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Differences in Water Budget among Wheat, Maize and Their Intercropping Field in the Heihe River Basin of Northwest China

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The objective of this paper is to clarify the effects of changes in land use on water budget in the Heihe River Basin of Northwest China, focusing on differences in water budget among wheat field, maize field and intercropping, which is a system to plant two or more different species alternately in each row at the same time, with wheat and maize. The Heihe River situated in an arid region of Northwest China runs from the Qilian Mountains to terminal lakes located in hyper-arid area through oases. Surface water of the river is the very important easy-accessible water resources not only to the people who living in the region but also to the ecosystem. The middle reaches of the Heihe River Basin is famous for high harvest yield of crops in China. The most typical agricultural land use before 1980 was for wheat field. From 1980's to 1990's, areas of intercropping with wheat and maize (w-m intercropping field) had increased. Now, twenty percent of the agricultural land is wheat field, forty percent is maize field, and forty percent is the w-m intercropping field. However, in the last couple of decades, an increase in agricultural land and changes in land use resulted in decreasing in amount of discharge flowing into the lower reaches. Possible shortage of water resources threats both people's life and the ecosystem of the basin.

Both meteorological and hydrological observations and investigation of information of irrigation such as amount, frequency and interval, were carried out on wheat, maize and w-m intercropping fields in Zhangye oasis of the middle reaches of the Heihe River Basin from September 2003 to September 2004. Sensible heat flux and latent heat flux in the w-m intercropping field were estimated by the Bowen ratio method. In the wheat and maize field, bulk transfer formulas were applied.

Evapotranspiration during the growing period were 313 mm in the wheat field, 502 mm in the maize field, and 558 mm in the w-m intercropping field respectively. Irrigated water at a time on all the fields was approximately 120 mm. During the growing period, numbers of irrigation were 4 times both in the wheat and the maize field, and 7 times in the w-m intercropping field. Because the amount of rain during the growing period was 68 mm, the amount of water input for the wheat and the maze filed was 548 mm, 908 mm for the w-m intercropping field. Based on these results, we will discuss the effects of changes in land use on water budget in the Heihe River Basin.