

## Abstract

Water scarcity and its unsustainable use are threatening farming efficiency in most “Arid et semi-arid lands” (ASALs) of Kenya. More significantly, these factors lead to recurrent food shortage in Machakos District of Kenya. This has been attributed to both endogenous and exogenous factors pertaining to on-farm management and environmental changes, respectively. This study used hydro-geomorphologic risk assessment, social impact and economic inventory models to evaluate farmers’ water use efficiency. This procedure referred to as “hydro-economic inventory” assesses the risks related to the use of water and land in farming, and its impact on the social welfare of farmers and the economic viability of their activities. It serves as a basis to the planning, monitoring and evaluation of water disasters in agriculture in that catchment area. It focuses on an incremental analysis of crop water requirements and farmers’ water demand under fluctuating rainfall regimes using hybrid inventory models. Results of this study show that significant increase of water shortage costs under below normal rainfall regime (BNOR) undermines agricultural efficiency. Almost all farming units need to define a “Minimum efficient scale” (MES) of their farming water demand to optimize their crop water requirements under recurrent risk of drought. Farmers also need appropriate farming technologies and rational water policies to foster their economic efficiency.