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GROWTH ANALYSES AND SOIL WATER BALANCE OF SELECTED VEGETABLE CROPS

by

NTUTHUZELO COLUMBUS MHLAULI

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SUPERVISOR	:	**Dr N. Z. Jovanovic**
CO-SUPERVISOR	:	**Dr J. G. Annandale**
DEPARTMENT	:	**Plant Production and Soil Science**
DEGREE	:	**M.Inst.Agrar. (Horticultural Science)**

ABSTRACT

Two trials were set up at Roodeplaat (Gauteng Province, South Africa) on a clay loam soil, during the 1996 and 1996/97 growing seasons. The 1996 dry winter trial involved six winter vegetable species (*Allium cepa, Brassica oleracea, Beta vulgaris, Daucus carota, Beta vulgaris spp. cicia,* and *Lactuca sativa*), whilst the 1996/97 summer trial involved 19 cultivars covering 9 crop species (*Lycopersicon esculentum, Zea mays saccharata, Cucurbita pepo, Cucurbita maxima, Cucurbita moschata, Phaseolus vulgaris, Phaseolus multiflorus, Solanum melongena,* and *Capsicum annuum*). The objective was to determine crop water requirements and create a database of specific crop growth coefficients to be included in the Soil Water Balance (SWB) generic crop, irrigation scheduling model. The crops were irrigated with overhead sprinklers and irrigations were scheduled with a neutron probe. Soil water depletion was measured weekly with a neutron water meter, whilst growth analyses were carried out fortnightly. Fractional interception of photosynthetically active radiation was measured weekly with a sunfleck ceptometer. Weather data were recorded with an automatic weather station located close to the experimental site. Seasonal crop water requirements of these vegetables grown in Gauteng were successfully estimated. Crop water use of winter vegetables varied from around 280 mm for lettuce to 390 mm for carrots and swisschard. Seasonal crop water use of summer vegetables was estimated to be around 200 mm for both peppers, and between 350 and 400 mm for cucurbits. The following crop specific coefficients were determined: dry matter-transpiration ratio corrected for vapour pressure deficit, radiation

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conversion efficiency, specific leaf area, and dry matter partitioning parameters. Simulated values obtained with the SWB model were compared to measured data. The model provided good predictions of crop water use and harvestable dry matter under well-watered conditions. The application of the SWB model for irrigation scheduling of vegetables is recommended.