Recent droughts in Australia and concerns about climate change have highlighted the need to manage agricultural water resources more sustainably, especially in the Murray Darling Basin (MDB) that uses more than 70% of water for food production. Due to continuous and prolonged drought, many irrigation areas in the MDB have been seriously affected, to varying degrees, and this has resulted in a significant reduction of water allocation for growing cereal crops. The reduction in water availability forces farmers and irrigation managers to increase beneficial use of water for crop production and account for every drop of water coming in and going out of the system. However, this would be only possible if the irrigation managers have reliable and timely information available pertaining to actual water use in the irrigation systems.

This paper focuses on a decision support system (DSS), the Coleambally Integrated River Information System (Coleambally IRIS), for managing irrigation water demand and supply more sustainably in a real-time environment, in the Coleambally Irrigation Area (CIA), NSW, Australia. Accurate maps of various agricultural crops using high spatial resolution satellite images (Rapid Eye) was developed for each cropping season. Seasonal actual ET has been estimated from SAM-ET (spatial algorithm for mapping ET) algorithm, developed for an Australian agroecosystem, using 18 Landsat 5 TM satellite images and results being further validated with two eddy covariance systems and two large aperture scintillometers. In addition, this article also describes the active ground truth data campaigns being carried out on a fortnightly basis since 2007 to collect additional data about leaf area index from LICOR 2000, soil heat fluxes from HuskeFlux, and crop reflectance data from CROPScan and from a thermal radiometer. A UAV drone equipped with multispectral scanner and thermal imager was used to estimate very high spatial resolution actual ET maps over the selected farms. Lastly, the holistic spatial water accounting approach has been applied on weekly basis in the Coleambally IRIS.

Similarly, for demand forecasting, a decision tree has been trained using bayesian network and artificial neural network on a training data set having various non-class attributes, including weekly forecast weather data from the Bureau of Meteorology, and a class attribute which is actual ET. Having trained classifiers and forecast of weather data, our DSS can predict future ET and therefore water demand of all farms in CIA. The developed DSS have been practically used for managing irrigation water supply and demand in real life by irrigation managers, farmers, and researchers dealing with water management in CIA. User feedback is being used for the further development of the DSS.