



Water balance of an agricultural field cropped with squash on Tongatapu

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The objective of the present study is to present and evaluate the different components of the water balance of an agricultural field on the coral island of Tongatapu (175°12'W, 21°08'S) located in the Pacific Ocean. Tongatapu (256 km²) is a raised coral atoll and the main island of the Kingdom of Tonga. Agricultural practices have intensified on Tongatapu since 1987 when a niche period for the export of squash (*Cucurbita maxima*) into the lucrative Japanese market was identified. Over the last 10 years the export of squash has accounted for about 40% of the GDP of Tonga. With the increase in export a manifold increase in the importation and usage of agricultural chemicals has occurred. This has led to increasing concerns and mounting evidence of pollution of the precious freshwater lenses that float underneath the island. Detailed estimates of the water balance components of a field soil are needed to understand the fate of water and solutes in soil. Novel techniques were used to measure transpiration and drainage out of the root zone in a field planted with squash during the 2004 growing season. Heat pulse was used to measure sap flow in the squash and water flux meters were used to measure and sample drainage for further analysis at a depth of 1 m. Soil evaporation was measured with micro-lysimeters. The components were first satisfactorily modelled separately and subsequently integrated using WAVE. To evaluate off-season drainage simulations were carried out to include a part of the off-season wherein deep rooting Guinea grass (*Panicum maximum*) was quickly established after harvest.