



Hydrological processes of different land use systems and water budget in a small catchment of the low hilly region

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The Sunjia catchment is selected as the research area. It represents subtropical moist climate in China and has very typical geomorphology, land uses and soil parent materials. The catchment has an area of 46.2 ha and consists of well defined drainage divides. It builds up a set of hydrologic subordinated entities. Each of them is clearly delineated by small channels and is completely covered peanut (*Arachis hypogaea*) upland, chestnut orchard (*Castanea mollissima*), citrus orchard (*Citrus unshiu*), agroforestry (citrus intercropped with peanut), and rice (*Oriza sativa*) paddy fields. It is hypothesized that agroforestry can affect lateral subsurface interflow. The range of lateral subsurface flow is associated with soil horizon characteristics. The objectives of this study are to characterize hydrological process in agroforestry system, to estimate the amount of lateral subsurface flow in the research region, to compare water budget components under different land uses in an irrigated watershed and to construct watershed water-budget to estimate irrigation water flow and irrigation efficiency. The following conclusions we can draw: (1) The time of turning saturated on downslope was longer than those of upslope. The subinterflow was probably responsible for this distribution. The frequency of ψ ($50 < \psi < 80$ -Kpa) was significantly higher on peanut field as compared to agroforestry field at the lower soil layer. The wetter soil regime on the lower downslope was attributed to subinterflow from the upslope to the lower slope position. An obvious turning point was observed by the maximum ψ (-kPa) at the depth of 85 cm in the peanut field. just as indicated, where was the interface that the AB horizon transferred to B horizon, The ψ (-kPa) values were higher in

the AB horizons above 85 cm than those in the B horizon, which attributed to plant root pattern and soil hydraulic properties. On the other hand, this turning point also suggested the depth where lateral subinterflow occurred. (2) The water budgets are different among peanut fields, agroforest ecosystem of citrus intercropped with peanut, chestnut forest and paddy field, suggesting that land use has altered the hydrology of the small catchment. (3) This study shows how data obtained at plot experiments may be extrapolated to the small catchment scale and combined with other hydrological variables for catchment balance and irrigation performance evaluation, using such spatial data sets as land cover, soils and catena. (4) Rainy season showed poor irrigation performance of 10.2%, mainly due to over-irrigation. After that, less water was distributed and the efficiency increases. The irrigation efficiency was 26.1% on average at the small catchment.