

Abdi Boru Ayana 2012: Analysis of Land Use Change and Its Effects on Runoff and Sediment Yields in Fincha Watershed, Ethiopia. Doctor of Engineering (Irrigation Engineering), Major Field: Irrigation Engineering, Department of Irrigation Engineering. Thesis Advisor: Assistant Professor Ekasit Kositsakulchai, Dipl. Docteur. 189 pages.

The land use change of Fincha watershed was analyzed using remote sensing, GIS and Markov modeling between 1985 and 2005. An attempt was also made to predict the effects of land use change and management practices on runoff and sediment yields using SWAT model. Analysis results showed that agricultural land and water bodies increased by 53.59 and 93.10%, respectively. In contrast, tremendous loss of forest, grazing and shrub lands were observed by as much as 50.48, 31.23, 51.37 and 24.81%, respectively.

SWAT model also adequately predicted runoff and sediment yields from the study watershed with R² and ENS values ranging from 0.82 to 0.86 and 0.73 to 0.85, respectively. Simulation of various land use scenarios clearly indicated that average monthly runoff volumes and sediment yields increased between 2.24 to 17.86% and between 2.07 and 19.46%, respectively as the result of the increase under the area of agricultural land. Simulation of land management practices also showed that while runoff volumes remained almost unchanged, the average monthly sediment yields decreased between 20.82 and 24.41 t/ha due to interventions. This study demonstrated that SWAT model is capable of predicting the effects of land use change and management practices on the hydrological processes. Hence, it can be used as for land and water resources planning and management. Moreover, the use of remote sensing, GIS and Markov modeling was found to be beneficial in describing the direction, rate and spatial patterns of land use change.

Student's signature

Thesis Advisor's signature