

学 位 論 文 要 旨	
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題 目	Study on Diagnosis of Hydraulic and Water Serviceability Functions for Irrigation and Drainage Facilities (農業水利施設を対象とした水理および水利用機能診断に関する研究)
<p>Ministry of Agriculture, Forestry and Fisheries carries out the stock management projects to diagnose functions of irrigation and drainage facilities and to effectively and economically repair the facilities. In the past, structural ability function was diagnosed mainly, while hydraulic and water serviceability functions were not enough. Therefore, present facilities have some problems on hydraulic and water serviceability functions.</p> <p>This study aimed to examine diagnosis methods of hydraulic and water serviceability functions for irrigation and drainage facilities, in particular for irrigation open channels. The results of this study are summarized as follows;</p> <ol style="list-style-type: none"> 1) We proposed a new method that uses manufactured plates to estimate Manning's roughness coefficient. We chose four plates, with variable exposure conditions, and applied them to the estimation of Manning's roughness coefficient in the existing concrete open channel used for irrigation. The results showed that the difference between the coefficients estimated by the plates and the conventional laser distance meter was 0.001. Therefore, we conclude that the developed plates allow to estimate Manning's roughness coefficient without great effort even when the concrete surface is under water. 2) For irrigation open channels with gradually width-contracted part, we evaluated the effects of changes in structure of the contracted part on the coefficient f_{qc} of conversion loss based on laboratory experiments. The experimental results showed that f_{qc} increased corresponding to the increase in the reduction-angle θ at the contracted part from 12.5° to 90° meaning sudden contraction. Additionally, f_{qc} decreased when the reduction-ratio B_2/B_1 of the downstream to the upstream channel width at the contracted part increased from 0.5 to 0.7. We conclude that the optimum value of f_{qc} is 0.1 for designing the irrigation open channels with B_2/B_1 greater than 0.7. 3) We evaluated flow transmissibility in the hydraulic function of patchy concrete open channels that have been repaired sporadically by several repair methods over a short distance. The field surveys resulted in small changes in water level and flow velocity at the center of each repair section in the channel. The nonequivalent flow analysis showed that patchy repairs led to longitudinal fluctuations of water surface by changes in the longitudinal slope of channel bottom, but hardly by changes in the wall roughness and width of the channel. Accordingly, we suggested a new procedure for the diagnosis of the hydraulic function, i.e. flow transmissibility, in patchy concrete open channels. 4) We proposed a new method for converting an irrigation system into a network model based on the theory of delivery function that was one of the basic canal functions. We introduced a new irrigation canal order as a objective index based on a layered structure. 	