DSSAT-SALUS Simple: short user’s guide April 15, 2013

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The SALUS (System Approach to Land Use Sustainability, Basso et al., 2006) crop model contains two modeling approaches: a complex approach based on the CERES models and a simple approach based on EPIC (Erosion Productivity Impact Calculator, Williams et al., 1989) and ALMANAC (Agricultural Land Management Alternatives with Numerical Assessment Criteria, Kiniry et al., 1992). The simple SALUS model (SALUS-Simple) was integrated in DSSAT to make a simple model available for DSSAT users. The model is generic and can be potentially parameterized for several crops and grasses from literature or available data. A detailed description of the model, an uncertainty and sensitivity analysis and results from model testing can be found in Dzotsi et al. (2013) and Dzotsi (2012).

Running SALUS-Simple in DSSAT

The SALUS-Simple model can be run from a traditional DSSAT file X which has to be manually edited to specify SALUS as the model to run. This can be done from the simulation control section as indicated below:

\*SIMULATION CONTROLS  
@N GENERAL NYERS NREPS START SDATE RSEED SNAME.................... SMODEL   
1 GE 1 1 S 89100 2150 FACE EXPERIMENTS SALUS045

The cultivars can be defined in the file SALUS045.CUL (a list of calibrated cultivars is available in this file). The first few lines and columns from this file look like this:

\*GENERIC SALUS MODEL PARAMETERS: SALUS045 MODEL  
@CROP# CROPNAME........ EXPNO ECO# EMGINT EMGSLP TTGERM HRVINDEX LAIMAX  
MZ0001 Maize Early Limited 34.715 5.100 18.500 0.470 5.328

The cultivar parameters are defined in Table 1. The cultivar can be defined in the cultivar section of file X with the crop always specified as “MZ” as follows:

\*CULTIVARS  
@C CR INGENO CNAME  
 1 MZ MZ0001 Maize Early Limited

Management inputs specifically used by SALUS-Simple are **plant density**, **row spacing** and **sowing depth**. The current version of SALUS-Simple simulates potential and water-limited production (no N or P limitation). To simulate a water-limited treatment, users can activate the appropriate switch under simulation control. Additional cultivar parameters used by SALUS-Simple to simulate water limitation are **RLWR**, **StresLAI** and **StresRUE** (Table 1). Irrigation can be configured in the same way as for other DSSAT models.

Output files

In addition to normal DSSAT output files, specific growth variables calculated by SALUS-Simple can be found in SALUS.OUT (header definitions in Table 2).

Table 1. List of SALUS-Simple crop model parameters and definitions

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter | Unit | Description |
| 1 | EmgInt | oC-day | Intercept of emergence thermal time calculation |
| 2 | EmgSlp | oC-day cm-1 | Slope of emergence thermal time calculation |
| 3 | HrvIndex | - | Crop harvest index |
| 4 | MaxLAI | m2 m-2 | Maximum expected Leaf Area Index |
| 5 | RelLAIP1 | - | Parameter for shape at point 1 on the potential LAI curve |
| 6 | RelLAIP2 | - | Parameter for shape at point 2 on the potential LAI curve |
| 7 | RelTTSn | - | Relative thermal time at beginning of senescence |
| 8 | RelTTSn2 | - | Relative thermal time beyond which the crop is no longer sensitive to water stress |
| 9 | RLWR | cm g-1 | Root length to weight ratio |
| 10 | RUEMax | g MJ-1 | Maximum expected Radiation Use Efficiency |
| 11 | SeedWt | g seed-1 | Seed weight |
| 12 | SnParLAI | - | Parameter for shape of potential LAI curve after beginning of senescence |
| 13 | SnParRUE | - | Parameter for shape of potential RUE curve after beginning of senescence |
| 14 | StresLAI | - | Factor by which LAI senescence due to water stress is increased between RelTTSn and RelTTSn2 |
| 15 | StresRUE | - | Factor by which RUE decline due to water stress is accelerated after the beginning of leaf senescence |
| 16 | TBaseDev | oC | Base temperature for development |
| 17 | TFreeze | oC | Threshold temperature below which crop development and growth stop |
| 18 | TOptDev | oC | Optimum temperature for development |
| 19 | TTGerminate | oC-day | Thermal time from planting to germination |
| 20 | TTMature | oC-day | Thermal time from planting to maturity |

Table 2. Definition of header in SALUS.OUT

|  |  |  |
| --- | --- | --- |
| Header | Definition | Unit |
| BIOMASS | Aboveground dry matter | kg ha-1 |
| CUMDTT | Cumulative thermal time | oC-day |
| DAP | Day after planting | - |
| dBIOM | Rate of aboveground dry matter growth | g m-2 d-1 |
| dLAI | Rate of LAI growth | m2 m-2 d-1 |
| DTT | Daily thermal time | oC-day |
| RELTT | Relative thermal time | - |
| ROOT | Root dry matter | kg ha-1 |
| RUE | Radiation use efficiency | g MJ-1 |
| WATFAC | Water stress factor (1 indicated no stress, 0 is maximum stress) | - |
| XHLAI | Leaf area index (LAI) | m2 m-2 |
| YRDOY | Year-day of year | - |

References

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