Levee Management Project

—To clarify effectiveness of vegetation management in maintaining flood control functions of levees and reflect the findings in levee management—

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1. Introduction

To more effectively and efficiently manage river levees in the future, it will probably be important to set the maintenance level according to external force conditions, conditions of the hinterland, etc. While the effectiveness of mowing, inspections, river patrols and other maintenance activities in maintaining the levee's flood control functions have been partly studied [1], their effectiveness is still inadequately clarified, so completing technologies to assess the relationship of maintenance activities with maintaining flood control functions remains a challenge.

2. Levee Management Project

The Levee Management Project is a framework for the joint surveying of levees and development of technologies by the head office of the Ministry of Land, Infrastructure, Transport and Tourism, National Institute for Land and Infrastructure Management, the Public Works Institute, and the regional development bureaus in order to clarify the effects of levee slope vegetation management on erosion resistance to flood flow and on slip stability under seepage, and to propose necessary maintenance levels and maintenance intervals.

The project was planned to meet the following three challenges.

Challenge 1: Clarifying change over time of vegetation transition (flourishing of tall herbaceous plants), thickness of the loose layer of the surface soil, and strength or permeability inside the loose layer of levee slopes according to mowing frequency

Challenge 2: Quantitatively clarifying the bearing strength (erosion resistance, seepage resistance, resistance to slope sliding) of levees according to the quality of the levee (loose level, types of vegetation flourishing)

Challenge 3: Setting the management level at the minimum necessary based on the above.

Studying the frequency of mowing and removing and replacing the loose soil layer of the slope in order to maintain flood control functions by quantitatively evaluating the levee's bearing strength (challenge 2) according to change over time (challenge 1) of a levee according to differences in the management level (frequency of mowing). And also studying how to reflect the indices for plant communities or loose layer thickness etc. in levee inspection items (Challenge 3).

3. Towards reflection in the field

As an example of the project, the following are interim results of a large-scale water channel experiment using specimens taken in undisturbed state from an actual levee (Challenge 2). Assuming that erosion resistance capacity is mainly impacted by root hairs on roots of vegetation, the roots were classified as "vegetation consisting mainly of root hairs (Japanese lawn grass, cogon grass)", "vegetation consisting mainly of tap roots (thick roots) (tall goldenrod)", "vegetation consisting of mixed root hairs and tap roots (nezasa (*Pleioblastus chino* var. *viridis.*))" and then compared, and based on the results, it was concluded that the erosion resistance capacity of "vegetation consisting mainly of root hairs" was greater than that of the other types [2].

The achievements of this project will be reflected in setting the maintenance level, and we wish to continue this study in order to contribute to more efficient maintenance and to the improvement of the quality of river levees.

[Sources]
1) Uta et al.: Hydraulic stability and erodibility of rich-in-nature-type bank protection works, cohesive soil and short vegetation., Technical Note of PWRI, No. 3489, 1997
2) S. Ochiai, A. Hattori, H. Nobutsune, N. Fukuhara: Test of erosion resistance according to differences in vegetation, No. 65 Proceedings of annual conference of the Japan Society of Civil Engineers, 2010