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Corn Suitability Rating 2 Equation Updated

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Abstract
The equation for calculating Iowa's Corn Suitability Ratings (CSR) was recently updated and designated Corn Suitability Rating 2 (CSR2). The updated equation provides every user an opportunity to calculate the rating for each soil map unit identified in Iowa. Corn Suitability Rating 2 remains an index to the inherent soil productivity of each kind of soil for row crop production. The index is scaled from 100, for the most productive soils, to 5 as the least productive.

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Corn Suitability Rating 2 Equation Updated

By Gerald Miller, Professor Emeritus, and Lee Burras, Professor, Department of Agronomy

The equation for calculating Iowa's Corn Suitability Ratings (CSR) was recently updated and designated Corn Suitability Rating 2 (CSR2). The updated equation provides every user an opportunity to calculate the rating for each soil map unit identified in Iowa.

Corn Suitability Rating 2 remains an index to the inherent soil productivity of each kind of soil for row crop production. The index is scaled from 100, for the most productive soils, to 5 as the least productive.

The CSR2 equation and description of the six components used to calculate the productivity of each soil map unit is posted on the Soil and Land Use website at /soils/suitabilities-interpretations;

The equation is:

CSR2 formula: CSR2 = S-M-W-F-D ± EJ

Where:

S - is the taxonomic subgroup class of the series of the soil map unit (MU),
M - is the family particle size class,
W - relates to available water holding capacity (AWC) of the series,
F - is the field condition of a particular MU, for example, slope, flooding, ponding, erosion class and topsoil thickness,
D - is the soil depth and tolerable rate of soil erosion,
EJ - is an expert judgment correction factor. EJ is normally used with parent materials that have very high bulk density and/or are unusually clayey or sandy. Soil series with an EJ correction are described in the posted description.

Examples of calculating the CSR2 for Tama silty clay loam, two to five percent slope gradient with slight erosion (soil map symbol 120B) and Sparta loamy fine sand, nine to 14 slope gradient, moderately eroded (soil map symbol 41D2) are shown in the following illustration (Refer to description posted on the Soil and Land Use website to determine the value for each component)

Tama silty clay loam.
S - Typic Argiudolls = 100. Taxonomic subgroup can be founded by entering soil series name (Tama) at https://soilseries.sc.egov.usda.gov/osdnamequery.asp
M - Fine silty = 0. Family particle size class can be founded by entering soil series name at https://soilseries.sc.egov.usda.gov/osdnamequery.asp
W - AWC>= 9.00 = 0
F - slope < 5% = 5;
- erosion class = 0;
- not subject to flooding or ponding = 0
D - T factor 5 = 0

EJ - Not listed = 0

Therefore, CSR2 = 100-0-0-5-0-0-0-0 = 95

Sparta loamy fine sand
S Entic Hapludolls = 90. Taxonomic subgroup can be founded by entering soil series name (Sparta) at https://soilseries.sc.egov.usda.gov/osdnamequery.asp
M Sandy = 35. Family particle size class can be founded by entering soil series name at https://soilseries.sc.egov.usda.gov/osdnamequery.asp
W AWC<6 = 12
F - slope >= 9 = 27;
- erosion class = 3;
- not subject to flooding or ponding = 0
D T factor 5 = 0
EJ Not listed = 0

Therefore, CSR2 = 90-35-12-27-3-0-0-0 = 13

Several assumptions are used in CSR2. These include:

- Natural rainfall (no irrigation)
- artificial drainage has been installed where required so that each soil can reach its agronomic potential
- no land-leveling or terracing
- adequate level of management (not high level, therefore, CSR2 and yields on sloping lands do not have a linear relationship)

The CSR2 equation does not include a rainfall correction factor which was used in the original CSR equation. The original CSR was based on normal rainfall for the period 1931-1960. This 30-year period documents a significant decrease of rainfall west, southwest, and northwest of central Iowa compared to other areas of the state. More recent normal rainfall data for the period 1981-2010 documents rainfall has increased from the earlier 30 year normal by approximately 5 to 7 inches in north central, northwest and western Iowa. Thus, in CSR2 normal precipitation is included as part of the taxonomic classification at the suborder level. For example, soils in all soil association areas other than upland soils in the Moody-Trent association located in far northwest Iowa classify as udic (implies moist) soil moisture regimes. The upland soils in the Moody-Trent soil association classify as ustic (implies dryness). Hence, users will find a major increase between the original CSR and CSR2 in several soil association areas. For example, in addition to the Moody-Trent association increases in CSR2 compared to CSR will be common for soils located north and west of Webster county in the Clarion-Nicollet-Webster association, as well as nearly all soils in the Galva-Primghar-Marcus, Ida-Monona, Ida-Hamburg, Marshall-Monona, and Marshall association areas. A soil located in O'Brien county, for example, previously was assigned a CSR of 80 may now have a CSR2 of 100.

Field soil mapping and updates of soil surveys on a county-by-county basis are no longer being conducted by the USDA Natural Resources Conservation Service and the Iowa Cooperative Soil Survey. County based soil surveys ended with the release of Wayne and Worth counties in 2012. All current soil surveys are now posted on Web Soil Survey http://websoilsurvey.nrcs.usda.gov/app/ Beginning in 2012 soil survey updates are made at the multiple county Major Land Resource Area (MLRA) scale and posted on the USDA-NRCS site. It is anticipated that USDA-NRCS will update the site annually along with a listing of CSR2. Since these updates are made across county and state lines, where applicable, and within the total MLRA some CSR2 listed in Web Soil Survey may differ from those calculated using the equation listed on the Iowa Soil and Land Use website. This is because the latter CSR2 are based solely on the equation, whereas those in Web Soil Survey may be adjusted for inclusions and minor soils determined to be present within a representative soil map unit. Adjustments to the calculated CSR2 are made based on select sampling of soil profiles along transects across landscape components, statistically randomized field observations and laboratory analysis of archived soil profile

samples. In most situations the differences in CSR2 are minimal although is a few cases the differences are significant.

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