydro-ecological conditions – which often are the limiting factor for forest growth in this area - would change with underplanted pine and larch and how these conditions may benefit from stand-structural and forestry measures. This is why several lysimeter stands were changed as follows:

- Ø Larch underplanted with beech
- Ø Scots pine underplanted with beech
- Ø Scots pine underplanted with oak

### Results

Forests with their special hydrological properties have a substantial influence on the water budget, water supply and water distribution of entire landscapes. The tree species is of outstanding importance for deep seepage under forest stands. The sum of transpiration gives a rough overview about the water budget of the forest stand. More important for the detection of interactions between the compartments is the partitioning of the whole evaporation into individual evaporation components.

Under the given precipitation and soil conditions, the course of interception and hence, the amount of seepage

water depend on the crown structure in the stand. Depending on the amount of interception of the tree canopy and the duration of the leaching phase in spring, the mixed stands range between pure pine and pure beech. Making use of silvicultural methods and adequate stand treatment, forestry is able to control the water budget of landscapes.