THE EFFECT OF WOODY PLANTS ON RIVER LEVEES

EXPERIENCES FROM NATURAL SCALED RESEARCH LEVEES WITH RESPECT TO STABILITY AND MAINTENANCE

Lammeranner Walter[1], Meixner Harald[1], Florineth Florin[1]

OBJECTIVES

The recent flood events have once more drawn attention to the stability and maintenance of river levees. Levees are still an essential instrument for flood protection. However, long lasting floods represent a particular danger for old levees with unfavourable structure and geometry.
Subsequently, the attention has also been focused on the relationship between vegetation and the structural integrity of river levees. Sets of regulations regard compact turf to be the safest prevention against erosion. A contentious issue are woody plants, and many guidelines ban woody vegetation from levees.
The refusal of woody plants is based on several arguments. The most important objections are listed below:

- Root penetration facilitates water movement along their paths
- Live and dead roots lead to cavities which threaten the structural integrity and facilitate water movement
- Woody plants and dense vegetation complicate effective levee inspections
- Woody plants hinder levee defence operations

But the ban on woody vegetation is mainly based on experiences with problematic and maladjusted woody vegetation (e.g. single trees, groups of trees) and less research work has been done on this subject. Hence, the Institute of Soil Bioengineering and Landscape Construction, at the University of Natural Resources and Applied Life Sciences in Vienna, was commissioned with a research project by the Austrian Federal Ministry of Transport, Innovation and Technology, the Provincial government of Lower Austria and the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, to investigate the impact of woody plants on river levees.
The objectives of the research project are:

- Analysing the impacts of woody plants on the stability of levees with reference to percolation and overflowing
- Determining the impacts of woody structures on maintenance, levee inspection and defence
- Investigating if woody structures, in particular the application of small to medium sized woody plants as used in various soil bioengineering techniques, can enhance structural integrity without the hazards mentioned

[1] Institute of Soil Bioengineering and Landscape Construction, University of Natural Resources and Applied Life Sciences, Peter Jordan-Strasse 82, A-1190 Vienna, Austria (phone: +43-(0)1-47654-7315; fax: +43-(0)1-47654-7349; e-mail: walter.lammeranner@boku.ac.at)

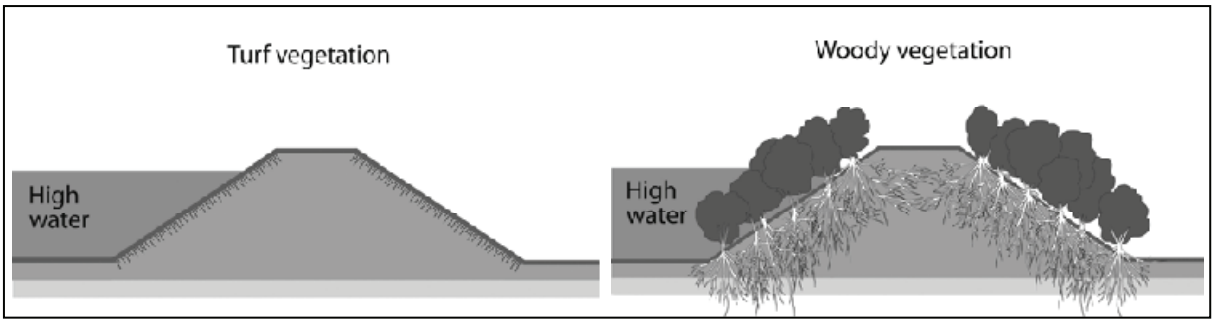

Fig. 1: Left: Levee with conventional turf. Right: Levee with flexible and dense woody vegetation.

METHODS

Data are collected from two research levees built to a natural scale in Deutsch-Wagram/Lower Austria. Both levees form a basin in between, which can be charged with water. The levees are planted with different forms of woody vegetation (dormant cuttings, living brush mattress, and living branch mattress) as well as turf vegetation. In impounding tests the impact of these vegetation structures on percolation and seepage is investigated using seepage monitoring pipes, soil moisture sensors, seepage water accumulation pins and additional soil temperature probes. The influence of vegetation on surface erosion and shear strength is analysed by using tensiometers for pore water pressure measurement. At four overflowing sections the different vegetation structures can be tested in respect to overflowing.
Gained results are complemented with field surveys at selected levee sections at the river March and nearby related rivers.

Fig. 2: The research levees with basin in between (September 2007).

STATE OF THE RESEARCH

The proposed paper deals with investigation, design, construction and monitoring over a period of one year. First results of plant performance, impounding and overflowing tests are presented.

Keywords: flood protection, levees, woody plants