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Effects of a network of sand-storage dams on the hydrology on catchment scale

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Water conservation is a high priority in the drier areas of sub-Saharan Africa. Storage of water from the rainy season to the dry season, or even from wet years to dry years is highly important. Small multi-purpose sub-surface water reservoirs recharged through infiltration are used to provide water for humans, livestock and crops in the Kitui region in Kenya. The groundwater dams obstruct the natural flow of water in wet seasons or periods, and provide storage of water during dry seasons or periods. This paper links the hydrology of the sand-storage dams to human agency. When is a dam a success in hydrological terms? When it provides water every year? Every two years? How many months? What happens in very dry years? Obviously, water use will decrease the water volume and thus the water level upstream of the dam, but to what extent typically depends on the amounts used compared to the size of the dam and the water use itself. Longer-term effects on groundwater levels to be expected depend strongly on the way the water is used. Household water use and river banks infiltration increasing seasonal storage can go hand in hand. However, when water in dams is used for higher water demanding activities such as (motorized) irrigation, the infiltration effect into banks may be minimal. A dam can also be “too effective” and decrease water availability for water users further downstream. It is unlikely, however, that an individual farmer will effect on the downstream users of the resources he/she is tapping, but a network of dams as in Kitui may have considerable effect. Measurements indicate that only about 2% to 3% of the total yearly runoff within the catchment directly associated with a single dam is stored in its reservoir. Therefore only this small percentage of the total flow of a seasonal river with dams is blocked. The paper will detail these general concepts with a case study of the Kiindu catchment. The hydrology of the Kiindu catchment is dependent on different aspects which influence each other. The physical environment determines the living conditions of the people directly and indirectly through the availability of water. The society on the other hand changes the physical environment directly by building sand dams or digging terraces directly and by the water use indirectly. Within the catchment, different sub-catchments show specific outcomes of this interaction. This means that even on a small scale of a catchment of some 20 kilometres, significant differences in water availability and quality can be found.