



Reference Manual

AquaCrop Version 3.0

January 2009

Developed by

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with special support by Gabriella IZZI and Lee K. HENG

with contributions of the AquaCrop Network

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Acknowledgments

Many experts from several organizations and institutions worldwide contributed at various degrees and at different stages to AquaCrop release. The authors would like to express their gratitude to the whole AquaCrop Network.

AquaCrop constitutes the first tangible result of the effort undertaken by FAO for the revision of the Irrigation & Drainage Paper 33, Yield Response to Water (Doorenbos and Kassam, 1979). For this review process, FAO organized consultations with recognized authorities and experts from major scientific and academic institutions, national and international research centers and governmental organizations worldwide. Authors would like to convey a special thank to:

- John G. Annandale (University of Pretoria, South-Africa)
- Christian Baron (Centre de coopération Internationale en Recherche Agronomique pour le Développement, France)
- Bruno Basso (University of Basilicata, Italy)
- Netij Ben Mechlia (Institut National Agronomique de Tunisie, Tunisia)
- Angelo Caliandro (University of Bari, Italy)
- G.S. Campbell (Washington State University, Washington, USA)
- Luigi Cavazza (University of Bologna, Italy)
- Jan Doorenbos (FAO-Retiree)
- René Gommès (FAO)
- Gerrit Hoogenboom (University of Georgia, Georgia, USA)
- Riza Kanber (University of Çukurova, Turkey)
- Amir Kassam (FAO-Retiree)
- Cosimo Lacirignola (Mediterranean Agronomic Institute of Bari, Italy)
- Delphine Luquet (Centre de coopération Internationale en Recherche Agronomique pour le Développement, France)
- Florent Maraux (Centre de coopération Internationale en Recherche Agronomique pour le Développement, France)
- Giovanni Munoz (FAO)
- Hiroshi Nakagawa (Research Institute for Humanity and Nature, Japan)
- Long Nguyen (International Atomic Energy Agency, Austria)
- Francois C. Olivier (University of Pretoria, South-Africa)
- John Passioura (Commonwealth Scientific and Industrial Research Organization, Australia)
- Antonia Patrono (University of Bologna, Italy)
- Daniel Renault (FAO)
- Victor Sadras (South Australian Research & Development Institute, Australia)
- Dogo Seck (Centre d'Etude Régional pour l'Amélioration de l'Adaptation à la Sécheresse, Senegal)
- Martin Smith (FAO-Retiree)
- Claudio Stöckle (Washington State University, Washington, USA)
- Lamourdia Thiombiano (FAO)
- To Phuc Tuong (International Rice Research Institute, Philippines)
- Hugh Turrall (International Water Management Institute, Sri Lanka)
- Tsugihiko Watanabe (Research Institute for Humanity and Nature, Japan)
- Tim Wheeler (University of Reading, UK)

- Gerardo Van Halsema (Wageningen University and Research Centre, The Netherlands)
- Kees van Diepen (Alterra, Wageningen University and Research Centre, The Netherlands)

Many people and institutions supported AquaCrop calibration and validation by providing and/or processing high-quality field data. Among others, the authors are particularly thankful to:

Cotton

- Marie-Therese Abi Saab (Mediterranean Agronomic Institute, Italy)
- Hamid J. Farahani (Clemson University, South Carolina)
- Margarita García-Vila (University of Cordoba, Spain)
- Riza Kanber (University of Çukurova, Turkey)
- Fadi Karam (Lebanese Agricultural Research Institute, Lebanon)
- Francisco Orgaz (IAS-CSIC, Cordoba, Spain)
- Theib Y. Oweis (International Center for Agricultural Research in the Dry Areas, Syria)
- Mustapha Ünlu (University of Çukurova, Turkey)
- Eline Vanuytrecht (Katholieke Universiteit Leuven, Belgium)

Maize

- Edmundo Acevedo (University of Chile, Chile)
- Steve R. Evett (US Department of Agriculture - Agricultural Research Service, Texas)
- Gerrit Hoogenboom (University of Georgia, Georgia)
- Terry A. Howell (US Department of Agriculture - Agricultural Research Service, Texas)
- Basilio Rojas-Lara (deceased)

Potato

- Staff of the Centro Internacional de la Papa (Peru), and in particular Roberto Quiroz (Head of the Natural Resources Management Division), Victor Mares, and Raymundo Gutierrez
- Margarita García-Vila (University of Cordoba, Spain)
- Christian R. Jensen (Royal Veterinary and Agricultural University, Denmark)
- David Wolfe (Cornell University, New York, USA)

Rice

- Staff of the International Rice Research Institute (Philippines), and in particular Bas Bouman (Head of the Crop and Environmental Sciences Division), Romeo Cabangon, Anita Boling, Syed Jabbar, Shaobing Peng, Rachid Serraj, and Joel Siopongco
- Eline Vanuytrecht (Katholieke Universiteit Leuven, Belgium)

Sugarbeet

- Philippe Clouet (Cristal Union, France)
- Pasquale Garofalo (Consiglio per la Ricerca e Sperimentazione in Agricoltura, Italy)
- Sam Geerts (Katholieke Universiteit Leuven, Belgium)
- Stefaan Horemans (SESVanderhave, Belgium)
- Michele Rinaldi (Consiglio per la Ricerca e Sperimentazione in Agricoltura, Italy)

- Nirman Shrestha (Katholieke Universiteit Leuven, Belgium)

Quinoa

- Magali Garcia Cardenas (Universidad Mayor de San Andres, Bolivia)
- Sam Geerts (Katholieke Universiteit Leuven, Belgium)

Soybean

- Arianna Facchi (Università di Milano, Italy)
- Gerrit Hoogenboom (University of Georgia, Georgia)
- Piara Singh (International Crops Research Institute for the Semi-Arid Tropics, Anhdra Pradesh, India)
- Suhas P. Wani (International Crops Research Institute for the Semi-Arid Tropics, Anhdra Pradesh, India)

Wheat

- Marie-Therese Abi Saab (Mediterranean Agronomic Institute, Italy)
- Rossella Albrizio (Consiglio Nazionale delle Ricerche, Italy)
- John Angus (Commonwealth Scientific and Industrial Research Organisation, Australia)
- Senthold Asseng (Commonwealth Scientific and Industrial Research Organisation, Australia)
- Simona Bassu (Università di Sassari, Italy)
- Francesco Giunta (Università di Sassari, Italy)
- Gerrit Hoogenboom (University of Georgia, Georgia)
- Ivan Ortiz-Monasterio (Centro Internacional de Mejoramiento de Maíz y Trigo, Mexico)
- Victor Sadras (Primary Industries and Resources South Australia - South Australian Research & Development Institute)

The authors would like to thank Nicoletta Forlano and James Morgan for their support in website and material preparation.

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II. Indicative values for lengths of crop development stages

List of principal symbols

Symbol	Description	Unit
B	dry (above ground) biomass	Mg ha ⁻¹
CC	Green Canopy Cover	m ² m ⁻²
CC*	Green Canopy Cover adjusted for micro advection	m ² m ⁻²
CC _o	Canopy Cover at 90% emergence	m ² m ⁻²
CC _x	Maximum green Canopy Cover	m ² m ⁻²
CDC	Canopy Decline Coefficient	d ⁻¹ or °C-d ⁻¹
CGC	Canopy Growth Coefficient	d ⁻¹ or °C-d ⁻¹
CN _{II}	Curve Number for antecedent moisture class II	-
CR	Capillary Rise	mm d ⁻¹
Dr	Root zone depletion	mm
DP	Deep percolation	mm d ⁻¹
E	Soil evaporation	mm d ⁻¹
E _x	Soil evaporation in Stage I (wet soil surface)	mm d ⁻¹
ET	Evapotranspiration (soil water evaporation and crop transpiration)	mm d ⁻¹
ET _o	Reference crop evapotranspiration (evaporating power of the atmosphere)	mm d ⁻¹
f	Adjustment factor	-
FC	Field Capacity	
GDD	Growing Degree Days	°C-d
HI	Harvest Index	%
HI _o	Reference Harvest Index	%
I	Irrigation	mm d ⁻¹
K _{sat}	Saturated hydraulic conductivity	mm d ⁻¹
K _{cb}	Crop transpiration coefficient	-
K _{cb_x}	Crop transpiration coefficient when complete canopy cover (CC = 1) but prior to senescence	-
K _e	Soil evaporation coefficient for fully wet soil surface	-
K _{e_x}	Soil evaporation coefficient for fully wet and non-shaded soil surface	-
K _r	Evaporation reduction coefficient	-
K _{S_{aer}}	Water stress coefficient for water logging (aeration stress)	-
K _{S_b}	Cold stress coefficient for biomass production	-
K _{S_{CC_x}}	Soil fertility stress coefficient for maximum Canopy Cover	-
K _{S_{exp,f}}	Soil fertility stress coefficient for canopy expansion	-
K _{S_{exp,w}}	Water stress coefficient for canopy expansion	-
K _{S_{pol,c}}	Cold stress coefficient for pollination	-
K _{S_{pol,h}}	Heat stress coefficient for pollination	-
K _{S_{pol,w}}	Water stress coefficient for pollination	-
K _{S_{sen}}	Water stress coefficient for canopy senescence	-
K _{S_{sto}}	Water stress coefficient for stomatal closure	-
K _{S_{WP}}	Soil fertility stress coefficient for Water Productivity	-
p _{exp, lower}	Fraction of TAW at which CGC becomes 0	-
p _{exp, upper}	Fraction of TAW at which CGC starts to be reduced	-

p_{pol}	Fraction of TAW at which pollination starts to fail	-
p_{sen}	Fraction of TAW at which early canopy senescence is triggered	-
p_{sto}	Fraction of TAW at which stomata start to close	-
P	Precipitation	mm.d ⁻¹
PWP	Permanent Wilting Point	
RAW	Readily Available soil Water in the root zone	mm
REW	Readily Evaporable Water	mm
RO	Surface runoff	mm.d ⁻¹
S	Root extraction term	m ³ .m ⁻³ .d ⁻¹
S_x	Maximum root extraction term	m ³ .m ⁻³ .d ⁻¹
t	Time	GDD or d
T	Air temperature	°C
T_{avg}	Average air temperature	°C
T_{base}	Base temperature (below which crop development does not progress)	°C
T_n	Daily minimum air temperature	°C
T_{upper}	Upper temperature (above which crop development no longer increases with an increase in air temperature)	°C
T_x	Daily maximum air temperature	°C
Tr	Crop transpiration	mm.d ⁻¹
Tr_x	Maximum crop transpiration (for a well watered crop)	mm.d ⁻¹
TAW	Total Available soil Water (between FC and PWP) in the root zone	mm
Wr	Soil water content of the root zone expressed as an equivalent depth	mm
WP	Crop water productivity	Mg ha ⁻¹ mm
WP*	Crop water productivity normalized for ET _o and air CO ₂ concentration	Mg ha ⁻¹
$Z_{e,surf}$	Evaporating soil surface layer	m
$Z_{e,top}$	Top soil layer from which water flows to the evaporating surface layer	m
Z	Effective rooting depth	m
Z_o	Rooting depth at planting (sowing depth or the rooting depth of the transplanted seedling)	m
Z_n	Minimum effective rooting depth	m
Z_x	Maximum effective rooting depth	m
Δz	Soil compartment (depth layer)	m
θ	Volumetric soil water content	m ³ .m ⁻³
$\theta_{air\ dry}$	Soil water content when air dry	m ³ .m ⁻³
θ_{FC}	Soil water content at FC	m ³ .m ⁻³
θ_{PWP}	Soil water content at PWP	m ³ .m ⁻³
θ_{sat}	Soil water content at soil saturation	m ³ .m ⁻³
τ	Drainage coefficient	-