Preliminary results on modeling current corn yields in Ethiopia

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Weather Station Network
(1980-2010)

- Weather station
- Province boundary
Weather Station’s Area of Influence
(Thiessen Polygons)

- Weather station
- Thiessen boundary
The Soil Atlas of Africa (Jones et al., 2013):

Soils maps derived from several projects covering African continent, such as the Harmonized World Soil Database, the Soil Geographical Database of Eurasia, and the FAO-UNESCO soil map of the World.
Source of soil data:

The reanalyzed soil database of the ISRIC-WISE 1.1 (Romero et al., 2012)

- Source of soil profile data from FAO, ISRIC, and USDA-NRCS; data from this source also found in the African Soil Information Service.

- 1272 soil profile description available for Africa;

- Advantage: soil profile data already in format to be used by DSSAT;

- Data includes detailed information for each soil layer required by the model:

  - Soil depth
  - Soil color and soil albedo (only for topsoil)
  - Clay and silt fraction
  - Hydraulic coefficients –wilting point, field capacity, saturation- estimated!
  - Bulk density
  - Soil organic C
  - Total N concentration
  - pH and CEC
### Source of soil data:

- And additional information related to crop growth and development, such as soil fertility factor, mineralization factor, and root growth factor.

- **Example** of a soil profile description in specific format for DSSAT:

```plaintext
*WI_CMTZ062 WISE  LS  175 WISE DATABASE, SOIL TZ062

@SITE  COUNTRY  LAT  LONG  SCS Family
-99  Tanzania  -4.217  33.183  Chromic Cambisol (CMx)

@SCOM  SALB  SLU1  SLDR  SLRO  SLNF  SLPF  SMHB  SMPX  SMKE
BN  0.13  7.70  0.60  76.00  1.00  1.00  SA001  SA001  SA001

@SLB  SLMH  SLLL  SDUL  SSAT  SRGF  SSKS  SBDM  SLOC  SLCL  SLSI  SLCF  SLNI  SLHW  SLHB  SCEC  SADC
20  Ap  0.031  0.127  0.399  0.82  17.64  1.50  0.61  7.00  11.00  -99.0  0.07  5.80  -99.0  3.20  -99.0
40  Bw1  0.026  0.099  0.359  0.55  26.43  1.62  0.22  12.00  5.00  -99.0  0.04  5.50  -99.0  3.20  -99.0
80  Bw2  0.215  0.299  0.358  0.30  0.26  1.62  0.19  19.00  8.00  -99.0  0.03  5.50  -99.0  4.50  -99.0
175  BC  0.210  0.296  0.370  0.08  0.37  1.59  0.10  17.00  18.00  -99.0  0.02  5.80  -99.0  4.70  -99.0
```
Soil map

Province boundary
Overlaying Weather Station’s Area of Influence and Soil Map
(Climate-Soil Units)

- Thiessen boundary
- Soil unit boundary
Genetic Coefficients

*MAIZE CULTIVAR COEFFICIENTS: MZCER045 MODEL

! COEFF DEFINITIONS
! ========= =========
! VAR# Identification code or number for a specific cultivar
! VAR-NAME Name of cultivar
! EXPNO Number of experiments used to estimate cultivar parameters
! ECO# Ecotype code of this cultivar, points to the Ecotype in the
! ECO file (currently not used).
! P1 Thermal time from seedling emergence to the end of the juvenile
! phase (expressed in degree days above a base temperature of 80°C)
! during which the plant is not responsive to changes in
! photoperiod.
! P2 Extent to which development (expressed as days) is delayed for
! each hour increase in photoperiod above the longest photoperiod
! at which development proceeds at a maximum rate (which is
! considered to be 12.5 hours).
! P5 Thermal time from silking to physiological maturity (expressed
! in degree days above a base temperature of 80°C).
! G2 Maximum possible number of kernels per plant.
! G3 Kernel filling rate during the linear grain filling stage and
! under optimum conditions (mg/day).
! PHINT Phylochron interval; the interval in thermal time (degree days)
! between successive leaf tip appearances.

@VAR# VRNAME......... EXPNO ECO# P1 P2 P5 G2 G3 PHINT
1 2 3 4 5 6

| Added by Guillermo Baigorria from Kassie et al. 2014 for Ethiopia |

ET0001 BH-540
  . IB0001 220.1 0.860 840.1 266.2 10.65 38.90
ET0002 Melkasa-1
  . IB0001 101.5 0.750 685.0 375.0 11.65 40.00
Decision Support Systems for Agrotechnology Transfer (DSSAT v. 4.5)
Simulated Corn Yield
(average 1980-2010)

Cultivar: BH-540
Ethiopia’s Corn Production Region

Production unit boundary
Simulated Corn Yield in Ethiopia’s Corn Production Region (average 1980-2010)

Cultivar: BH-540

Corn Yield (dry matter) (tn/ha)

- nd
- 0 - 1.5
- 1.5 - 3.0
- 3.0 - 4.5
- 4.5 - 6.0
- 6.0 - 7.5
- 7.5 - 9.5
Soil map

Country boundary
Weather Station Network

<table>
<thead>
<tr>
<th>Country</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>12</td>
</tr>
<tr>
<td>Sudan</td>
<td>4</td>
</tr>
<tr>
<td>Eritrea</td>
<td>2 (+1 only max &amp; min temp)</td>
</tr>
<tr>
<td>Tanzania</td>
<td>0 (6 only rainfall)</td>
</tr>
</tbody>
</table>

Shared data is and will be treated as highly confidential and it won’t be shared if you, your institute or your government requires it.
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