Objectives & Rationale

Selective and limited information is available on the crop water use and requirements of various stone and pome fruits produced across South Africa (SA). Further, little is known about the ranges in crop and region-specific water use and water requirement. The factors influencing it are not well understood. No “reference” document exists summarising this information. This research aimed at assessing and summarising available information related to crop water use and irrigation requirements of pome and stone fruit. A summary of the results are proposed for a quick reference guide on pome and stone fruit water use.

Methods

This project was executed as a desktop study and focussed on pome and stone fruit production in SA, with a specific emphasis on the Western Cape (WC). It involved an extensive literature review (crop water use, water requirements, crop production), collation of available large datasets, GIS analysis to generate a pome and stone fruit map for the WC, extract long-term climatic data for the WC production regions, extract statistical information on orchard evapotranspiration (growing and dormant seasonal and annual) and compare this to crop water requirements (CWR) used by water managers, a comprehensive producers’ survey (to obtain feedback on water use and irrigation practices) and machine learning and statistical analysis of the drivers of crop yield and orchard level evapotranspiration. The key knowledge generated was collated for possible use in a quick reference guide on pome and stone fruit water use.

Key Results

A detailed new pome and stone fruit distribution production map for the WC Province was created. This map was used to extract long-term climatic statistics on rainfall, reference evapotranspiration, solar radiation, Positive Chill Units and Heat Units. The statistics indicated the large range in climatic conditions within one production region. The statistics on orchard evapotranspiration (ET) as well as the data from local and international literature stressed the differences in the various pome and stone fruit crops and between different production regions. Comparing this data to CWR currently used in water management showed agreement between the ET estimates and the CWR for some quaternary catchments but also big differences in others, with CWR often less than ET. The feedback from the producers’ survey highlighted the extent and impact of the recent drought and water conservation measures on crop production. It summarised strategies farmers used in saving water during the extended drought, but also the extent and means of water management on pome and stone fruit farms. The machine learning and regression analysis highlighted the complexities of ET and yield modelling.

Conclusion and Discussion / Recommendation

This research highlighted the lack of available knowledge related to crop water use of pome and stone fruit. A fair amount is known about apple water use, but very little about plum and apricot water use. A new production map and long-term climatic statistics showed large in-region variation. The geographical extent of the regions suggest that the delineation of these

areas could be changed or made smaller, to reflect the regional differences or conditions better. The ET statistics generated highlighted important variations in crop water use between production regions and between fruit crops. This dataset could prove to be very valuable in aiding water resource planning and provide a starting point for CWR and irrigation water requirement estimation. However, since it is based on limited data (only two season), it is proposed that data from more seasons are extracted to improve and expand the dataset. The current dataset highlighted differences compared to the SAPWAT CWR for quaternary catchments currently used for water resource planning and water licencing. Feedback from producers to the survey showed the range in fruit production, water management and water availability. Also, the challenges producers face regarding water availability and the significance and impact of four years of water restrictions on fruit production. It listed measures producers put in place to save water and the impacts on fruit production. Annual surveys like this one, to obtain feedback from producers, may prove very valuable if repeated. The ET and yield machine learning and regression analysis showed the complexity in modelling it. The ET modelling results highlighted the importance of location (catchment, production region), crop type as well as crop health (N and NDVI). For yield modelling, the importance of the previous season on the current season yield was shown, as well as crop age and cultivar.