

Estimation of damage area due to tropical cyclones using fragility curves for paddy rice in Japan

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A method for estimating the area of crop damage due to tropical cyclones (TCs) by using fragility curves (FCs) is proposed. FCs, which represent the probability of damage caused by external forces, are one method considered appropriate for estimating structural damage caused by natural disasters. Here, FCs are applied to estimate the area of damage to paddy rice resulting from typhoons in Japan. The FCs for paddy rice are assumed to vary with growth stage. Statistical data on areas damaged by 42 typhoons that have struck Japan between 1991 and 2007, together with observed meteorological data, are used to derive the FCs. In general, our estimates agree with the reported areas of damage for the 42 typhoons, especially for typhoons that affected large areas of paddy rice. Moreover, from statistical data on crop damage due to typhoons, the proposed method successfully shows that the heading stage of paddy rice is the stage most vulnerable to typhoons, as found in earlier experimental studies and post-disaster investigations.