ACRU (Agricultural Catchments Research Unit)

Description	The ACRU model has its origins in a catchment evapotranspiration based study carried out in Natal in the early 1970s. The agrohydrological component of ACRU first came to the fore during research on an agrohydrological and agroclimatological atlas for Natal. ACRU is a multipurpose model that integrates water budgeting and runoff components of the terrestrial hydrological system with risk analysis, and can be applied in crop yield modeling, design hydrology, reservoir yield simulation and irrigation water demand/supply, regional water resources assessment, planning optimum water resource allocation and utilization, climate change, land use and management impacts, and resolving conflicting demands on water resources. The ACRU model uses daily multilayer soil water budgeting and has been developed essentially into a versatile total evaporation model. It has therefore been structured to be highly sensitive to climate and to land cover/use changes on the soil water and runoff regimes, and its water budget is responsive to supplementary watering by irrigation, to changes in tillage practices, or to the onset and degree of plant stress.
Appropriate Use	ACRU can be used at the catchment or subcatchment level to study the impact of climate change and enhanced CO_2 conditions on crop yield and water balances.
Scope	ACRU can operate as site-specific or as a lumped small catchments model. However, for large catchments or in areas of complex land uses and soils, ACRU can operate as a distributed cell-type model.
Key Output	Crop yield and water balances (including irrigation needs, runoff, etc.) for different climate change scenarios.
Key Input	Weather data: maximum and minimum temperatures, rainfall. Catchment: location, area, configuration, altitude. Other data: land cover, soil properties (texture, depth).
Ease of Use	For trained hydrologists and agronomists.
Training Required	No formal training required, but advanced knowledge of plant and soil processes as well as hydrology is needed.
Training Available	Training and support is available from the School of Bioresources Engineering and Environmental Hydrology, University of Natal, Pietermaritzburg, South Africa.
Computer Requirements	Windows-based PC.
Documentation	Smithers, J. and R. Schulze. 1995. ACRU: Hydrological Modelling System. User Manual Version 3. Available at: http://www.beeh.unp.ac.za/acru.
Applications	ACRU has been used to assess the potential impact of elevated CO_2 and temperature levels and possible changes in precipitation and potential evaporation on crop and runoff production in southern Africa. The model has also been used to study shifts in maize production regions in southern Africa as a consequence of global climate change. A version of ACR linked to the CERES Maize model was used to simulate possible changes in maize production under different fertilizer scenarios over southern Africa.
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ACRU (Agricultural Catchments Research Unit) (cont.)

Cost	Not identified.
References	Schulze, R. 1989. ACRU: Background, Concepts and Theory. Report 35, Agricultural Catchments Research Unit, Department of Agricultural Engineering, University of Natal, Pietermaritzburg, South Africa. Schulze, R.E., G. Kiker, and R.P. Kunz. 1993. Global climate-change and agricultural productivity in Southern Africa. *Global Environmental Change* 3:330-349. Tarboton, K.C. and R.E. Schulze. 1991. The ACRU modeling system for large catchment water resources management. *Int. Assoc. Hydrol. Sci. Publ.* 201:219-232.