

## **Risk Assessment of Agricultural Water Conveyance and Delivery Systems by Fault Tree Analysis Method for West Dez Main Irrigation Canal**

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### **Abstract**

Accurate identification of the potential hazards within the main Agricultural Water Conveyance and Delivery Systems (AWCDS) and their influences on the system failure could provide practical solutions for improving the operational performance of the systems. Therefore, risk analysis in AWCDS is inevitable to the system recognition and reliability endurance against the imminent hazards. Satisfactory operational of the AWCDS in irrigation networks is associated with delivery of adequate and equitable water to the entire off-takes located within the main irrigation canals. Accordingly, this study was conducted, for the first time, to present a unique framework to assess the adequacy, equity, and efficiency of water delivery risk analysis within AWCDS. To this end, the "fault tree" technique was employed for risk analysis of the disaster (hazardous event) which is called the "undesirability of supply and delivery". Consequently, factors leading to the occurrence of the failure, including natural hazards, human and operational threats as well, are recognized and formed the basic and middle events in the "fault tree" structure. The designed "fault tree" was tested on the West Dez main irrigation canal, as the case study of the research. By interviewing the manager, local authorities, ditch-riders, and personnel of the Dez irrigation district, a set of questionnaires were filled up. According to the obtained information, failure probabilities of the basic events were gathered in the form of linguistic terms. Later, the assembled fault tree was analyzed and, as a result, the failure probability of the secondary events and the top event was determined. Failure likelihood of the top event was calculated at about 30%. Consequently, due to this high failure likelihood, basic events were ranked based on their share in the occurrence of the relevant secondary events as well as the top event. The five most important events were "failure to fund maintenance process", "lack of operation flexibility", "non-homogeneous operation system", "inactivity of cultural and training centers of the province" and "inaccurate operation of the intakes". The Birnbaum index of these events varied from 0.055 to 0.097. Ranking of the events affecting the adequacy, equity, and efficiency was performed, with similar results.

**Keywords: Top Event, Hazards and Threats, Risk of adequacy, Risk of equity, Risk of efficiency, Birnbaum index.**

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