Flood Damage Analysis Computerize Method on Agriculture Floodplain

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Abstract

Lowering the cost of flood damage in rural floodplain in compare with urban floodplain and making more space to pass the flood into the river corridor are two main reasons of re-look on rural floodplain development strategy. In rural floodplain the flood damage related to time and quality and quantity of crops would change per unit area and different crops make changes on different Annual Recurrence Interval of flow (ARI). Some of crops show more sensitivity in lower discharge and some make more sensitivity in higher discharges. This paper makes an analysis on flood hazard changes of crops totally and separately and explains about sensitivity of crops to flood damages in different ARI using a special software for Flood Hazard Risk analysis in Malaysia Rivers. The analysis applied for limited reach of Bernam River in Malaysia. The input data contain some hydraulic and hydrology data such as depth, duration and flooded area for crops in different ARI and the output of this software shows the flood damage of crops totally and separately and how the behavior of oil palm, rubber and other tree crops are different in different ARI.

Keywords: Flood damage, rural floodplain, crop loss, flood damage assessment models.

1.   INTRODUCTION

The main effective factors on flood hazards depend on new regulations, alleviation plans, changing land use configurations and susceptibility of flooded properties can be different. For example in urban area the flood depth is the main effective factor on flood damage and for agriculture area, crop losses are substantially affected by the duration and occurrence time of the flood.

Some models such as Flood Damage Assessment (FDA) (An Integrated Software Package for Flood Damage Analysis) and The Australian National University flood damage modeling program (ANUFLOOD) are suitable for urban area. They evaluate the depth-damage relationship and using more real historical data of flood damages the uncertainty of these models will decrease. Also, for agricultural flood damage, Computerized Agricultural Crop Flood Damage Assessment System (CACFDAS) and HAZUS Flood Model are available and applicable in the USA (Dutta, et al., 2001).

The CACFDAS is a computer program that is utilized to evaluate flood damages to crops and analyzes daily stage data. The CACFDAS was developed to include various levels of management, planting dates, and yields for the principal crops of rice, cotton, soybeans, and corn.

In HAZUS Flood Model two national datasets are the National Resources Inventory (NRI) and the National Agriculture Statistical Service (NASS) are used (Schneider, P. 2007). In these datasets, general distribution of crops by type, average yield, the unit price, the harvest price, specific hydrologic Unit Codes, soils data and "expansion factors", statistical weighting factors and many more data are considered. In this model, The US Army Corps of Engineers (USACE) has a set of factors for 0, 3, 7, and 14 days of duration. The flood model will provide a single table of losses by crop type for each duration period and the user will need to provide a date for the flood scenario, and the flood model will determine the Julian date and identify the loss potential from the damage function. The loss will be increased by the duration factors table.

The Norberto results (2010) show that how velocity of flow increase the magnitude of the building damage due to riverine and coastal floods compared to flood damage solely consider water depth.

In Malaysia there is a simple and effective method to flood damage assessment. This method has applied by JICA and in "FHRRS" software is used too. In this method flood damage calculate by multiplying of unit values of crops by flooded area for respected crop by damage factor. Damage factor for different crops predicted and listed in a Table to use and two effective parameters of depth and duration of flood are