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Mechanisms resulting in sharp decrease of runoff in Haihe Catchment of North China

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In Haihe Catchment, most subcatchments are experiencing quick decline of runoff since 1970s. It is generally understand that runoff decrease are caused by human activity and climate change. But it is so far not sure which factor has the most dominating influence on runoff decline, since there are so many human forces such as land use change, reservoir construction, small dams for runoff control in small valleys, and etc.

Our study understand that 1) Runoff decrease mainly starts in 1978-1984 period, the starting period of China's agricultural reform; 2) Among eight catchments, catchments with over 25% of agricultural cover all have significant decline of runoff, and the higher the percentage of agricultural cover is, the stronger the runoff decline is. Such findings indicate that agriculture water use could be a major driving force of runoff decline.

In order to further clarify our hypothesis, in Hutuo River basin, we testified that dramatic decline of runoff is heavily caused human activities rather than climate change or precipitation decrease through the application of SWAT (Soil and Water Assessment Tool) model. Precipitation decline only results in 24% of runoff decrease, while human forces result in 76% of the runoff decrease.

In next research, we compared runoff decrease in the Ye River Catchment, where Dazhai is located, and Hutuo River Basin. Our study further showed that agriculture effect on runoff is dominate, since runoff decrease started in 1968 in Ye River catchment where agricultural activities is the strongest in China over that period. However, in the nearby catchment, where agricultural activities are not as strong as Ye River Basin, significant runoff decline took place during China's agricultural reform period.

Those studies confirmed that agriculture is the major force of runoff decrease in Haihe Catchment.