EnSALUS Model Data Dictionary

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Contents

1 Crop File (CDB)

1.1 CO2_XY

CDB | CO2_XY

1.1.1 PhotoSynType

CDB | CO2_XY | PhotoSynType

- **Variable:** PhotSynID – Photosynthesis Type (None) – Required
  - **Choices:**
    * **C3:** Calvin or C3 Cycle
    * **C4:** Hatch-Slack or C4 Cycle

Point *CDB | CO2_XY | PhotoSynType | Point*

- **Variable:** CO2 – Atmospheric Carbon Dioxide (ppm) – Required
- **Variable:** Multiplier – Effect on C Accumulation (fraction) – Required
  - Amount to muliply daily accumulation of Carbon in a plant in response to CO2 level

1.2 Complex_Species

CDB | Complex_Species

1.2.1 Species

CDB | Complex_Species | Species

- **Variable:** CHeight – Approx. Height of Crop (m) – Optional
  - Approximate crop height (used for calculating transpiration for CO2 effects) [m]
- **Variable:** EmgInt – Intercept of emerg. time calc. (leaf equivalent) – Optional
  - Intercept of function to calculate the development time from germination to emergence.
- **Variable:** EmgSlp – Slope of emergence time calc. (leaf equivalent cm^-1) – Optional
  - Slope of function to calculate the development time from germination to emergence.
- **Variable:** glfmat – Green leaf frac. at maturity (leaf leaf^-1) – Optional
  - Ratio of green leaves at maturity to green leaves at the end of phase 2 (end of vegetative stage), used to calculate how many leaves to sensesce till maturity.
- **Variable:** Kf – Const. for row spacing coef. (N/A) – Optional
  - Constant used in the calculation of the row spacing coefficient required for the light interception calculation.
- **Variable:** LEear – Leaf eq for ear growth (leaf equivalent) – Optional

  - Development time for ear growth, generally 224 degree days before silking to 100 degree days after silking. Must be greater than phase3 variable.

- **Variable:** LEsec – L. E. at senescence (leaf equivalent) – Optional
  - Development time when the first leaf starts senescing.
- **Variable:** LEtg – L. E. to germinate (leaf equivalent) – Optional
  - Development time required for germination.
- **Variable:** lncsf – Factor to reduce dev. at sen. (unitless) – Optional
  - Factor to reduce the daily rate of plant development during leaf senescence.
- **Variable:** Nfixing – Does species fix nitrogen? (N/A) – Optional
  - Nitrogen fixing switch.
  - **Choices:**
    * **N:** Does not fix nitrogen
    * **Y:** Fixes nitrogen
- **Variable:** PARtE – IPAR threshold for 1st ear (MJ plant^-1) – Optional
  - Cum. IPAR threshold to produce the first ear per plant.
- **Variable:** PARtK – IPAR threshold for 1st kernel (MJ plant^-1) – Optional
  - Cum. IPAR threshold to produce the first kernel in the first ear.
- **Variable:** Phase3 – L. E. for phase 3 (leaf equivalent) – Optional
  - Development time during phase 3, end of vegetative growth (last leaf expanded) to end of ear growth (begin of grain fill).
- **Variable:** PhotoC – Photoperiod coefficient (N/A) – Optional
  - Coefficient in the equation used to compute phyllochron interval from photoperiod for winter cereals.
- **Variable:** PhotoSynID – Photosynthesis Type (None) – Required
  - **Choices:**
    * **C3:** Calvin or C3 Cycle
    * **C4:** Hatch-Slack or C4 Cycle
- **Variable:** RUE – Radiation use efficiency (g MJ^-1) – Optional
- **Variable:** SLWmax – Max. specific leaf weight (g cm^-2) – Optional
  - Maximum specific leaf weight, modified by the specific leaf weight fraction from the species phases table.
- **Variable:** Species_Name – Full species name (N/A) – Required
- **Variable:** SpeciesID – Species Identifier (N/A) – Required
  - Formerly limited to 2 Characters
  - **Choices:**
    * **AL:** Alfalfa
    * **AR:** Aroid
    * **BA:** Barley
    * **BN:** Dry bean
    * **BW:** Broad leaf weed
    * **CO:** Cotton

    * **CS:** Cassava
    * **FA:** Fallow
    * **GW:** Grass weed
    * **ML:** Pearl millet
    * **MZ:** Maize
    * **NC:** Not a Crop
    * **PN:** Peanut
    * **PT:** Potato
    * **RI:** Rice
    * **SB:** Soybean
    * **SC:** Sugar cane
    * **SG:** Grain sorghum
    * **SQ:** Crop sequence
    * **ST:** Shrubs/Tree
    * **WH:** Wheat

- **Variable:** TbaseD – Base temp. for development (degree C) – Optional
  - Base temperature for development.
- **Variable:** ToptD – Opt. temp. for development (degree C) – Optional
  - Optimum temperature for development.
- **Variable:** ToptP – Opt. temp. for photosynthesis (degree C) – Optional
  - Optimum temperature for potosynthesis.

Cultivars *CDB | Complex_Species | Species | Cultivars*

Cultivar *CDB | Complex_Species | Species | Cultivars | Cultivar*

- **Variable:** BrnCo – Barrenness coefficient (N/A) – Required
  - Genetic coefficient for tolerating high plant population.
- **Variable:** CultivarID – Cultivar code (N/A) – Required
- **Variable:** DelpH – Delay per h of phot. inc./dec. (d h^-1) – Required
  - Delay in development after juvenile stage per hour of photoperiod increase/decrease (equal to P2 and P1D in CERES). Always positive.
- **Variable:** EaNPt – Potential ear # per plant (ears plant^-1) – Required
  - Potential ear (spike) number per plant for plants that normally tiller.
- **Variable:** EaSEf – Ear setting efficiency (ears MJ^-1) – Required
  - The slope of the function of number of ears (spikes) per plant vs. cumulative intercepted radiation per plant.
- **Variable:** KrNPt – Potential kernel # per ear (kernels ear^-1) – Required
  - Potential kernel number per ear (equal to G2 in CERES-Maize).
- **Variable:** krPGR – Daily rate of kernel fill (g kernel^-1 d^-1) – Required
  - Daily rate of kernel fill at optimum temperature (equal to G3 * 10-3 in CERES-Maize).

- **Variable:** KrSEf – Kernel setting efficiency (kernels ear^-1 MJ^-1) – Required
  - The slope of the function of number of kernels per ear vs. cumulative intercepted radiation per plant.
- **Variable:** LEgg – L. E. for grain growth (leaf equivalent) – Optional
  - Development time required for grain fill, from end of ear growth to physiological maturity (equal to (P5 - 100) / PHINT in CERES).
- **Variable:** LEJuv – L. E. to end juvenile (leaf equivalent) – Optional
  - Development time from emergence to the end the juvenile period during which the plant is not photoperiod sensitive (equal to P1 / PHINT in CERES-Maize).
- **Variable:** LT50c – Coef. for cold tolerance (degree C) – Optional
  - Genetic coefficient for cultivar low temperature tolerance (prob. the temperature at which 50% of plants are killed).
- **Variable:** MnNMlt – Multiplier for min. N conc. (unitless) – Optional
  - Multiplier for the minimum permissible N concentration in plant with respect to the optimum.
- **Variable:** MnPMlt – Multiplier for min. P conc. (unitless) – Optional
  - Multiplier for the minimum permissible P concentration in plant with respect to the optimum.
- **Variable:** MxNKr – Max. N conc. in grain (g g^-1) – Optional
  - Maximum concentration of N in the grain.
- **Variable:** MxNVg – Max N conc. in vegetative part (g g^-1) – Optional
  - Maximum concentration of N in the vegetative parts of the plant.
- **Variable:** MxPKr – Max. P conc. in grain (g g^-1) – Optional
  - Maximum concentration of P in the grain.
- **Variable:** MxPVg – Max P conc. in vegetative part (g g^-1) – Optional
  - Maximum concentration of P in the vegetative parts of the plant.
- **Variable:** Name – Cultivar name (N/A) – Optional
- **Variable:** PhHig – Photoperiod high limit (h) – Optional
  - Upper limit of photoperiod sensitivity range with respect to the rate of induction.
- **Variable:** PhLow – Photoperiod low limit (h) – Optional
  - Lower limit of photoperiod sensitivity range with respect to the rate of induction.
- **Variable:** Phy14 – Phyllochron at 14h day (degree day leaf^-1) – Optional
  - Phyllochron interval at 14 h daylength. Used to compute phyllochron interval from photoperiod for winter cereals.
- **Variable:** phyll – Phyllochron interval (degree day leaf^-1) – Optional
  - Thermal time (in degree days) between successive leaf tip appearances.
- **Variable:** Prolf – Is cultivar prolific? (N/A) – Optional
  - Prolificacy coefficient for plants like maize that normally grow one ear but some times more, provided that they intercept enough IPAR.
  - **Choices:**
    - **N:** No
    - **Y:** Yes
- **Variable:** Vcoef – Vernalization coef. for cereal (d [?]) – Optional
  - Vernalization coefficient for winter cereals (prob. number of cold days required to complete vernalization).

Phases *CDB | Complex_Species | Species | Phases*

Phase *CDB | Complex_Species | Species | Phases | Phase*

- **Variable:** GRF – Grain partitioning coefficient (g g^-1) – Optional
- **Variable:** Label – Leaf eq. # or phase fraction (N/A) – Optional
  - Leaf equivalent number or fraction of phase that has passed.
  - **Choices:**
    * **EG0.0:** Beginning of ear growth phase
    * **EG0.25:** One quarter of ear growth phase
    * **EG1.0:** End of ear growth phase
    * **FL-00:** Final leaf equivalent
    * **FL-01:** Final leaf equivalent minus 1
    * **FL-02:** Final leaf equivalent minus 2
    * **FL-03:** Final leaf equivalent minus 3
    * **FL-04:** Final leaf equivalent minus 4
    * **FL-05:** Final leaf equivalent minus 5
    * **GG0.0:** Beginning of grain growth phase
    * **GG0.5:** One half of grain growth phase
    * **GG1.0:** End of grain growth phase
    * **L01:** Leaf equivalent 1
    * **L02:** Leaf equivalent 2
    * **L03:** Leaf equivalent 3
    * **L04:** Leaf equivalent 4
    * **L05:** Leaf equivalent 5
    * **L06:** Leaf equivalent 6
    * **L07:** Leaf equivalent 7
    * **L08:** Leaf equivalent 8
    * **L09:** Leaf equivalent 9
    * **L10:** Leaf equivalent 10
    * **L11:** Leaf equivalent 11
    * **L12:** Leaf equivalent 12
    * **L13:** Leaf equivalent 13
    * **L14:** Leaf equivalent 14
    * **L15:** Leaf equivalent 15
    * **L16:** Leaf equivalent 16
    * **L17:** Leaf equivalent 17
    * **L18:** Leaf equivalent 18
    * **L19:** Leaf equivalent 19
    * **L20:** Leaf equivalent 20
    * **L21:** Leaf equivalent 21
    * **L22:** Leaf equivalent 22
    * **L23:** Leaf equivalent 23
    * **L24:** Leaf equivalent 24
    * **L25:** Leaf equivalent 25
    * **L26:** Leaf equivalent 26
    * **L27:** Leaf equivalent 27
    * **L28:** Leaf equivalent 28
    * **L29:** Leaf equivalent 29

        * **L30:** Leaf equivalent 30
        * **L31:** Leaf equivalent 31
        * **L32:** Leaf equivalent 32
        * **L33:** Leaf equivalent 33
        * **L34:** Leaf equivalent 34
- **Variable:** LeafF – Leaf partitioning coefficient (g g^-1) – Optional
- **Variable:** MxTiS – Rel. max. size of tillers (g g^-1) – Optional
    - Max. potential size of tillers relative to main stem.
- **Variable:** PhylF – Phyllochron fraction (unitless) – Optional
    - Phyllochron fraction for first few leaves.
- **Variable:** ResF – Reserve fraction of stem mass (g g^-1) – Optional
- **Variable:** RlNKr – Rel. N concentration in grain (g g^-1) – Optional
    - Relative N concentration in grain.
- **Variable:** RlNVg – Rel. N concentration in veg. (g g^-1) – Optional
    - Relative N concentration in vegetative parts.
- **Variable:** RlPKr – Rel. P concentration in grain (g g^-1) – Optional
    - Relative P concentration in grain.
- **Variable:** RlPVg – Rel. P concentration in veg. (g g^-1) – Optional
    - Relative P concentration in vegetative parts.
- **Variable:** RTF – Root fraction of tops sink (g g^-1) – Optional
- **Variable:** Slwf – Specific leaf weight fraction (unitless) – Optional
- **Variable:** StemF – Stem partitioning coefficient (g g^-1) – Optional
- **Variable:** TopSk – Potential tops sink (g plant^-1 leaf equiv.^-1) – Optional
- **Variable:** Tswch – Temperature selection switch (N/A) – Optional
    - Development temperature selection switch.
    - **Choices:**
        * **A:** Use air temperature
        * **C:** Use crown temperature

TempFactors *CDB | Complex_Species | Species | TempFactors*

Factor *CDB | Complex_Species | Species | TempFactors | Factor*

- **Variable:** TRF – Temp. red. factor label (N/A) – Optional
    - Temperature reduction factor label.
    - **Choices:**
        * **Grain Growth:** None
        * **Leaf Expansion:** None
        * **Root Depth Growth:** None
- **Variable:** X – X coordinate of polygon vertex (C) – Optional
- **Variable:** Y – Y coordinate of polygon vertex (unitless) – Optional

1.3 Simple_Crop

CDB | Simple_Crop

1.3.1 Species

CDB | Simple_Crop | Species

- **Variable:** AgeBegStableYr – First stable/peak year of Perennial Crop (unitless) – Optional
  - For perennial, aging curve parmeter for the first stable/peak year.
- **Variable:** AgeEndStableYr – Last stable/peak year of Perennial Crop (unitless) – Optional
  - For perennial, aging curve parmeter for the last stable/peak year.
- **Variable:** AgeKDecline – Decline Rate Perennial Crop (unitless) – Optional
  - For perennial, aging curve parmeter for decreasing the growth after AgeEndStableYr years of the crop
- **Variable:** AgeLamEst – Establishment Rate Perennial Crop (unitless) – Optional
  - For perennial, aging curve parmeter for increasing the growth for the first AgeBegStableYr years of the crop
- **Variable:** CHeight – Approx. Height of Crop (m) – Required
  - Approximate crop height (used for calculating transpiration for CO_2 effects) [m]
- **Variable:** EmgInter – Intercept of emerg. time calc. (leaf equivalent) – Required
  - Intercept of function to calculate the development time from germination to emergence.
- **Variable:** EmgSlope – Slope of emergence time calc. (leaf equivalent cm^-1) – Required
  - Slope of function to calculate the development time from germination to emergence.
- **Variable:** GrnN_Mt – Opt. N in grain at maturity (g g^-1) – Optional
  - Optimum grain nutrient concentration at maturity.
- **Variable:** GrnP_Mt – Opt. P in grain at maturity (g g^-1) – Optional
  - Optimum grain nutrient concentration at maturity.
- **Variable:** HrvIndex – Harvest index (Mg Mg^-1) – Required
  - Fraction of crop that is grain
- **Variable:** LAImax – Max. potential leaf area index (m^2 m^-2) – Required
- **Variable:** LinRPart – Make root/shoot C partitioning linear (N/A) – Optional
  - From APEX; Zilverberg et al., 2017
  - **Choices:**
    - **Y:** Use linear root/shoot C partitioning
    - **N:** Use traditional root/shoot C partitioning
- **Variable:** Nfixing – Does species fix nitrogen? (N/A) – Required
  - Nitrogen fixing switch.
  - **Choices:**

    * **N:** Does not fix nitrogen
    * **Y:** Fixes nitrogen

- **Variable:** Perennial – Is species perennial? (N/A) – Required
  - Does this plant grow over multiple species?
  - **Choices:**
    * **N:** Plant is Annual
    * **Y:** Plant is Perennial
- **Variable:** PhotoSynID – Photosynthesis Type (None) – Required
  - **Choices:**
    * **C3:** Calvin or C3 Cycle
    * **C4:** Hatch-Slack or C4 Cycle
- **Variable:** PlntN_Em – Opt. N in plant at emergence (g g^-1) – Optional
  - Optimum whole plant nutrient concentration at emergence.
- **Variable:** PlntN_Hf – Opt. N in plant halfway to mt. (g g^-1) – Optional
  - Optimum whole plant nutrient concentration halfway through maturity.
- **Variable:** PlntN_Mt – Opt. N in plant at maturity (g g^-1) – Optional
  - Optimum whole plant nutrient concentration at maturity.
- **Variable:** PlntP_Em – Opt. P in plant at emergence (g g^-1) – Optional
  - Optimum whole plant nutrient concentration at emergence.
- **Variable:** PlntP_Hf – Opt. P in plant halfway to mt. (g g^-1) – Optional
  - Optimum whole plant nutrient concentration halfway through maturity.
- **Variable:** PlntP_Mt – Opt. P in plant at maturity (g g^-1) – Optional
  - Optimum whole plant nutrient concentration at maturity.
- **Variable:** relLAI_P1 – Relative LAI at point 1 (m^2 m^-2) – Required
  - Relative leaf area index at first point in the growing season.
- **Variable:** relLAI_P2 – Relative LAI at point 2 (m^2 m^-2) – Required
  - Relative leaf area index at second point in the growing season.
- **Variable:** relTT_P1 – Relative devel. time at pt. 1 ((deg. day) (deg. day)^-1) – Required
  - Relative development time at first point in the growing season.
- **Variable:** relTT_P2 – Relative devel. time at pt. 2 ((deg. day) (deg. day)^-1) – Required
  - Relative development time at second point in the growing season.
- **Variable:** relTT_Sn – Rel dev. time at start of sen. ((deg. day) (deg. day)^-1) – Required
  - Fraction of growing season when leaf area starts declining.
- **Variable:** RootPartFac – Root Partition Factor (unitless) – Optional
  - A simple multipler to change the amount of daily biomass that goes to the roots (the higer the number the more biomass goes to roots). Added for Rafael Martinez-Feria 2019-05-30.

- **Variable:** RootSenFac – Root Senescence Factor (unitless) – Optional
  - A simple multipler to change the amount of daily root biomass that senesce (the higer the number the more biomass that leaves from roots). Added for Rafael Martinez-Feria 2019-07-22.
- **Variable:** RUEmax – Max. potential rad. use eff. (g MJ^-1) – Required
  - Maximum potential radiation use efficiency.
- **Variable:** RWPC1 – Parameter in linear partitioning of biomass (N/A) – Optional
  - pcRoot = (1 - rel_TT) * RWPC1 + rel_TT * RWPC2
- **Variable:** RWPC2 – Parameter in linear partitioning of biomass (N/A) – Optional
  - pcRoot = (1 - rel_TT) * RWPC1 + rel_TT * RWPC2
- **Variable:** SnParLAI – Par. for LAI decl. after sen. (N/A) – Required
  - Leaf area index decline rate parameter after senescence starts.
- **Variable:** SnParRUE – Par. for RUE decl. after sen. (N/A) – Required
  - Radiation use efficiency decline rate parameter after senescence starts.
- **Variable:** Source – Source of parameter info. (N/A) – Optional
  - Bibliographic information or other reference for the value of the parameter.
- **Variable:** Species_Name – Full species name (N/A) – Required
- **Variable:** SpeciesID – Species Identifier (N/A) – Required
  - Formerly limited to two digits.
- **Variable:** TbaseDev – Base temp. for development (degree C) – Required
  - Minimum temperature for plant development.
- **Variable:** ToptDev – Opt. temp. for development (degree C) – Required
  - Optimum temperature for plant development.
- **Variable:** TTtoGerm – Development time to germinate (degree day) – Required
- **Variable:** TTtoMatr – Development time to mature (degree day) – Required

Subspecies *CDB | Simple_Crop | Species | Subspecies*

- **Variable:** AgeBegStableYr – Override first stable/peak year of Perennial Crop (unitless) – Optional
  - For perennial, aging curve parmeter for the first stable/peak year.
- **Variable:** AgeEndStableYr – Override last stable/peak year of Perennial Crop (unitless) – Optional
  - For perennial, aging curve parmeter for the last stable/peak year.
- **Variable:** AgeKDecline – Override decline Rate Perennial Crop (unitless) – Optional
  - For perennial, aging curve parmeter for decreasing the growth after AgeEndStableYr years of the crop
- **Variable:** AgeLamEst – Override establishment Rate Perennial Crop (unitless) – Optional
  - For perennial, aging curve parmeter for increasing the growth for the first AgeBegStableYr years of the crop

- **Variable:** CHeight – Override approx. height of crop (m) – Optional
  - Approximate crop height (used for calculating transpiration for CO_2 effects) [m]
- **Variable:** EmgInter – Override intercept of emerg. time calc. (leaf equivalent) – Optional
  - Intercept of function to calculate the development time from germination to emergence.
- **Variable:** EmgSlope – Override slope of emergence time calc. (leaf equivalent cm^-1) – Optional
  - Slope of function to calculate the development time from germination to emergence.
- **Variable:** GrnN_Mt – Override opt. N in grain at maturity (g g^-1) – Optional
  - Optimum grain nutrient concentration at maturity.
- **Variable:** GrnP_Mt – Override opt. P in grain at maturity (g g^-1) – Optional
  - Optimum grain nutrient concentration at maturity.
- **Variable:** HrvIndex – Override Harvest index (Mg Mg^-1) – Optional
  - Fraction of crop that is grain
- **Variable:** LAImax – Override max. potential leaf area index (m^2 m^-2) – Optional
- **Variable:** LinRPart – Override make root/shoot C partitioning linear (N/A) – Optional
  - From APEX; Zilverberg et al., 2017
  - **Choices:**
    - **Y:** Use linear root/shoot C partitioning
    - **N:** Use traditional root/shoot C partitioning
- **Variable:** Nfixing – Override does species fix nitrogen? (N/A) – Optional
  - Nitrogen fixing switch.
  - **Choices:**
    - **N:** Does not fix nitrogen
    - **Y:** Fixes nitrogen
- **Variable:** Perennial – Override if species perennial (N/A) – Optional
  - Does this plant grow over multiple species?
  - **Choices:**
    - **N:** Plant is Annual
    - **Y:** Plant is Perennial
- **Variable:** PhotoSynID – Override photosynthesis type (None) – Optional
  - **Choices:**
    - **C3:** Calvin or C_3 Cycle
    - **C4:** Hatch-Slack or C_4 Cycle
- **Variable:** PlntN_Em – Override opt. N in plant at emergence (g g^-1) – Optional
  - Optimum whole plant nutrient concentration at emergence.
- **Variable:** PlntN_Hf – Override opt. N in plant halfway to mt. (g g^-1) – Optional
  - Optimum whole plant nutrient concentration halfway through maturity.
- **Variable:** PlntN_Mt – Override opt. N in plant at maturity (g g^-1) – Optional

  - Optimum whole plant nutrient concentration at maturity.
- **Variable:** PlntP_Em – Override opt. P in plant at emergence (g g^-1) – Optional
  - Optimum whole plant nutrient concentration at emergence.
- **Variable:** PlntP_Hf – Override opt. P in plant halfway to mt. (g g^-1) – Optional
  - Optimum whole plant nutrient concentration halfway through maturity.
- **Variable:** PlntP_Mt – Override opt. P in plant at maturity (g g^-1) – Optional
  - Optimum whole plant nutrient concentration at maturity.
- **Variable:** relLAI_P1 – Override Relative LAI at point 1 (m^2 m^-2) – Optional
  - Relative leaf area index at first point in the growing season.
- **Variable:** relLAI_P2 – Override relative LAI at point 2 (m^2 m^-2) – Optional
  - Relative leaf area index at second point in the growing season.
- **Variable:** relTT_P1 – Override relative devel. time at pt. 1 ((deg. day) (deg. day)^-1) – Optional
  - Relative development time at first point in the growing season.
- **Variable:** relTT_P2 – Override relative devel. time at pt. 2 ((deg. day) (deg. day)^-1) – Optional
  - Relative development time at second point in the growing season.
- **Variable:** relTT_Sn – Override rel dev. time at start of sen. ((deg. day) (deg. day)^-1) – Optional
  - Fraction of growing season when leaf area starts declining.
- **Variable:** RootPartFac – Override Root Partition Factor (unitless) – Optional
  - A simple multipler to change the amount of daily biomass that goes to the roots (the higer the number the more biomass goes to roots). Added for Rafael Martinez-Feria 2019-05-30.
- **Variable:** RootSenFac – Override Root Senescence Factor (unitless) – Optional
  - A simple multipler to change the amount of daily root biomass that senesce (the higer the number the more biomass that leaves from roots). Added for Rafael Martinez-Feria 2019-07-22.
- **Variable:** RUEmax – Override max. potential rad. use eff. (g MJ^-1) – Optional
  - Maximum potential radiation use efficiency.
- **Variable:** RWPC1 – Override parameter in linear partitioning of biomass (N/A) – Optional
  - pcRoot = (1 - rel_TT) * RWPC1 + rel_TT * RWPC2
- **Variable:** RWPC2 – Override parameter in linear partitioning of biomass (N/A) – Optional
  - pcRoot = (1 - rel_TT) * RWPC1 + rel_TT * RWPC2
- **Variable:** SnParLAI – Override par. for LAI decl. after sen. (N/A) – Optional
  - Leaf area index decline rate parameter after senescence starts.
- **Variable:** SnParRUE – Override par. for RUE decl. after sen. (N/A) – Not Used
  - Radiation use efficiency decline rate parameter after senescence starts.
- **Variable:** Source – Source of parameter info. (N/A) – Optional

  - Bibliographic information or other reference for the value of the parameter.
- **Variable:** Subspecies_Name – Full subspecies name (N/A) – Required
- **Variable:** SubspeciesID – Subspecies Identifier (N/A) – Required
- **Variable:** TbaseDev – Override base temp. for development (degree C) – Optional
  - Minimum temperature for plant development.
- **Variable:** ToptDev – Override opt. temp. for development (degree C) – Optional
  - Optimum temperature for plant development.
- **Variable:** TTtoGerm – Override development time to germinate (degree day) – Optional
- **Variable:** TTtoMatr – Override development time to mature (degree day) – Optional

1.4 N_Fix

CDB | N_Fix

1.4.1 Species

CDB | N_Fix | Species

- **Variable:** CtoNod – C reserved for nodules (Fraction) – Not Used
  - Fraction of the assimilate C allocated to root growth that is reserved for nodules
- **Variable:** RFIXN – Respiration parameter (?) – Not Used
  - Respiration parameter related to N-fixing
- **Variable:** Source – Source of parameters (N/A) – Optional
- **Variable:** Species_Name – Species name (N/A) – Optional
- **Variable:** SpeciesID – Crop Code (N/A) – Required
  - Formerly resricted to 2 characters
- **Variable:** TTFIX – Thermal time to start N-fixing (degree-days) – Required

Subspecies *CDB | N_Fix | Species | Subspecies*

- **Variable:** CtoNod – Override C reserved for nodules (Fraction) – Not Used
  - Fraction of the assimilate C allocated to root growth that is reserved for nodules
- **Variable:** RFIXN – Override respiration parameter (?) – Not Used
  - Respiration parameter related to N-fixing
- **Variable:** Source – Source of parameters (N/A) – Optional
- **Variable:** Subspecies_Name – Species name (N/A) – Optional
- **Variable:** SubspeciesID – Crop Code (N/A) – Required
  - Formerly resricted to 2 characters
- **Variable:** TTFIX – Override Thermal time to start N-fixing (degree-days) – Required

2 Event Output File (EDB)

2.1 Experiment

EDB | Experiment

- **Variable:** ExpID – ID for experiment (N/A) – Required
- **Variable:** Title – Name of this experiment (N/A) – Required

2.1.1 Event

EDB | Experiment | Event

- **Variable:** Amt – Amount of Water (mm) – Optional
  - For Irrigation Events
- **Variable:** ByProductHarv – Amount Stover Harvested (kg/ha) – Optional
  - For Harvest Events
- **Variable:** CultivarID – Cultivar Identifier (N/A) – Optional
  - For Planting Events
- **Variable:** Date – ISO Date (N/A) – Required
  - YYYY-MM-DD
- **Variable:** DepRes – Residue incorporation depth (cm) – Optional
  - For Residue Events
- **Variable:** DFert – Depth of Fertilizer (cm) – Optional
  - For Fertilizer Events
- **Variable:** DOY – Day of Year (N/A) – Required
- **Variable:** Fert_kg_C – Carbon Applied (kg/ha) – Optional
  - For Fertilizer Events
- **Variable:** Fert_kg_N – Nitrogen Applied (kg/ha) – Optional
  - For Fertilizer Events
- **Variable:** Fert_kg_P – Phosphorus Applied (kg/ha) – Optional
  - For Fertilizer Events
- **Variable:** IFType – Fertilizer material code (N/A) – Optional
  - For Fertilizer Events
  - **Choices:**
    - **FE001:** Ammonium nitrate
    - **FE002:** Ammonium sulfate
    - **FE003:** Ammonium-nitrate-sulfate

        * **FE004:** Anhydrous ammonia
        * **FE005:** Urea
        * **FE006:** Diammoium phosphate
        * **FE007:** Monoammonium phosphate
        * **FE008:** Calcium nitrate
        * **FE009:** Aqua ammonia
        * **FE010:** Urea ammonium nitrate solution
        * **FE011:** Calcium ammonium nitrate solution
        * **FE012:** Ammonium polyphosphate
        * **FE013:** Single superphosphate
        * **FE014:** Triple superphosphate
        * **FE015:** Liquid phosphoric acid
        * **FE016:** Potassium chloride
        * **FE017:** Potassium nitrate
        * **FE018:** Potassium sulfate
        * **FE019:** Urea super granules
        * **FE020:** Dolomitic limestone
        * **FE021:** Rock Phosphate
        * **FE022:** Calceitic limestone
        * **FE023:** Unknown
        * **FE024:** Rhizobium
        * **FE025:** Unknown
        * **FE026:** Calcium hydroxide
        * **FE027:** Unknown
        * **FE028:** Unknown
        * **FE029:** Unknown
        * **FE030:** Unknown
        * **NOCOD:** Unknown

- **Variable:** IrrCod – Irrigation operation code (N/A) – Optional
    - For Irrigation Events
    - **Choices:**
        * **IR001:** Furrow
        * **IR002:** Alternating furrows
        * **IR003:** Flood
        * **IR004:** Sprinkler
        * **IR005:** Drip or trickle
        * **IR006:** Flood Depth
        * **IR007:** Water table depth
        * **IR008:** Percolation rate (mm/day)
        * **IR009:** Bund height
        * **IR010:** Puddling (Amt = 0 => Yes or Amt = 1 => No)
        * **IR011:** Constant flood depth
        * **MSU10:** Drainage through pipes (mm/day)
        * **MSU11:** Managed water table depth
        * **MSU12:** Set controlled drainage parameters
- **Variable:** Ppop – Plant population at seeding (plants m^-2) – Optional
    - For Planting Events
- **Variable:** PrimaryHarv – Grain/Tuber Harvested (kg/ha) – Optional

  - For Harvest Events
- **Variable:** ResC – Carbon Applied (kg/ha) – Optional
  - For Residue Events
- **Variable:** ResCode – Residue material, code (N/A) – Optional
  - For Residue Events
  - **Choices:**
    * **RE001:** Crop residue
    * **RE002:** Green manure/Compost
    * **RE003:** Barnyard manure
    * **RE004:** Liquid manure
- **Variable:** ResN – Nitrogen Applied (kg/ha) – Optional
  - For Residue Events
- **Variable:** ResP – Phosphorus Applied (kg/ha) – Optional
  - For Residue Events
- **Variable:** RowSpc – Row Spacing (cm) – Optional
  - For Planting Events
- **Variable:** SDepth – Planting Depth (cm) – Optional
  - For Planting Events
- **Variable:** SpeciesID – Species Identifier (N/A) – Optional
  - For Planting Events
  - **Choices:**
    * **AL:** Alfalfa
    * **AR:** Aroid
    * **BA:** Barley
    * **BN:** Dry bean
    * **BW:** Broad leaf weed
    * **CO:** Cotton
    * **CS:** Cassava
    * **FA:** Fallow
    * **GW:** Grass weed
    * **ML:** Pearl millet
    * **MZ:** Maize
    * **NC:** Not a Crop
    * **PN:** Peanut
    * **PT:** Potato
    * **RI:** Rice
    * **SB:** Soybean
    * **SC:** Sugar cane
    * **SG:** Grain sorghum
    * **SQ:** Crop sequence
    * **ST:** Shrubs/Tree
    * **WH:** Wheat
- **Variable:** TDep – Tillage Depth (cm) – Optional

  - For Tillage Events

- **Variable:** TImpl – Tillage implement code (N/A) – Optional
  - For Tillage Events
  - **Choices:**
    * **TI000:** Undefined Implement
    * **TI002:** Tandem disk
    * **TI003:** Offset disk
    * **TI004:** Oneway disk
    * **TI005:** Moldboard plow
    * **TI006:** Chisel plow
    * **TI007:** Disk plow
    * **TI008:** Subsoiler
    * **TI009:** Breeder/lister
    * **TI010:** Field cultivator
    * **TI011:** Row crop cultivator
    * **TI012:** Harrow-springtooth
    * **TI013:** Harrow-spike
    * **TI014:** Rotary hoe
    * **TI015:** Roto-tiller
    * **TI016:** Row crop planter
    * **TI017:** Drill
    * **TI018:** Shredder
    * **TI019:** Hoe
    * **TI020:** Planting stick
    * **TI021:** Animal-drawn implement
    * **TI022:** Hand
    * **TI023:** Manual hoeing

- **Variable:** Type – Type of event (N/A) – Required
  - **Choices:**
    * **fertilizer:** Fertilizer Event
    * **harvest:** Harvest Event
    * **irrigation:** Irrigation Event
    * **planting:** Planting Event
    * **residue:** Residue Event
    * **tillage:** Tillage Event

- **Variable:** Year – 4 Digit Year (N/A) – Required

3 Global Parameter File (GDB)

3.1 CENTURY_History_Par

GDB | CENTURY_History_Par

- **Variable:** Code – CENTURY Field History code (N/A) – Not Used
  - **Choices:**
    * **FH101:** Cultivated with good management practices, initially cultivated land

    * **FH102:** Cultivated with poor management practices, initially cultivated land
    * **FH201:** Cultivated with good management practices, initially grassland/forest
    * **FH202:** Cultivated with poor management practices, initially grassland/forest
    * **FH301:** DCultivated with good management practices, initially degraded
    * **FH302:** Cultivated with poor management practices, initially degraded

3.1.1 Texture

GDB | CENTURY_History_Par | Texture

- **Variable:** Name – Soil Texture (N/A) – Not Used
  - **Choices:**
    * **sand:** None
    * **loamy sand:** None
    * **sandy loam:** None
    * **silty loam:** None
    * **silt:** None
    * **loam:** None
    * **sandy clay loam:** None
    * **silty clay loam:** None
    * **clay loam:** None
    * **sandy clay:** None
    * **silty clay:** None
    * **clay:** None

Duration *GDB | CENTURY_History_Par | Texture | Duration*

- **Variable:** FL_DUR_begin – Earliest year (year) – Not Used
  - First year in the duration class.
- **Variable:** FL_DUR_end – Latest year (year) – Not Used
  - Last year in the duration class.

Depth *GDB | CENTURY_History_Par | Texture | Duration | Depth*

- **Variable:** bottom_dpth – Depth to the bottom (cm) – Not Used
- **Variable:** FL_HIST – Field history multipier (fraction) – Not Used
- **Variable:** HistCode – Field history code (N/A) – Not Used
- **Variable:** top_dpth – Depth to the top (cm) – Not Used

3.2 CENTURY_Residue_Par

GDB | CENTURY_Residue_Par

- **Variable:** Code – CENTURY Residue code (N/A) – Not Used
  - **Choices:**
    * **RE001:** Generic crop residue
    * **RE101:** Generic legume residue
    * **RE201:** Generic cereal crop residue
    * **RE301:** Generic grass
    * **RE999:** Decomposed crop residue
    * **RE002:** Green manure
    * **RE003:** Barnyard manure
    * **RE004:** Liquid manure
    * **RE005:** Compost
    * **RE006:** Bark
    * **RE102:** Cowpea residue
    * **RE103:** Mucuna reside
    * **RE104:** Peanut residue
    * **RE105:** Pigeon Pea residue
    * **RE106:** Soybean residue
    * **RE107:** Alfalfa residue
    * **RE108:** Chickpea residue
    * **RE109:** Faba Bean residue
    * **RE110:** Pea residue
    * **RE111:** Hairy vetch residue
    * **RE202:** Pearl Millet residue
    * **RE203:** Maize residue
    * **RE204:** Sorghum residue
    * **RE205:** Wheat residue
    * **RE206:** Barley residue
    * **RE207:** Rice residue
    * **RE208:** Rye residue
    * **RE302:** Bahiagrass
    * **RE303:** Bermudagrass
    * **RE304:** Switchgrass
    * **RE305:** Brachiaria
    * **RE306:** Forage grasses
    * **RE401:** Bush fallow residue
    * **RE402:** Sugarcane
    * **RE403:** Pineapple
    * **RE404:** Cassava
- **Variable:** Crop – Two letter code for crop (if applicable) (None) – Not Used
- **Variable:** AM – Area covered per unit dry weight of residue (cm2 g-1) – Not Used
- **Variable:** WATFAC – Saturation water content of surface mulch (kg[H2O] kg[DM]-1) – Not Used
- **Variable:** EXTFAC – Mulch layer light extinction coefficient (None) – Not Used
- **Variable:** PSLIG – Proportion of lignin in surface residue (Fraction) – Not Used
- **Variable:** SCN – N content of initial surface (shoots) residue (Percent) – Not Used

- **Variable:** SCP – P content of initial surface (shoots) residue (Percent) – Not Used
- **Variable:** PRLIG – Proportion of lignin in subsurface residue (Fraction) – Not Used
- **Variable:** RCN – N content of initial subsurface (roots) residue (Percent) – Not Used
- **Variable:** RCP – P content of initial subsurface (roots) residue (Percent) – Not Used
- **Variable:** Description – Original text from code (None) – Not Used

3.3 CO2_Trend_XY

GDB | CO2_Trend_XY

- **Variable:** CO2_Level – CO2 in the Atmosphere (measured or predicted) (PPM) – Required
- **Variable:** Yr – Year (None) – Required

3.4 Crop_Par

GDB | Crop_Par

- **Variable:** Code – Code for crop (N/A) – Required
- **Variable:** KnDnFrac – Knock-Down Fraction –by-produ (Fraction) – Required
  - Knock-Down Fraction, fraction of the non-harvested by-product that goes to surface at harvest
- **Variable:** Name – Full name of crop (N/A) – Required
- **Variable:** RootC – C content of roots (% dry wt.) – Required
- **Variable:** RootIntC – % total C in inter. decomposin (%) – Required
  - Percent of total C in intermediate decomposing root tissue such as cellulose/hemicelluloses
- **Variable:** RootN – N content of roots (% dry wt.) – Required
- **Variable:** RootP – P content of roots (% dry wt.) – Required
- **Variable:** RootSloC – % total C in slow decomposing (%) – Required
  - Percent of total C in slowly decomposing root tissue such as lignin
- **Variable:** RootSloN – % total N in slow decomposing (%) – Required
  - Percent of total N in slowly decomposing root tissue such as lignin
- **Variable:** VegC – C content of veg. top+root @ m (% dry wt.) – Required
- **Variable:** VegIntC – % total C in inter. decomposin (%) – Required
  - Percent of total C in intermediate decomposing vegetative tops+roots at maturity such as cellulose/hemicelluloses
- **Variable:** VegN – N content of vegetation at mat (% dry wt.) – Required
  - N content of vegetative tops+roots at maturity
- **Variable:** VegP – P content of vegetation at mat (% dry wt.) – Required
  - P content of vegetative tops+roots at maturity
- **Variable:** VegSloC – % total C in slow decomposing (%) – Required
  - Percent of total C in slowly decomposing vegetative tops+roots at maturity such as lignin
- **Variable:** VegSloN – % total N in slow decomposing (%) – Required
  - Percent of total N in slowly decomposing vegetative tops+roots at maturity such as lignin

3.5 Fert_Par

GDB | Fert_Par

- **Variable:** Code – Code for fertilizer type (N/A) – Required
- **Variable:** FerDecRt – Fertilizer decomposition rate (None) – Required
  - under optimum conditions [
- **Variable:** Name – Name of fertilizer (N/A) – Required
- **Variable:** NH_4Frac – Fraction of N in ammonium (Fraction) – Required
- **Variable:** NO_3Frac – Fraction of N in nitrate form (Fraction) – Required
- **Variable:** UreaFrac – Fraction of N in urea (Fraction) – Required
- **Variable:** VolN – % total N that can readily vol (%) – Required
  - Percent of total N that can readily volatilize if surface-applied
- **Variable:** VolNRate – Rate const. N that can readily (None) – Required
  - Rate constant for percent of total N that can readily volatilize if surface-applied

3.6 Irr_Par

GDB | Irr_Par

- **Variable:** Code – Code for irrigation type (N/A) – Required
- **Variable:** Name – Name of irrigation type (N/A) – Required

3.7 Residue_Par

GDB | Residue_Par

- **Variable:** Code – Code for residue type (N/A) – Required
- **Variable:** HumifdC – Slow C that has been humified (%) – Required
  - Percent of slow C that has been humified.
- **Variable:** IntermdC – % C in interm. decomposing mat (%) – Required
  - Percent of total C in intermediate decomposing material such as cellulose/hemicelluloses
- **Variable:** Name – Name of residue type (N/A) – Required
- **Variable:** ResC – C content of residues (% dry wt.) – Required
- **Variable:** ResK – K content of residues (% dry wt.) – Required
- **Variable:** ResN – N content of residues (% dry wt.) – Required
- **Variable:** ResP – P content of residues (% dry wt.) – Required
- **Variable:** SlowC – % C in slow decomposing materi (%) – Required
  - Percent of total C in slowly decomposing material such as lignin

- **Variable:** SlowN – %N in slow decomposing materi (%) – Required
  - Percent of total N in slowly decomposing material such as lignin
- **Variable:** VolN – % FOM N that can readily volat (%) – Required
  - Percent of total N in slowly decomposing material such as lignin
- **Variable:** VolNRate – Rate const. % FOM N that readi (None) – Required
  - Rate constant for percent of FOM pool N that can readily volatilize if surface-applied [d-1]

3.8 Soil_Bio_Kinetic_Par

GDB | Soil_Bio_Kinetic_Par

- **Variable:** ActI2CO2 – Frac. of delta active inorg. t (d-1) – Optional
- **Variable:** ActIn2Lb – Active inorganic to labile con (d-1) – Optional
- **Variable:** ActInorg – Active inorg. decomposition co (d-1) – Optional
- **Variable:** ActO2CO2 – Frac. of delta active org. to (d-1) – Optional
- **Variable:** ActOrg – Active org. decomposition cons (d-1) – Optional
- **Variable:** C2N_Act_Org – Active C/N ratios (Ratio) – Optional
  - Originally hardwired into code
- **Variable:** C2N_Res_Org – Resistant C/N ratios (Ratio) – Optional
  - Originally hardwired into code
- **Variable:** C2N_Slo_Org – Slow C/N ratios (Ratio) – Optional
  - Originally hardwired into code
- **Variable:** Element – Element name (N/A) – Required
- **Variable:** Intr2CO2 – Frac. of delta interm. residue (d-1) – Optional
- **Variable:** Labile – Labile decomposition const. (d-1) – Optional
- **Variable:** LabInSol – Fraction of labile in solution (Fraction) – Optional
- **Variable:** Mlch2Sl – Mulch to top soil layer consta (d-1) – Optional
  - on dry days
- **Variable:** N2ODenitFac – N2O factor in denitrification (Unitless) – Optional
  - For Element == N
- **Variable:** pN2ONitr – N2O emitted during nitrification (Unitless) – Optional
  - For Element == N
- **Variable:** Rapd2CO2 – Frac of delta rapid residue to (d-1) – Optional
- **Variable:** SloFOMAb – Slow FOM decomposition const. (d-1) – Optional
  - Slow FOM decomposition constant above ground
- **Variable:** SloFOMBl – Slow FOM decomposition const. (d-1) – Optional

  - Slow FOM decomposition constant below ground
- **Variable:** SloFOMHm – Humified slow FOM dec. const. (d-1) – Optional
  - Humified slow FOM decomposition constant above and below ground.
- **Variable:** SloInorg – Slow inorg. decomposition cons (d-1) – Optional
- **Variable:** SloO2CO2 – Frac. of delta slow org. to CO (d-1) – Optional
- **Variable:** Slow2CO2 – Frac. of delta slow residue t (d-1) – Optional

3.9 Till_Par

GDB | Till_Par

- **Variable:** BDFac – Tillage effect on bulk density (None) – Required
- **Variable:** Code – Code for tillage type (N/A) – Required
- **Variable:** DecomFac – Effect on soil bio. pools deco (None) – Required
  - Tillage effect on soil biochemistry pools decomposition rates
- **Variable:** KnDnFrac – Knock-Down Fraction (Fraction) – Required
  - Knock-Down Fraction, fraction of the standing dead that drops on the soil surface at tillage
- **Variable:** KsMcFac – Effect on saturated hydraulic (None) – Required
  - Macropore
- **Variable:** MixFrac – Mixing fraction for the implem (Fraction) – Required
- **Variable:** Name – Name of tillage implement (N/A) – Required
- **Variable:** PondFac – Tillage effect on ponding (None) – Required

4 Results File (RDB)

4.1 Results

RDB | Results

- **Variable:** AgeFac – Perennial age factor (unitless)
  - Perennial crops have low potential growth when planted, increase to a plateau, stays level for a few years, then decreases
- **Variable:** BMh – Upper limit sink capacity (g/plant)
- **Variable:** BMl – Lower limit sink capacity (g/plant)
- **Variable:** BundHeight – Height of bund (for rice) (cm)
- **Variable:** BWAH – By-Product at Harvest (kg ha^-1)
  - Dry Weight
- **Variable:** BWAHC – Cumulative By-Product at Harvest (kg ha^-1)

  - Dry Weight
- **Variable:** C_ActInoBl – Below ground active inorg. C (kg ha^-1)
- **Variable:** C_ActOrgBl – Below ground active organic C (kg ha^-1)
- **Variable:** C_AtmoCO2 – Atmospheric CO2 (ppm)
- **Variable:** C_CO2 – C in cumulative CO2 evolved (kg ha^-1)
- **Variable:** C_FertApp – C fertilizer applied (kg ha^-1)
  - Cumulative carbon applied in fertilizer
- **Variable:** C_FertBl – Below ground fertilizer C (kg ha^-1)
- **Variable:** C_In – Total C additions (kg ha^-1)
- **Variable:** C_IntFOMAb – Above ground interm. FOM C (kg ha^-1)
- **Variable:** C_IntFOMBl – Below ground interm. FOM C (kg ha^-1)
- **Variable:** C_Net – Net C change (kg ha^-1)
- **Variable:** C_Out – Total C withdrawals (kg ha^-1)
- **Variable:** C_RapFOMAb – Above ground rapid FOM C (kg ha^-1)
- **Variable:** C_RapFOMBl – Below ground rapid FOM C (kg ha^-1)
- **Variable:** C_RDADC – Cumulative C sent to the roots (kg ha^-1)
- **Variable:** C_ResOrgBl – Below ground resistant org. C (kg ha^-1)
- **Variable:** C_RSADC – Cumulative C senesced from the roots (kg ha^-1)
- **Variable:** C_SloFOMAb – Above ground slow FOM C (kg ha^-1)
- **Variable:** C_SloFOMBl – Below ground slow FOM C (kg ha^-1)
- **Variable:** C_SloInoBl – Below ground slow inorganic C (kg ha^-1)
- **Variable:** C_SloOrgBl – Below ground slow organic C (kg ha^-1)
- **Variable:** C_StDead – Recognizeable standing dead C (kg ha^-1)
- **Variable:** CapFringe – Depth of capillary fringe (mm)
- **Variable:** CD_WaterDepth – Depth H2O stored in drainage ditch (m)
- **Variable:** CD_WaterVolume – Volume H2O stored in drainage ditch (m^3)
- **Variable:** CDay – Cumulative day (d)
- **Variable:** CDRad – Clear day radiation (MJ m^-2 d^-1)
  - Estimated solar radiation at the surface on a cloudless day
- **Variable:** CO2_Effect – Effect that increased CO2 has on plants (Unitless)
  - This is multiplier that increases growth depending on the CO2 in the atmosphere and if the crop is a C3 or C4 plant.
- **Variable:** ColdFac – Cold stress factor (unitless)
- **Variable:** CompOrdNum – Order Number for rot. compon. (N/A)
  - Order number for a single rotation component (if inside a multi Rotation_Components experimement it will have the format xx:yy)
- **Variable:** CompTitle – Title for rot. compon. (N/A)

  - Title for a single rotation component (if inside a multi Rotation_Components experimement it will have the format xx:yy)
- **Variable:** cropmod – Simple or Complex Model? (N/A)
  - S for Simple, C for Complex
- **Variable:** cThrTime – Cumulative thermal time (degree day)
- **Variable:** CultivarID – Cultivar code (N/A)
  - Only used for the complex model
- **Variable:** CWAD – Total above ground biomass (kg ha^-1)
  - Total mass of stem, leaves, grain, etc.
- **Variable:** DAP – Days after planting (d)
- **Variable:** Date – ISO Date (N/A)
  - YYYY-MM-DD
- **Variable:** dBiomass – Delta biomass (kg ha^-1)
- **Variable:** DewP – Average daily dewpoint (degree C)
- **Variable:** DOY – Day of the year (day of the year)
- **Variable:** DrghtFac – Drought factor (unitless)
  - General value calculated in Soil, not used directly in plants.
- **Variable:** DrghtFac_Stom – Stomatal drought factor (unitless)
  - Stomatal drought reduction factor used to calculate the biomass source
- **Variable:** DrghtFac_Turg – Turgor drought factor (unitless)
  - Turgor drought reduction factor used to calculate the biomass sink
- **Variable:** DrghtStressDays – Cumulative drought stress (unitless)
  - Sum of (1.0 - DrghtFac) during a growing season
- **Variable:** DRNC – Cumulative drainage (mm)
- **Variable:** dThrTime – Daily thermal time (degree day)
- **Variable:** EOAC – Potential ET, cumul. (mm)
- **Variable:** EOAD – Potential ET, daily (mm d^-1)
- **Variable:** EPAC – Plant transp., cumul. (mm)
- **Variable:** EPAD – Plant transp., daily (mm d^-1)
- **Variable:** EPOAC – Potential plant evap. cumul. (mm)
- **Variable:** EPOAD – Potential plant evap. daily (mm d^-1)
- **Variable:** ESAC – Soil evaporation, cumul. (mm)
- **Variable:** ESAD – Soil evaporation, daily (mm d^-1)
- **Variable:** ESOAC – Potential soil evap. cumul. (mm)
- **Variable:** ESOAD – Potential soil evap. daily (mm d^-1)
- **Variable:** ETAC – Evapotranspiration, cumul. (mm)

- **Variable:** ETAD – Evapotranspiration, daily (mm d^-1)
- **Variable:** ExpElev – Elevation for experiment site (m)
  - Echos the Elev variable in XDB/Experiment
- **Variable:** ExpID – Experiment ID (N/A)
- **Variable:** ExpLat – Latitude for experiment site (degree)
  - Echos the Lat variable in XDB/Experiment
- **Variable:** ExpLong – Longitude for experiment site (degree)
  - Echos the Long variable in XDB/Experiment
- **Variable:** FldLvlSet – Desired level of flood water (cm)
  - Set by user
- **Variable:** Flood – Flood water height, current (cm)
- **Variable:** gPhase – Development phase (N/A)
  - gPhase 0 = Until emergence gPhase 1 = Until induction (WH,BA incl. vern. Others incl. juv.) gPhase 2 = Until end of veg. growth (last leaf stops expanding) gPhase 3 = Until ear stops growing gPhase 4 = Until maturity gPhase 5 = Matured
- **Variable:** gPhase0Date – Date Phase 0 is entered (ISO Date)
  - Plantng Date
- **Variable:** gPhase1Date – Date Phase 1 is entered (ISO Date)
- **Variable:** gPhase2Date – Date Phase 2 is entered (ISO Date)
- **Variable:** gPhase3Date – Date Phase 3 is entered (ISO Date)
- **Variable:** gPhase4Date – Date Phase 4 is entered (ISO Date)
- **Variable:** gPhase5Date – Date Phase 5 is entered (ISO Date)
  - Matured Crop
- **Variable:** gPhase0DOY – Day Phase 0 is entered (N/A)
  - Plantng Day of Year
- **Variable:** gPhase1DOY – Day Phase 1 is entered (N/A)
- **Variable:** gPhase2DOY – Day Phase 2 is entered (N/A)
- **Variable:** gPhase3DOY – Day Phase 3 is entered (N/A)
- **Variable:** gPhase4DOY – Day Phase 4 is entered (N/A)
- **Variable:** gPhase5DOY – Day Phase 5 is entered (N/A)
  - Matured Crop
- **Variable:** gPhase0Year – Year Phase 0 is entered (N/A)
  - Plantng Year
- **Variable:** gPhase1Year – Year Phase 1 is entered (N/A)
- **Variable:** gPhase2Year – Year Phase 2 is entered (N/A)
- **Variable:** gPhase3Year – Year Phase 3 is entered (N/A)

- **Variable:** gPhase4Year – Year Phase 4 is entered (N/A)
- **Variable:** gPhase5Year – Year Phase 5 is entered (N/A)
  - Matured Crop
- **Variable:** GWAD – Dry weight - grain (kg ha^-1)
- **Variable:** HeatFac – Heat stress factor (unitless)
- **Variable:** HRLT – Day Length (hr)
- **Variable:** HWAD – Cumulative harvested plant mass (kg ha^-1)
- **Variable:** HWAH – Pirmary Harvest (kg ha^-1)
  - Dry Weight
- **Variable:** HWAHC – Cumulative Pirmary Harvest (kg ha^-1)
  - Dry Weight
- **Variable:** IPAR – Intercepted photosynthetically active radiation (MJ m^-2 d^-1)
- **Variable:** IRRC – Cumulative irrigation (mm)
- **Variable:** KRPP – Number of kernels per shoot (unitless)
- **Variable:** LAI – Leaf area index (m^2 m^-2)
- **Variable:** LAIMax – Max. leaf area index in the season (m^2 m^-2)
- **Variable:** LAIMaxDate – Date of max leaf area index (ISO Date)
  - Date of maximum leaf area index during growing season
- **Variable:** LAIMaxDOY – DOY max leaf area index (N/A)
  - Day of year of maximum leaf area index of the year during growing season
- **Variable:** LAIMaxYear – Year of max leaf area index (N/A)
  - Year of maximum leaf area index during growing season
- **Variable:** LeafEq – Leaf equivalent (leaf equivalent)
- **Variable:** LeafEqEar – Leaf Eq for ear growth (leaf equivalent)
  - Development time for ear growth, generally 224 degree days before silking to 100 degree days after silking. Must be greater than phase3 variable.
- **Variable:** LeafEqFinal – Final Leaf equivalent (leaf equivalent)
- **Variable:** LeafNum – Number of leaves (count)
- **Variable:** LWAD – Dry weight - leaf (kg ha^-1)
- **Variable:** LWAT – Dry weight - leaf - tillers (kg ha^-1)
- **Variable:** matDate – Date maturity occurs (Unitless)
  - ISO Date
- **Variable:** matDOY – Day of year maturity occurs (Unitless)
- **Variable:** matYear – Year maturity occurs (Unitless)
- **Variable:** MulchCover – Mulch coverage (fraction)

- **Variable:** MulchDW – Mulch dry weight (kg ha^-1)
- **Variable:** MulchSponge – Mulch water holding capacity (cm)
- **Variable:** MulchWat – Water in mulch (cm)
- **Variable:** N_ActInoBl – Below ground active inorg. N (kg ha^-1)
- **Variable:** N_ActOrgBl – Below ground active organic N (kg ha^-1)
- **Variable:** N_AmmoniaBl – Total ammonia in soil (kg ha^-1)
- **Variable:** N_BFixBl – Below ground asymbiotic N fixed (kg ha^-1)
  - N fixed by soil microbes (bacteria, etc) summed across all soil layers.
- **Variable:** N_Denitr – Daily N Denitrified (kg ha^-1)
  - N Denitrified across all soil layers.
- **Variable:** N_Denitr_C – Cumulative N Denitrified (kg ha^-1)
  - Cumulative N denitrified across all soil layers.
- **Variable:** N_FertApp – N fertilizer applied (kg ha^-1)
  - Cumulative nitrogen applied in fertilizer
- **Variable:** N_FertBl – Below ground fertilizer N (kg ha^-1)
- **Variable:** N_Fix – Cumulative N fixed (kg ha^-1)
  - For symbiosis (legumes, etc.)
- **Variable:** N_FOMMin – N Mineralization/Immobilization from FOM (kg ha^-1)
  - Daily Mineralization/Immobilization from Fresh Organic Matter values accumulated for all the layers
- **Variable:** N_Harvst – Cumulative harvested plant N (kg ha^-1)
- **Variable:** N_In – Total N additions (kg ha^-1)
- **Variable:** N_LabileBl – Below ground labile N (kg ha^-1)
- **Variable:** N_Min – N Mineralization/Immobilization (kg ha^-1)
  - Daily Mineralization/Immobilization values accumulated for all the layers
- **Variable:** N_N2 – Cumulative N_2 produced (kg ha^-1)
- **Variable:** N_N2O – Cumulative N_2O to the atmosphere (kg ha^-1)
  - Cumulative N_2O released into the atmosphere from the surface layer via diffusion
- **Variable:** N_N2OProd – Daily N_2O produced from nit/denitrification (kg ha^-1 d^-1)
  - Daily N_2O produced as a by-product during nitrification/denitrification in soil
- **Variable:** N_Net – Net N change (kg ha^-1)
- **Variable:** N_Nitr – Daily N Nitrified (kg ha^-1)
  - N nitrified across all soil layers.
- **Variable:** N_Nitr_C – Cumulative N Nitrified (kg ha^-1)
  - Cumulative N nitrified across all soil layers.

- **Variable:** N_NitrateBl – Total nitrate in soil (kg ha^-1)
- **Variable:** N_Out – Total N withdrawals (kg ha^-1)
- **Variable:** N_Plants – Cumulative plant uptake N (kg ha^-1)
  - This does not count N created by symbionts
- **Variable:** N_RapFOMAb – Above ground rapid FOM N (kg ha^-1)
- **Variable:** N_RapFOMBl – Below ground rapid FOM N (kg ha^-1)
- **Variable:** N_ResOrgBl – Below ground resistant org. N (kg ha^-1)
- **Variable:** N_SloFOMAb – Above ground slow FOM N (kg ha^-1)
- **Variable:** N_SloFOMBl – Below ground slow FOM N (kg ha^-1)
- **Variable:** N_SloInoBl – Below ground slow inorganic N (kg ha^-1)
- **Variable:** N_SloOrgBl – Below ground slow organic N (kg ha^-1)
- **Variable:** N_SOCMin – N Mineralization/Immobilization from SOC (kg ha^-1)
  - Daily Mineralization/Immobilization from Soil Organic Carbon values accumulated for all the layers
- **Variable:** N_Sol – Below ground solution N (kg ha^-1)
- **Variable:** N_StDead – Recognizeable standing dead N (kg ha^-1)
- **Variable:** N_UreaBl – Total urea in soil (kg ha^-1)
- **Variable:** N_Vol – Total N that can volatilize (kg ha^-1)
- **Variable:** NIAD – Inorganic N in soil (kg ha^-1)
- **Variable:** NitroFac – N stress factor (unitless)
- **Variable:** NitroStressDays – Cumulative N stress (unitless)
  - Sum of (1.0 - NitroFac) during a growing season
- **Variable:** NLCC – Cumulative N leached (kg ha^-1)
  - N leaving the bottom of the soil profile.
- **Variable:** NOAD – Organic N in soil (kg ha^-1)
- **Variable:** OWAD – Dry weight - one grain (g)
- **Variable:** OWAT – Dry weight - one grain-tillers (g)
- **Variable:** P_ActInoBl – Below ground active inorg. P (kg ha^-1)
- **Variable:** P_ActOrgBl – Below ground active organic P (kg ha^-1)
- **Variable:** P_FertApp – P fertilizer applied (kg ha^-1)
  - Cumulative phosphorus applied in fertilizer
- **Variable:** P_FertBl – Below ground fertilizer P (kg ha^-1)
- **Variable:** P_Harvst – Cumulative harvested plant P (kg ha^-1)
- **Variable:** P_In – Total P additions (kg ha^-1)
- **Variable:** P_LabileBl – Below ground labile P (kg ha^-1)
- **Variable:** P_Net – Net P change (kg ha^-1)
- **Variable:** P_Out – Total P withdrawals (kg ha^-1)

- **Variable:** P_Plants – Cumulative plant uptake P (kg ha^-1)
- **Variable:** P_RapFOMAb – Above ground rapid FOM P (kg ha^-1)
- **Variable:** P_RapFOMBl – Below ground rapid FOM P (kg ha^-1)
- **Variable:** P_ResOrgBl – Below ground resistant org. P (kg ha^-1)
- **Variable:** P_SloInoBl – Below ground slow inorganic P (kg ha^-1)
- **Variable:** P_SloOrgBl – Below ground slow organic P (kg ha^-1)
- **Variable:** P_Sol – Below ground solution P (kg ha^-1)
- **Variable:** P_StDead – Recognizeable standing dead P (kg ha^-1)
- **Variable:** PhaseDes – Development phase name (N/A)
  - Until emergence – Phase 0 Until induction – Phase 1 (WH,BA incl. vern. Others incl. juv.) Until end veg. – Phase 2 (last leaf stops expanding) Until end ear – Phase 3 Until maturity – Phase 4 Matured – Phase 5
- **Variable:** PhosFac – P stress factor (unitless)
- **Variable:** PhosStressDays – Cumulative P stress (unitless)
  - Sum of (1.0 - PhosFac) during a growing season
- **Variable:** PhotoFac – Photoperiod factor (unitless)
- **Variable:** POND – Ponding height, current (mm)
- **Variable:** PONDMX – Ponding height, maximum (mm)
- **Variable:** PREC – Cumulative precipitation (mm)
- **Variable:** RadUseEf – Radiation use efficiency (g MJ^-1)
- **Variable:** Rain – Daily precipitation (mm)
- **Variable:** RcID – Unique ID for rotation compon. (N/A)
- **Variable:** RelatvTT – Relative thermal time (unitless)
- **Variable:** RID – Rotation ID (N/A)
  - Counter for occurance of a given rotation component
- **Variable:** ROFC – Cumulative runoff (mm)
- **Variable:** RootDep – Root depth (cm)
- **Variable:** RWAD – Dry weight - root (kg ha^-1)
- **Variable:** RWADMax – Max dry weight - root (kg ha^-1)
  - Maximum root weight during growing season
- **Variable:** RWADMaxDate – Date of max dry weight - root (ISO Date)
  - Date of maximum root weight during growing season
- **Variable:** RWADMaxDOY – DOY max dry weight - root (N/A)
  - Day of the year of maximum root weight of during growing season
- **Variable:** RWADMaxYear – Year of max dry weight - root (N/A)
  - Year of maximum root weight during growing season
- **Variable:** SatDef – Saturation Deficiet (mm)

- **Variable:** Sink – C Sink (kg ha^-1)
- **Variable:** SinkMax – C Sink Maximum (kg ha^-1)
- **Variable:** SoilAlbedo – Soil Albedo (unitless)
- **Variable:** SoilElev – Elevation of soil profile (m)
- **Variable:** SoilID – Soil Code (N/A)
  - Code of soil used in experiment
- **Variable:** SoilLat – Latitude of soil profile (degree)
- **Variable:** SoilLong – Longitude of soil profile (degree)
- **Variable:** SolRadMult – Sol Rad Mult (MPI Only) (fraction)
  - How much to reduce the solar radiation due to intercropping (MPI version) shading.
- **Variable:** Source – C Source (kg ha^-1)
- **Variable:** SpeciesID – Species code (N/A)
  - Formerly limited to two characters
- **Variable:** SRAA – Average solar radiation (MJ m^-2 d^-1)
- **Variable:** StationElev – Elevation of weather station (m)
- **Variable:** StationID – Weather Station Code (N/A)
  - Code of weather station used in experiment
- **Variable:** StationLat – Latitude of weather station (degree)
- **Variable:** StationLong – Longitude of weather station (degree)
- **Variable:** SWAD – Dry weight - stem (kg ha^-1)
- **Variable:** SWAT – Dry weight - stem - tillers (kg ha^-1)
- **Variable:** SWXD – Potentially extractable water (cm)
- **Variable:** TApexDay – Apex daytime temperature (degree C)
- **Variable:** TApexMean – Apex mean temperature (degree C)
  - Mean is weighted by number of hour of sunlight.
- **Variable:** TApexNight – Apex nighttime temperature (degree C)
- **Variable:** TIDRC – Cumulative tile drainage (mm)
- **Variable:** Title – Experiment Title (N/A)
- **Variable:** TMNA – Average min. temperature (degree C)
- **Variable:** TMXA – Average max. temperature (degree C)
- **Variable:** VDays – Vernalization Days (Days)
- **Variable:** VPD – Vapor Pressure Deficit (kPa)
- **Variable:** WTDEPTH – Water Table Depth (mm)
- **Variable:** WthDate – Source Weather Date (N/A)
  - Date of the weather being pulled from the weather file (YYYY-MM-DD).
- **Variable:** Year – Four digit year (N/A)

4.2 Results_Layer

RDB | Results_Layer

- **Variable:** BD – Bulk density (Mg m^-3)
- **Variable:** C_ActOrg – Total active organic C (kg ha^-1)
- **Variable:** C_CO2_FOM_lay – C in cumulative CO2 evolved from FOM (kg ha^-1)
  - Rapid_FOM_2_CO2_kg + Inter_FOM_2_CO2_kg + Slow_FOM_2_CO2_kg
- **Variable:** C_CO2_lay – C in cumulative CO2 evolved (kg ha^-1)
- **Variable:** C_CO2_SOC_lay – C in cumulative CO2 evolved from SOC (kg ha^-1)
  - Act_Org_2_CO2_kg + Slo_Org_2_CO2_kg + dRes_Org_2_CO2_kg
- **Variable:** C_IntFOM – Total interm. decomp. FOM C (kg ha^-1)
- **Variable:** C_RapFOM – Total rapid decomposing FOM C (kg ha^-1)
- **Variable:** C_ResOrg – Total resistant organic C (kg ha^-1)
- **Variable:** C_SloFOM – Total slow decomposing FOM C (kg ha^-1)
- **Variable:** C_SloOrg – Total slow organic C (kg ha^-1)
- **Variable:** C_Tot – Total C (kg ha^-1)
  - Sum of C_ActOrg_kg, C_SloOrg, C_ResOrg, C_RapFOM, C_IntFOM_kg, C_SloFOM
- **Variable:** CN_RapFOM – C:N ratio rapid FOM pool (unitless)
- **Variable:** CN_SloFOM – C:N ratio slow FOM pool (unitless)
- **Variable:** Dflow – Downward Flux (cm/day)
- **Variable:** DUL – Drained Upper Limit of Soil Water (m^3 m^-3)
- **Variable:** LL – Lower Limit of Soil Water (m^3 m^-3)
- **Variable:** Min_Kg – Minimum element in a pool (kg ha^-1)
  - Hardwired in the Global class.
- **Variable:** N_ActOrg – Below ground active organic N (kg ha^-1)
- **Variable:** N_Ammonia – Ammonia in soil (kg ha^-1)
- **Variable:** N_BFix – Asymbiotic N fixed (kg ha^-1)
  - Cumulative N fixed by soil microbes (bacteria, etc)
- **Variable:** N_FOMMinLay – FOM Mineralization/Immobilization (kg ha^-1)
  - Amount of Mineralization/Immobilization Fresh Organic Matter for each layer.
- **Variable:** N_IntFOM – Below ground interm. FOM N (kg ha^-1)
- **Variable:** N_MinLay – Mineralization/Immobilization (kg ha^-1)
  - Amount of Mineralization/Immobilization for each layer.
- **Variable:** N_MinLayConc – Mineralization/Immobilization Concentration (ppm)
  - Mineralization/Immobilization Concentration for each layer.

- **Variable:** N_N2OConc – N2O Concentration (ppm)
- **Variable:** N_N2OLay – N2O in Layer (kg ha^-1)
- **Variable:** N_Nitrate – Nitrate in soil (kg ha^-1)
- **Variable:** N_RapFOM – Rapid FOM N (kg ha^-1)
- **Variable:** N_ResOrg – Resistant org. N (kg ha^-1)
- **Variable:** N_SloFOM – Slow FOM N (kg ha^-1)
- **Variable:** N_SloOrg – Slow org. N (kg ha^-1)
- **Variable:** N_SOCMinLay – SOC Mineralization/Immobilization (kg ha^-1)
  - Amount of Mineralization/Immobilization Soil Organic Carbon for each layer.
- **Variable:** N_Tot – Total N (kg ha^-1)
  - Sum of N_ActOrg_kg, N_SloOrg, N_ResOrg, N_RapFOM, N_IntFOM_kg, N_SloFOM
- **Variable:** N_Urea – Urea in soil (kg ha^-1)
- **Variable:** NDownLay – Labile N leaving bottom of layer (kg ha^-1 d^1)
  - Non-cumulative. The sum of NDownLay from the bottom layer is the equivelent of N Leaching (NLCC).
- **Variable:** NDownLayC – Cumm. labile N leaving bottom of layer (kg ha^-1)
  - Cumulative. The value of NDownLayc from the bottom layer is the equivelent of N Leaching (NLCC).
- **Variable:** NetFlow – Net Flux (cm/day)
- **Variable:** NIADL – Inorganic N in soil (kg ha^-1)
- **Variable:** NOutLay – Labile N to other layers?? (kg ha^-1)
- **Variable:** P_Labile – P in soil (kg ha^-1)
- **Variable:** RootU – Root Water Uptake (cm/day)
- **Variable:** RWADL – Dry weight - root (kg ha^-1)
- **Variable:** SAT – Saturated Soil Water Content (m^3 m^-3)
- **Variable:** ST – Soil temperature (degree C)
- **Variable:** SW – Soil water content (m^3 m^-3)
- **Variable:** SWCN – Sat. hydraulic cond., macr. (cm h^-1)
  - Macropore.
- **Variable:** Uflow – Upward Flux (cm/day)
- **Variable:** ZLYR – Depth to bottom of the layer (cm)

5 Soil File (SDB)

5.1 Soils

SDB | Soils

5.1.1 Soil

SDB | Soils | Soil

- **Variable:** CN2 – Runoff curve number, SCS (N/A) – Not Used
  - From the U.S. Soil Conservation Service
- **Variable:** Fldd – Drainage Depth (None) – Not Used
- **Variable:** FracActInorgInTotInorgC – Fraction SInorgC in initial active pool (fraction) – Optional
  - Fraction of inorganic soil C to go into initial active pool
- **Variable:** FracResOrgInTotOrgC – Fraction SOC in initial resistant pool (fraction) – Optional
  - Fraction of organic soil C to go into initial resistant pool
- **Variable:** PondMax – Maximum ponding height (mm) – Required
  - In this case used for surface storage due to roughness.
- **Variable:** Salb – Dry soil albedo (unitless) – Not Used
- **Variable:** Scom – Color, moist, Munsell hue (N/A) – Not Used
- **Variable:** SCount – Country name (N/A) – Optional
- **Variable:** SElev – Elevation of soil profile (m) – Optional
  - Only used to pass information to the output file(s)
- **Variable:** SLat – Latitude of soil profile (degree) – Optional
  - Only used to pass information to the output file(s)
- **Variable:** SlDesc – Description or local class. (N/A) – Required
  - Local classification
- **Variable:** Sldp – Depth of soil (cm) – Not Used
- **Variable:** Slnf – Mineralization factor (unitless) – Not Used
- **Variable:** SLong – Longitude of soil profile (degree) – Optional
  - Only used to pass information to the output file(s)
- **Variable:** Slpf – Photosynthesis factor (unitless) – Not Used
- **Variable:** Slsour – Source of original soil info. (N/A) – Not Used
- **Variable:** Sltx – Texture, code (N/A) – Not Used
  - **Choices:**
    - **CL:** Clay
    - **CLLO:** Clay loam
    - **CLOSA:** Coarse loamy sand
    - **CSA:** Coarse sand
    - **CSALO:** Coarse sandy loam
    - **CSI:** Coarse silt
    - **FLO:** Fine loam
    - **FLOSA:** Fine loamy sand

        * **FSA:** Fine sand
        * **FSALO:** Fine sandy loam
        * **LO:** Loam
        * **LOSA:** Loamy sand
        * **SA:** Sand
        * **SACL:** Sandy clay
        * **SACLL:** Sandy clay loam
        * **SALO:** Sandy loam
        * **SI:** Silt
        * **SICL:** Silty clay
        * **SICLL:** Siltly clay loam
        * **SILO:** Sitly loam
        * **VFLOS:** Very find loamy sand
        * **VFSA:** Very find sand
        * **VFSAL:** Very fine sandy loam

- **Variable:** Smhb – pH in buffer method (pH units) – Not Used
    - pH in buffer determination method, code.
- **Variable:** Smke – P determination method (N/A) – Not Used
    - Phosphorus determination method, code.
    - **Choices:**
        * **SA001:** Olsen
        * **SA002:** Bray No. 1
        * **SA003:** Bray No. 2
        * **SA004:** Mehlich
        * **SA005:** Anion exchange resin
        * **SA006:** Truog
        * **SA007:** Double acid
        * **SA008:** Colwell
        * **SA009:** Water
        * **SA010:** IFDC Pi strip
- **Variable:** Smpx – P extractable, code (N/A) – Not Used
    - Phosphorus, extractable, determination code.
- **Variable:** SoilID – Soil ID (N/A) – Required
    - Identifier (Insitute + Site + Year + Soil).
- **Variable:** SSite – Site name (N/A) – Not Used
- **Variable:** SWCON – Drainage rate (d^-1) – Not Used
- **Variable:** Tacon – Family, SCS system (N/A) – Not Used
- **Variable:** U – Evaporation limit (cm) – Not Used

Layer *SDB | Soils | Soil | Layer*

- **Variable:** BD – Bulk density (Mg m^-3) – Required
- **Variable:** CaCo – Calcium carbonate content (%) – Optional
- **Variable:** CEC – Cation exchange capacity (cmol kg^-1) – Not Used
- **Variable:** Clay – Clay content (%) – Required
  - < 0.002 mm.
- **Variable:** DUL – Drained upper limit of soil w. (m^3 m^-3) – Required
  - Drained upper limit of soil water availability.
- **Variable:** ExK – K, exchangeable (cmol kg^-1) – Not Used
- **Variable:** ExMg – Mg, exchangeable (cmol kg^-1) – Not Used
- **Variable:** ExNa – Na, exchangeable (cmol kg^-1) – Not Used
- **Variable:** ExtAl – Al, exchangeable ([?]) – Not Used
- **Variable:** ExtFe – Fe, exchangeable ([?]) – Not Used
- **Variable:** ExtMn – Mn, exchangeable ([?]) – Not Used
- **Variable:** ExTs – S, exchangeable ([?]) – Not Used
- **Variable:** KsMtrx – Sat. hydraulic cond, matrix (cm h^-1) – Not Used
  - Matrix.
- **Variable:** LayerNum – Soil layer number (N/A) – Not Used
  - Used in the Expert Soil Builder.
- **Variable:** LL – Lower limit of soil water avl. (m^3 m^-3) – Required
- **Variable:** MH – Master horizon (N/A) – Not Used
- **Variable:** OC – Organic C (%) – Required
- **Variable:** P_ActIno – Active inorganic P in soil (mg kg^-1) – Not Used
- **Variable:** P_Labile – Labile P in soil (mg kg^-1) – Not Used
  - P that can be readily absorbed by plants.
- **Variable:** P_SloIno – Slow inorganic P in soil (mg kg^-1) – Not Used
- **Variable:** pH – pH in water (pH units) – Required
- **Variable:** pHKcl – pH in buffer (pH units) – Not Used
- **Variable:** ResC – Fraction SOC in initial resistant pool (fraction) – Optional
  - Can be overridden by FracResOrgInTotOrgC in experment file
- **Variable:** Sand – Sand content (%) – Not Used
  - This variable used for display only
- **Variable:** SAT – Saturated soil water content (m^3 m^-3) – Optional
- **Variable:** SBioDepF – Depth factor for soil biochem. (unitless) – Optional

  - Factor that restricts soil biochemistry kinetics with depth.
- **Variable:** SHF – Soil hospitality factor (unitless) – Required
  - Soil hospitality factor for root growth.
- **Variable:** SHF_Mat – Mature/perennial soil hospitality factor (unitless) – Optional
  - Mature/perennial soil hospitality factor for root growth. Controlled by the SHF_Mat/SHF_Juv TImpl flag in Mgt_Tillage_App.
- **Variable:** Silt – Silt content (%) – Required
  - 0.002 to 0.05 mm.
- **Variable:** Slec – Electrical conductivity (S m^-1) – Not Used
- **Variable:** Stones – Coarse fragment content (%) – Optional
  - > 2 mm.
- **Variable:** SWCN – Sat. hydraulic cond., macr. (cm h^-1) – Optional
  - Macropore.
- **Variable:** TotBas – Base saturation (cmol kg^-1) – Not Used
- **Variable:** TotN – Total N (%) – Required
- **Variable:** TotP – P, total (mg kg^-1) – Not Used
- **Variable:** ZLYR – Depth to base of layer (cm) – Required

6 Weather File (WDB)

6.1 Stations

WDB | Stations

- **Variable:** Amp – Air temperature amplitude (degree C) – Optional
  - Air temperature amplitude, monthly averages.
- **Variable:** Elev – Elevation (m) – Required
- **Variable:** Hmht – Height of humidity measurements (m) – Not Used
- **Variable:** Lat – Latitude (degree) – Required
- **Variable:** Long – Longitude (degree) – Optional
- **Variable:** Place_Name – State, province, or country (N/A) – Optional
- **Variable:** Station_Name – Station name (N/A) – Optional
- **Variable:** StationID – Station code (N/A) – Required
- **Variable:** Tav – Air temperature average (degree C) – Optional
- **Variable:** Tmht – Height of temp. measurements (m) – Optional
- **Variable:** Wmht – Height of wind measurements (m) – Optional

6.1.1 HourlyRain

WDB | Stations | HourlyRain

- **Variable:** DOY – Day of the year (day of the year) – Optional
- **Variable:** Hour – Hour of the day (h) – Optional
- **Variable:** HrPrecip – Rainfall for the hour (mm) – Optional
- **Variable:** StationID – Weather station ID (N/A) – Optional
  - Four letter station code.
  - **Choices:**
    - **1:** 1
- **Variable:** Year – Four digit year (N/A) – Optional

6.1.2 Storm_Intensity

WDB | Stations | Storm_Intensity

- **Variable:** Month – Month of the year (N/A) – Optional
- **Variable:** SIValue – Storm intensity for the month (N/A) – Optional
- **Variable:** StationID – Station ID (N/A) – Optional
  - **Choices:**
    - **1:** 1

6.1.3 Weather

WDB | Stations | Weather

- **Variable:** CDRad – Clear day solar radiation (MJ m^-2 d^-1) – Not Used
  - Normally this is generated internally in SalGUI
- **Variable:** DewP – Dew point temperature (degree C) – Not Used
- **Variable:** DOY – Day of the year (day of the year) – Required
- **Variable:** PAR – Photosynthetically active rad. (moles m^-2 d^-1) – Not Used
- **Variable:** Rain – Precipitation (mm) – Required
- **Variable:** Rmax – Relative humidity, maximum (%) – Not Used
- **Variable:** Rmin – Relative humidity, minimum (%) – Not Used
- **Variable:** SH – Specific humidity (g/kg) – Not Used
- **Variable:** SRAD – Solar radiation (MJ m^-2 d^-1) – Required
- **Variable:** Tmax – Air temperature, maximum (degree C) – Required
- **Variable:** Tmin – Air temperature, minimum (degree C) – Required
- **Variable:** Wind – Wind run (km/d^) – Not Used
- **Variable:** WindSp – Average wind speed (m/s) – Not Used
  - Averaged over 24 hours
- **Variable:** Year – Four digit year (N/A) – Required

7 Experiment File (XDB)

7.1 Experiment

XDB | Experiment

- **Variable:** Address – Address of Experiment (N/A) – Optional
- **Variable:** Cropfp – Crop file path (N/A) – Required
- **Variable:** Custom – Indentify String (N/A) – Optional
  - This should be a space delimited set of name=value pairs. This can be printed in output file(s) for post process sorting/filtering.
- **Variable:** Elev – Elevation (m) – Optional
  - Not used by the model but can printed in the output file(s) to aid is spatial post-processing
- **Variable:** ExpID – ID for experiment (N/A) – Required
- **Variable:** FracResOrgInTotOrgC – Fraction SOC in initial resistant pool (fraction) – Optional
  - Fraction of organic soil C to go into initial resistant pool. If it exists it will override the FracResOrgInTotOrgC value in Soils and the ResC value in Soil Layers.
- **Variable:** kResOrg – Temporary Resistiant Organic Parameter (N/A) – Optional
- **Variable:** kSloOrg – Temporary Slow Organic Parameter (N/A) – Optional
- **Variable:** Lat – Latitude (degree) – Optional
  - Not used by the model but can printed in the output file(s) to aid is spatial post-processing
- **Variable:** Location – Location description (N/A) – Optional
- **Variable:** Long – Longitude (degree) – Optional
  - Not used by the model but can printed in the output file(s) to aid is spatial post-processing
- **Variable:** NitDenitFlag – De/Nitrification model to use (N/A) – Optional
  - User can select which soil Denitrification/Nitrification model to use for that experiment. This is ignored if NitDenitFlag is set on the command line or in the control file.
  - **Choices:**
    - **dssat:** Use model from DSSAT
    - **daycent:** Use model from DayCent
    - **dndc:** Use model from DNDC
    - **dssat:** Use model from DSSAT
    - **salus:** Use the SALUS classic code
- **Variable:** NYrs – Number of years of simulation (yr) – Required
- **Variable:** Person – Name of the researcher(s) (N/A) – Optional
- **Variable:** SDOY – Starting day of year (day of the year) – Required
- **Variable:** Soilfp – Soil file path (N/A) – Required
- **Variable:** SoilID – Soil ID (N/A) – Required
  - Identifier (Insitute + Site + Year + Soil).
- **Variable:** SoilTempFlag – Soil temperature model to use (N/A) – Optional

  - User can select which soil temperature model to use for that experiment. This is ignored if SoilTempFlag is set on the command line or in the control file.
  - **Choices:**
    * **salus:** Use the SALUS classic Soil Temperature code

- **Variable:** SOMModFlag – Soil organic model to use (N/A) – Optional
  - User can select which soil organic matter model to use for that experiment. This is ignored if SOMModFlag is set on the command line or in the control file.
  - **Choices:**
    * **century:** Use the Century SOM from DSSAT
    * **daycent:** Use the Century SOM from DSSAT
    * **dssat:** Use the Century SOM from DSSAT
    * **salus:** Use the SALUS classic SOM code

- **Variable:** StationID – Weather station ID (N/A) – Required
  - Weather station code.

- **Variable:** SYear – Starting year of simulation (N/A) – Required
  - Four-digit.

- **Variable:** Title – Title of this experiment (N/A) – Required
- **Variable:** Weatherfp – Weather file path (N/A) – Required

7.1.1 Custom_Labels

XDB | Experiment | Custom_Labels

- **Variable:** Label1 – An example of a custom label (Text) – Optional
- **Variable:** Label2 – Another example of a custom label (Text) – Optional

7.1.2 EnvMod

XDB | Experiment | EnvMod

- **Variable:** CO2Adj – CO2 adjustment (ppm) – Optional
- **Variable:** CO2Fac – CO2 adjustment factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract

- **Variable:** DayAdj – Daylight adjustment (h) – Optional
- **Variable:** DayFac – Daylight adjustment factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply

    * **R:** Replace
    * **S:** Subtract

- **Variable:** DOY – Day of year of env. modif. (day of the year) – Required
- **Variable:** DptAdj – Dew point adjustment (degree C) – Optional
- **Variable:** DptFac – Dew point adjustment factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract
- **Variable:** PrcAdj – Precipitation adjustment (mm) – Optional
- **Variable:** PrcFac – Precip. adjustment factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract
- **Variable:** RadAdj – Radiation adjustment (MJ m^-2 d^-1) – Optional
- **Variable:** RadFac – Radiation adjustment factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract
- **Variable:** TnAdj – Temperature (min.) adjustment (degree C) – Optional
- **Variable:** TnFac – Temperature (min.) adj. factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract
- **Variable:** TxAdj – Temperature (max.) adjustment (degree C) – Optional
- **Variable:** TxFac – Temperature (max.) adj. factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract
- **Variable:** WndAdj – Wind adjustment (km d^-1) – Optional
- **Variable:** WndFac – Wind adjustment factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract
- **Variable:** Year – Year of environmental modif. (N/A) – Required

7.1.3 Experiments_Notes

XDB | Experiment | Experiments_Notes

- **Variable:** Notes – Freeform notes about experiment (N/A) – Optional

7.1.4 Mgt_InitialCond

XDB | Experiment | Mgt_InitialCond

- **Variable:** DOY – Day of year of soil analysis (day of the year) – Required
  - If needed.
- **Variable:** EfInoc – Rhizobia number, scaled (unitless) – Not Used
- **Variable:** EfNFix – Rhizobia effectiveness, scaled (unitless) – Not Used
- **Variable:** FlDD – Initial drain depth (cm) – Not Used
- **Variable:** KnDnFrac – Knock-down fraction (kg kg^-1) – Optional
  - Fraction of initial above ground residue that is fallen vs. standing. Used only when previous crop was no-till.
- **Variable:** PrCrop – Previous crop code (N/A) – Optional
  - Two-character crop code.
  - **Choices:**
    - **AL:** Alfalfa
    - **AR:** Aroid
    - **BA:** Barley
    - **BN:** Dry bean
    - **BW:** Broad leaf weed
    - **CO:** Cotton
    - **CS:** Cassava
    - **FA:** Fallow
    - **GW:** Grass weed
    - **ML:** Pearl millet
    - **MZ:** Maize
    - **NC:** Not a Crop
    - **PN:** Peanut
    - **PT:** Potato
    - **RI:** Rice
    - **SB:** Soybean
    - **SC:** Sugar cane
    - **SG:** Grain sorghum
    - **SQ:** Crop sequence
    - **ST:** Shrubs/Tree
    - **WH:** Wheat
- **Variable:** SFDrn – Initial drain spacing (m) – Not Used
- **Variable:** TDep – Tillage depth (cm) – Optional
  - Tillage depth that was used in the previous crop. If previous crop was no-till, enter -99. Ignored if TImpl is blank.

- **Variable:** TImpl – Tillage implement code (N/A) – Optional
  - Tillage implement that was used in the previous crop. If previous crop was no-till, leave blank.
  - **Choices:**
    * **TI000:** Undefined Implement
    * **TI002:** Tandem disk
    * **TI003:** Offset disk
    * **TI004:** Oneway disk
    * **TI005:** Moldboard plow
    * **TI006:** Chisel plow
    * **TI007:** Disk plow
    * **TI008:** Subsoiler
    * **TI009:** Breeder/lister
    * **TI010:** Field cultivator
    * **TI011:** Row crop cultivator
    * **TI012:** Harrow-springtooth
    * **TI013:** Harrow-spike
    * **TI014:** Rotary hoe
    * **TI015:** Roto-tiller
    * **TI016:** Row crop planter
    * **TI017:** Drill
    * **TI018:** Shredder
    * **TI019:** Hoe
    * **TI020:** Planting stick
    * **TI021:** Animal-drawn implement
    * **TI022:** Hand
    * **TI023:** Manual hoeing
- **Variable:** WResAG – Weight of aboveground residue (kg ha^-1) – Required
  - Above ground residue weight from previous crop.
- **Variable:** WResNd – Nodule wt. from previous crop (kg ha^-1) – Not Used
- **Variable:** WResR – Root weight from previous crop (kg ha^-1) – Required
- **Variable:** Year – Year of soil analysis (N/A) – Required
  - If needed, four-digits.

Layer *XDB | Experiment | Mgt_InitialCond | Layer*

- **Variable:** DLayrI – Depth to bottom of the layer (cm) – Required
- **Variable:** INinorg – Initial soil inorganic N (g elemental N Mg^-1 soil) – Optional
- **Variable:** P_ActIno – Initial active inorganic P (g elemental P Mg^-1 soil) – Optional
- **Variable:** P_Labile – Initial labile P (g elemental P Mg^-1 soil) – Optional
  - P that can be readily absorbed by plants.
- **Variable:** P_SloIno – Initial slow inorganic P (g elemental P Mg^-1 soil) – Optional
- **Variable:** SWInit – Initial soil water content (m^3 m^-3) – Optional
- **Variable:** TotP – Initial total soil P (g elemental P Mg^-1 soil) – Not Used
  - Presently not used by the model.

7.1.5 Measured_Data

XDB | Experiment | Measured_Data

- **Variable:** Date – Date of measurement (N/A) – Required
  - YYYY-MM-DD
- **Variable:** FieldName – Variable name (same as in output files) (N/A) – Required
  - For layered variables use variable_name(layer) using the pre-calculated depths (0-2, 2-7, 7-15, 15-26, 26-40, 40-57, 57-77, 77-100, 100-125, 125-150, 150-175, 175-200)
- **Variable:** Value – Value of the measured data (various) – Required

7.1.6 Measured_Data_Notes

XDB | Experiment | Measured_Data_Notes

- **Variable:** Notes – Freeform notes about measured data (N/A) – Required

7.1.7 Rotation_Components

XDB | Experiment | Rotation_Components

- **Variable:** OrderNum – Order of the treatment (integer) – Required
  - Order of the running the Rotation_Component (1, 2, 3...).
- **Variable:** RcID – Unique ID for rotation component (N/A) – Required
- **Variable:** Repeat – # times to repeat component (integer) – Optional
  - Number of times to repeat this Rotation_Component before moving on to the next one
- **Variable:** TimesToUse – How many times to use Rotation_Component (int) – Optional
  - Use a rotation component X times and drop it from reusing later in the rotation. This Rotation Compent can repeat any number of time for the same use. For example for spin-up TimesToUse might be set to 1.
- **Variable:** Title – Rotation component title (N/A) – Required
- **Variable:** WeatherOffset – Number years difference between current date and weather date. (yr) – Optional
  - For this Rotation Component how many years difference between the current date and weather date to use. If WeatherYrear is set, this variable is ignored.
- **Variable:** WeatherYear – Year to start reading weather from. (yr) – Optional
  - For this Rotation Component what year to pull weather from. Supersedes WeatherOffset if both are set.

Component *XDB | Experiment | Rotation_Components | Component*

- **Variable:** EndFlag – How to End Component (N/A) – Required
  - How to End This Current Management Component [Reorted (I)SO date, (R)eported Year/DOY, reported (D)ays after planting, days after (H)arvest or day of the (Y)ear].
  - **Choices:**
    * **D:** Days after Planting
    * **H:** Days after Harvest
    * **I:** Reported ISO Date (yyyy-mm-dd)
    * **R:** Reported Year/Day-of-year
    * **Y:** Reported Day of the year
- **Variable:** GrazeFlag – Perennial Harvest management (N/A) – Required
  - Management for grazing of the crop (R)eported Date, reported (D)ays after planting, reported days after (H)arvest, day of the (Y)ear, or (I)SO date.
  - **Choices:**
    * **D:** Days after Planting
    * **H:** Days after Harvest
    * **I:** Reported ISO Date (yyyy-mm-dd)
    * **N:** No Grazing
    * **R:** Reported Date
    * **Y:** Reported Day of Year
- **Variable:** IEnvI – Environmental Mod. Management (N/A) – Required
  - Environmental Modification Management [(N)o environmental modification, (R)eported Date, reported (D)ays after planting, or day of the (Y)ear].
  - **Choices:**
    * **D:** Days after Planting
    * **H:** Days after Harvest
    * **N:** No Environmental Modification
    * **R:** Reported Date
    * **Y:** Reported Day of the year
- **Variable:** IferI – Fertilizer management (N/A) – Required
  - Fertilizer management [(A)uto, (N)o Fertilizer, Auto with (F)ixed amount, (R)eported Date, rported (D)ays after planting, or day of the (Y)ear].
  - **Choices:**
    * **A:** Automatic
    * **D:** Days after planting
    * **F:** Automatic with fixed amount
    * **H:** Days after Harvest
    * **N:** Not Fertilized
    * **R:** Reported Date
    * **Y:** Reported Day of Year
- **Variable:** IHarI – Harvest management (N/A) – Required
  - Harvest management [(A)uto; auto at (G)rowth stages, at (M)aturity, or Top (W)eight (R)eported Date, reported (D)ays after planting, or day of the (Y)ear].
  - **Choices:**

    * **A:** Automatic
    * **D:** Days after Planting
    * **G:** At Growth Stages
    * **H:** Days after Harvest of an earlier crop
    * **M:** At Maturity
    * **O:** At maturity Or reported date, which ever happens first
    * **R:** Reported Date
    * **W:** Harvest when crop reaches given weight
    * **Y:** Reported Day of Year

- **Variable:** IIrrI – Irrigation management (N/A) – Required
  - Irrigation management [(A)uto, (N)ot Irrigated, Auto with (F)ixed amount, (R)eported Date, reported (D)ays after planting, or day of the (Y)ear].
  - **Choices:**
    * **A:** Automatic and refill profile
    * **D:** Days after planting or day of year
    * **F:** Automatic with fixed amount
    * **H:** Days after Harvest
    * **N:** Not irrigated
    * **R:** Reported Date
    * **Y:** Reported Day of Year

- **Variable:** IPerenHarI – Perennial Harvest management (N/A) – Required
  - Management for non-final harvesting of crops [(A)uto; auto at (G)rowth stages, at (M)aturity, or Top (W)eight (R)eported Date, reported (D)ays after planting, or day of the (Y)ear].
  - **Choices:**
    * **A:** Automatic
    * **D:** Days after Planting
    * **G:** At Growth Stages
    * **H:** Days after Harvest
    * **M:** At Maturity
    * **N:** No Perennial Harvest
    * **R:** Reported Date
    * **W:** Harvest when crop reaches given weight
    * **Y:** Reported Day of Year

- **Variable:** IPltI – Planting/transplant management (N/A) – Required
  - Planting/Transplant management [(A)uto or (R)eported Date].
  - **Choices:**
    * **A:** Automatic
    * **D:** Days after Planting (of a previous crop)
    * **H:** Days after Harvest (of a previous crop)
    * **N:** Not applicable
    * **R:** Reported Date
    * **Y:** Reported Day of Year

- **Variable:** IResI – External residue management (N/A) – Required
  - Residue management [(A)uto for crop sequence, (N)o residue, (R)eported Date, reported (D)ays after planting, or day of the (Y)ear]. This is for residue brought in by the grower, not the left over material from previous crop.
  - **Choices:**

        * **A:** Automatic
        * **D:** Days after planting or day of year
        * **H:** Days after Harvest
        * **N:** No Residue Applications
        * **R:** Reported Date
        * **Y:** Reported Day of Year

- **Variable:** ITilI – Tillage management (N/A) – Required
    - Tillage management [(A)uto for crop sequence, (N)o tillage, (R)eported Date, reported (D)ays after planting, or day of the (Y)ear].
    - **Choices:**
        * **A:** Automatic
        * **D:** Days after planting
        * **H:** Days after Harvest
        * **N:** No tillage
        * **R:** Reported Date
        * **Y:** Reported Day of Year
- **Variable:** OrderNum – Order of the Component (N/A) – Required
    - Order of the Compent inside a Rotation_Component (1, 2, 3...).
- **Variable:** RcID – Unique ID for Component (N/A) – Required
- **Variable:** Repeat – # times to repeat component (integer) – Optional
    - Number of times to repeat this Component before moving on to the next one
- **Variable:** TimesToUse – How many times to use Component (integer) – Optional
    - Use a Component X times and then drop it from reusing later in the rotation. This Rotation Compent can repeat any number of time for the same use.
- **Variable:** Title – Component title (N/A) – Required

Mgt_End_Component *XDB | Experiment | Rotation_Components | Component | Mgt_End_Component*

- **Variable:** DAH – Days after harvest (d) – Optional
    - Days after harvest of crop TargetPlantID
- **Variable:** DAP – Days after planting (d) – Optional
    - Days after planting of crop PlantID
- **Variable:** Date – ISO Date to end component (date) – Optional
- **Variable:** DOY – Day of year to end component (day of the year) – Optional
- **Variable:** EndFlag – How to End Component (N/A) – Required
    - Overrides the EndFlag on the component line.
    - **Choices:**
        * **D:** Days after Planting
        * **H:** Days after Harvest
        * **I:** Reported ISO Date (yyyy-mm-dd)
        * **R:** Reported Year/Day-of-year

        * **Y:** Reported Day of the year
- **Variable:** TriggerPlantID – Crop ID for DAP or DAH (N/A) – Optional
    - If this event depends on a specfic crop, previously planted in the field. Used with DAP or DAH.
- **Variable:** Year – Year to end component (N/A) – Optional
    - Not used in current version.

Mgt_EnvMod_App *XDB | Experiment | Rotation_Components | Component | Mgt_EnvMod_App*

- **Variable:** CO_2Adj – CO_2 adjustment (ppm) – Optional
- **Variable:** CO_2Fac – CO_2 adjustment factor (N/A) – Optional
    - **Choices:**
        * **A:** Add
        * **M:** Multiply
        * **R:** Replace
        * **S:** Subtract
- **Variable:** DAP – Days after planting for modif. (d) – Optional
    - If needed.
- **Variable:** DayAdj – Daylight adjustment (h) – Optional
- **Variable:** DayFac – Daylight adjustment factor (N/A) – Optional
    - **Choices:**
        * **A:** Add
        * **M:** Multiply
        * **R:** Replace
        * **S:** Subtract
- **Variable:** DOY – Day of year of env. modif. (day of the year) – Optional
    - If needed.
- **Variable:** DptAdj – Dew point adjustment (degree C) – Optional
- **Variable:** DptFac – Dew point adjustment factor (N/A) – Optional
    - **Choices:**
        * **A:** Add
        * **M:** Multiply
        * **R:** Replace
        * **S:** Subtract
- **Variable:** PrcAdj – Precipitation adjustment (mm) – Optional
- **Variable:** PrcFac – Precip. adjustment factor (N/A) – Optional
    - **Choices:**
        * **A:** Add
        * **M:** Multiply
        * **R:** Replace
        * **S:** Subtract

- **Variable:** RadAdj – Radiation adjustment (MJ m^-2 d^-1) – Optional
- **Variable:** RadFac – Radiation adjustment factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract
- **Variable:** TnAdj – Temperature (min.) adjustment (degree C) – Optional
- **Variable:** TnFac – Temperature (min.) adj. factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract
- **Variable:** TxAdj – Temperature (max.) adjustment (degree C) – Optional
- **Variable:** TxFac – Temperature (max.) adj. factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract
- **Variable:** WndAdj – Wind adjustment (km d^-1) – Optional
- **Variable:** WndFac – Wind adjustment factor (N/A) – Optional
  - **Choices:**
    * **A:** Add
    * **M:** Multiply
    * **R:** Replace
    * **S:** Subtract
- **Variable:** Year – Year of environmental modif. (N/A) – Optional
  - If needed.

Mgt_Fertilizer_App *XDB | Experiment | Rotation_Components | Component | Mgt_Fertilizer_App*

- **Variable:** ACFer – Ca in applied fertilizer (kg ha^-1) – Not Used
- **Variable:** ACrbFer – C in applied fertilizer (kg ha^-1) – Optional
- **Variable:** AKFer – K in applied fertilizer (kg ha^-1) – Not Used
- **Variable:** ANFer – N in applied fertilizer (kg ha^-1) – Optional
- **Variable:** AOFer – Other elements in appl. fert. (kg ha^-1) – Not Used
- **Variable:** APFer – P in applied fertilizer (kg ha^-1) – Optional
- **Variable:** DAP – Days after planting for fert. (d) – Optional

  - If needed.

- **Variable:** DFert – Fertilizer depth (cm) – Required
  - Fertilizer application/placement depth.
- **Variable:** DOY – Day of year of fert. event (day of the year) – Optional
  - If needed.
- **Variable:** FerCode – Fertilizer code (N/A) – Not Used
  - Fertilizer application/placement code.
  - **Choices:**
    * **AP000:** Applied when required - no shortage
    * **AP001:** Broadcast, not incorporated
    * **AP002:** Broadcast, incorporated
    * **AP003:** Banded on surface
    * **AP004:** Banded beneath surface
    * **AP005:** Applied in irrigation water
    * **AP006:** Foliar spray
    * **AP007:** Bottom of hole
    * **AP008:** On the seed
    * **AP009:** Injected
    * **AP011:** Brodcast on flooded/saturated soil, none in soil
    * **AP012:** Brodcast on flooded/saturated soil, 15% in soil
    * **AP013:** Brodcast on flooded/saturated soil, 30% in soil
    * **AP014:** Brodcast on flooded/saturated soil, 45% in soil
    * **AP015:** Brodcast on flooded/saturated soil, 60% in soil
    * **AP016:** Brodcast on flooded/saturated soil, 75% in soil
    * **AP017:** Brodcast on flooded/saturated soil, 90% in soil
    * **AP018:** Band on saturated soil, 2cm flood, 92% in soil
    * **AP019:** Deeply placed urea super granules/pellets, 95% in
    * **AP020:** Deeply placed urea super granules/pellets, 100% in
- **Variable:** FerDecRt – Fertilizer decomposition rate (d^-1) – Required
  - Fertilizer decomposition rate constant under optimum conditions. If set to <= 0.0 (or not used) the value will default to the value into global (GDB) file for that fertilizer type.
- **Variable:** FInP – Fertilizer incorporation perc. (%) – Required
- **Variable:** FOCod – Other element code (N/A) – Not Used
  - Not currently used.
- **Variable:** IFType – Fertilizer material code (N/A) – Required
  - **Choices:**
    * **FE001:** Ammonium nitrate
    * **FE002:** Ammonium sulfate
    * **FE003:** Ammonium-nitrate-sulfate
    * **FE004:** Anhydrous ammonia
    * **FE005:** Urea
    * **FE006:** Diammoium phosphate
    * **FE007:** Monoammonium phosphate
    * **FE008:** Calcium nitrate

        * **FE009:** Aqua ammonia
        * **FE010:** Urea ammonium nitrate solution
        * **FE011:** Calcium ammonium nitrate solution
        * **FE012:** Ammonium polyphosphate
        * **FE013:** Single superphosphate
        * **FE014:** Triple superphosphate
        * **FE015:** Liquid phosphoric acid
        * **FE016:** Potassium chloride
        * **FE017:** Potassium nitrate
        * **FE018:** Potassium sulfate
        * **FE019:** Urea super granules
        * **FE020:** Dolomitic limestone
        * **FE021:** Rock Phosphate
        * **FE022:** Calceitic limestone
        * **FE023:** Unknown
        * **FE024:** Rhizobium
        * **FE025:** Unknown
        * **FE026:** Calcium hydroxide
        * **FE027:** Unknown
        * **FE028:** Unknown
        * **FE029:** Unknown
        * **FE030:** Unknown
        * **NOCOD:** Unknown
- **Variable:** VolN – Volatile N (%) – Required
    - Percent of total N that can readily volatilize if surface-applied.
- **Variable:** VolNRate – Volatile N loss rate (d^-1) – Required
    - Rate constant for loss of N that can readily volatilize if surface-applied.
- **Variable:** Year – Year of fertilizer event (N/A) – Optional
    - If needed, four-digits.

Mgt_Fertilizer_Auto *XDB | Experiment | Rotation_Components | Component | Mgt_Fertilizer_Auto*

- **Variable:** DSoilN – Application depth (cm) – Required
- **Variable:** NCode – Material code (N/A) – Required
    - **Choices:**
        * **FE001:** Ammonium nitrate
        * **FE002:** Ammonium sulfate
        * **FE003:** Ammonium-nitrate-sulfate
        * **FE004:** Anhydrous ammonia
        * **FE005:** Urea
        * **FE006:** Diammonium phosphate
        * **FE007:** Monoammonium phosphate
        * **FE008:** Calcium nitrate
        * **FE009:** Aqua ammonia
        * **FE010:** Urea ammonium nitrate solution
        * **FE011:** Calcium ammonium nitrate solution

        * **FE012:** Ammonium polyphosphate
        * **FE013:** Single superphosphate
        * **FE014:** Triple superphosphate
        * **FE015:** Liquid phosphoric acid
        * **FE016:** Potassium chloride
        * **FE017:** Potassium nitrate
        * **FE018:** Potassium sulfate
        * **FE019:** Urea super granules
        * **FE020:** Dolomitic limestone
        * **FE021:** Rock Phosphate
        * **FE022:** Calceitic limestone
        * **FE023:** Unknown
        * **FE024:** Rhizobium
        * **FE025:** Unknown
        * **FE026:** Calcium hydroxide
        * **FE027:** Unknown
        * **FE028:** Unknown
        * **FE029:** Unknown
        * **FE030:** Unknown
        * **NOCOD:** Unknown
- **Variable:** NEnd – End of appl., growth stage (N/A) – Optional
    - End of applications, growth stage.
    - **Choices:**
        * **0:** Until emergence
        * **1:** Until induction (WH,BA incl. vern. Others incl. juv.)
        * **2:** Until end of veg. growth (last leaf stops expanding)
        * **3:** Until ear stops growing
        * **4:** Until maturity
- **Variable:** SoilNC – Threshold, N stress factor (%) – Required
- **Variable:** SoilNX – Amount per application (kg N ha^-1) – Required

Mgt_Grazing_App *XDB | Experiment | Rotation_Components | Component | Mgt_Grazing_App*

- **Variable:** DAP – Days after planting for harv. (d) – Optional
    - If needed.
- **Variable:** DOY – Day of year of harvest event (day of the year) – Optional
    - If needed.
- **Variable:** HKnDnPc – Harvest knock-down percent (%) – Optional
    - Percent of stalk/leaves knocked down at harvest.
- **Variable:** HLiveRemainBio – Fixed amount of biomass left (kg ha-1) – Optional
    - Fixed amount of biomass CWAD to keep alive during a harvest. Only used if if HLiveRemainPC is blank/invalid.
- **Variable:** HLiveRemainPc – Percent live plant remaining (%) – Optional
    - Percent of CWAD to keep alive during a harvest. Also how much relative thermal to keep.

- **Variable:** HPc – Harvest percentage (%) – Optional
- **Variable:** MyPlantID – Plant ID of the crop being grazed on (N/A) – Optional
  - Must be paired with a Mgt_Planting record, in the same rotation component, with the same MyPlantID. Used to track an individul crop when multiple crops are planted at the same time (intercropping).
- **Variable:** TriggerPlantID – Plant ID of crop used to trigger grazing. (N/A) – Optional
  - If this planting event depends on another crop, previously planted in the same field. For example this crop is planted 10 days after a previous crop was harvested.
- **Variable:** Year – Year of harvest event (N/A) – Optional
  - If needed, four-digits.

Mgt_Harvest_App *XDB | Experiment | Rotation_Components | Component | Mgt_Harvest_App*

- **Variable:** DAP – Days after planting for harv. (d) – Optional
  - If needed.
- **Variable:** DOY – Day of year of harvest event (day of the year) – Optional
  - If needed.
- **Variable:** HBmin – HBmin (None) – Not Used
- **Variable:** HBPc – Percent of byproduct harvested (%) – Optional
- **Variable:** HCom – Harvest component code (N/A) – Not Used
  - **Choices:**
    - **C:** Canopy
    - **H:** Harvest Product
    - **L:** Leaves
- **Variable:** HKnDnPc – Harvest knock-down percent (%) – Optional
  - Percent of stalk/leaves knocked down at harvest.
- **Variable:** HPc – Harvest percentage (%) – Optional
- **Variable:** HSiz – Harvest size group code (N/A) – Not Used
  - **Choices:**
    - **A:** All
    - **L:** Large - greater than 2/3 full size
    - **M:** Medium - from 1/3 to 2/3 full size
    - **S:** Small - less than 1/3 full size
- **Variable:** HStg – Harvest stage code (N/A) – Not Used
- **Variable:** Year – Year of harvest event (N/A) – Optional
  - If needed, four-digits.

Mgt_Harvest_Auto *XDB | Experiment | Rotation_Components | Component | Mgt_Harvest_Auto*

- **Variable:** HDlay – Earliest, days after maturity (d) – Optional
- **Variable:** HLDOY – Day of year for end of harvest (day of the year) – Required
  - Day of year for end of harvest window.
- **Variable:** HLYear – Year for end of harvest window (N/A) – Required
- **Variable:** HPP – Percent of product harvested (%) – Required
- **Variable:** HRP – Percent of residue harvested (%) – Required
- **Variable:** HTopW – Top weight to trigger harvest (kg/ha) – Optional
  - Only needed when IharI = "W"

Mgt_Irrigation_App *XDB | Experiment | Rotation_Components | Component | Mgt_Irrigation_App*

- **Variable:** Amt – Irrigation amount (mm or mm d^-1) – Required
  - Irrigation amount, depth of water/water table, bund height, or percolation rate.
- **Variable:** DAP – Days after planting for irrig. (d) – Optional
  - If needed.
- **Variable:** DFDrn – Drainage type (N/A) – Not Used
  - **Choices:**
    - **DR00:** No drainage
    - **DR01:** Ditches
    - **DR02:** Sub-surface tiles
    - **DR03:** Surface furrows
- **Variable:** DitchBottomWidth – Width of the bottom of the drainage ditch (m) – Optional
  - Used for Controlled Drainage
- **Variable:** DitchDepth – Depth of drainage ditch (m) – Optional
  - Used for Controlled Drainage
- **Variable:** DitchLength – Length of drainage ditch (cm) – Optional
  - Used for Controlled Drainage
- **Variable:** DitchTopWidth – Width of the top of the drainage ditch (cm) – Optional
  - Used for Controlled Drainage
- **Variable:** DOY – Day of year of irr. event (day of the year) – Optional
  - If needed.
- **Variable:** FLDD – Depth to Drain (cm) – Optional
  - Used for Controlled Drainage
- **Variable:** HeightDrainPipe – Height of Drainage Pipes (cm) – Optional
  - Measured from the bottom of the ditch. Used for Controlled Drainage

- **Variable:** IrrCod – Irrigation operation code (N/A) – Required
  - **Choices:**
    * **IR001:** Furrow
    * **IR002:** Alternating furrows
    * **IR003:** Flood
    * **IR004:** Sprinkler
    * **IR005:** Drip or trickle
    * **IR006:** Flood Depth
    * **IR007:** Water table depth
    * **IR008:** Percolation rate (mm/day)
    * **IR009:** Bund height
    * **IR010:** Puddling Switch (Amt = 0 => Yes or Amt = 1 => No)
    * **IR011:** Set Flood Water Height
    * **MSU10:** Drainage through pipes (mm/day)
    * **MSU11:** Managed water table depth
    * **MSU12:** Set controlled drainage parameters
- **Variable:** SFDrn – Drain spacing (m) – Not Used
- **Variable:** SurfAreaPlot – Surface area of plot (m^2) – Optional
  - Used for Controlled Drainage
- **Variable:** TDCoeff – Tile Drainage Coefficient (unitless) – Optional
  - Used for Controlled Drainage
- **Variable:** Year – Year of irrigation event (N/A) – Optional
  - If needed, four-digits.

Mgt_Irrigation_Auto *XDB | Experiment | Rotation_Components | Component | Mgt_Irrigation_Auto*

- **Variable:** AIrAm – Amount per irrigation if fixed (mm) – Optional
- **Variable:** DSoil – Management depth for irrig. (cm) – Required
  - Management depth for automatic application.
- **Variable:** EffIrr – Irrigation appl. efficiency (unitless) – Not Used
- **Variable:** IAMe – Method for automatic appl. (N/A) – Required
  - Method for automatic applications, code.
  - **Choices:**
    * **IR001:** Furrow
    * **IR002:** Alternating furrows
    * **IR003:** Flood
    * **IR004:** Sprinkler
    * **IR005:** Drip or trickle
    * **IR006:** Flood Depth
    * **IR007:** Water table depth
    * **IR008:** Percolation rate (mm/day)
    * **IR009:** Bund height
    * **MSU10:** Drainage through pipes (mm/day)
    * **MSU11:** Managed water table depth

- **Variable:** IEPt – End point for automatic appl. (% of max. available w.) – Optional
- **Variable:** IOff – End of appl., growth stage (N/A) – Not Used
  - End of applications, growth stage.
- **Variable:** ThetaC – Threshold for automatic appl. (% of max. available w.) – Required

Mgt_PerenHarv_App *XDB | Experiment | Rotation_Components | Component | Mgt_PerenHarv_App*

- **Variable:** DAP – Days after planting for harv. (d) – Optional
  - If needed.
- **Variable:** DOY – Day of year of harvest event (day of the year) – Optional
  - If needed.
- **Variable:** HKnDnPc – Harvest knock-down percent (%) – Optional
  - Percent of stalk/leaves knocked down at harvest.
- **Variable:** HLiveRemainBio – Fixed amount of biomass left (kg ha-1) – Optional
  - Fixed amount of biomass CWAD to keep alive during a harvest. Only used if if HLiveRemainPC is blank/invalid.
- **Variable:** HLiveRemainPc – Percent live plant remaining (%) – Optional
  - Percent of CWAD to keep alive during a harvest. Also how much relative thermal to keep.
- **Variable:** HPc – Harvest percentage (%) – Optional
- **Variable:** Year – Year of harvest event (N/A) – Optional
  - If needed, four-digits.

Mgt_Planting *XDB | Experiment | Rotation_Components | Component | Mgt_Planting*

- **Variable:** ATemp – Temp. of transplant environ. (degree C) – Not Used
- **Variable:** AziR – Row direction (degrees from N) – Not Used
- **Variable:** CropMod – Crop model to be used (N/A) – Required
  - **Choices:**
    * **C:** Complex
    * **I:** Intermediate – Under development
    * **S:** Simple
- **Variable:** CultivarID – Cultivar code (N/A) – Optional
  - Only needed for Complex crop model
- **Variable:** DOY – Day of year of planting (day of the year) – Optional
  - Only needed if the planting management is set to R or Y
- **Variable:** EDOY – Day of year of emergence (day of the year) – Not Used
- **Variable:** EYear – Year of emergence (N/A) – Not Used
- **Variable:** PlDs – Planting distribution (N/A) – Not Used

  - Planting distribution, row (R), broadcast (B) or hill (H).
  - **Choices:**
    * **B:** Broadcast
    * **H:** Hill
    * **R:** Rows
    * **U:** Uniform

- **Variable:** PlMe – Planting method (N/A) – Not Used
  - Planting method, Transplant (T), seed (S), pregerminated seed (P) or nursery (N).
  - **Choices:**
    * **N:** Nursery
    * **P:** Pregerminated Seed
    * **S:** Seed
    * **T:** Transplant
- **Variable:** PlPH – Plants per hill (plants hill^-1) – Not Used
- **Variable:** Ppoe – Plant population at emergence (plants m^-2) – Not Used
- **Variable:** Ppop – Plant population at seeding (plants m^-2) – Required
- **Variable:** RowSpc – Row spacing (cm) – Required
- **Variable:** SdAge – Transplant age (d) – Not Used
  - Not currently used.
- **Variable:** SDepth – Planting depth (cm) – Required
- **Variable:** SdWtPl – Planting material, dry weight (kg ha^-1) – Not Used
- **Variable:** SpeciesID – Species Identifier (N/A) – Required
  - Formerly restricted to two characters
- **Variable:** SubspeciesID – subspecies code (N/A) – Optional
  - Optionally used by the simple crop model
- **Variable:** Year – Year of planting (N/A) – Optional
  - If needed (planting on reported date), four-digits.

Mgt_Planting_Auto *XDB | Experiment | Rotation_Components | Component | Mgt_Planting_Auto*

- **Variable:** FDOY – Day of year pla. window begins (day of the year) – Required
  - Day of year for beginning of planting window.
- **Variable:** FYear – Year window begins (N/A) – Required
  - Year for beginning of planting window.
- **Variable:** LDOY – Day of year pla. window ends (day of the year) – Required
  - Day of year for end of planting window.
- **Variable:** LYear – Year window ends (N/A) – Required
  - Year for end of planting window.

- **Variable:** MyPlantID – Plant ID of the crop being planted (N/A) – Optional
  - Must be paired with a Mgt_Planting record, in the same rotation component, with the same MyPlantID. Used to track an individul crop when multiple crops are planted at the same time (intercropping).
- **Variable:** PTTn – Min. soil temperature (degree C) – Required
  - Minimum soil temperature (10 cm average).
- **Variable:** PTx – Max. soil temperature (degree C) – Required
  - Maximum soil temperature (10 cm average).
- **Variable:** SwPltD – Management depth for water (cm) – Required
- **Variable:** SwPltH – Uppermost soil water content (%) – Required
- **Variable:** SwPltL – Lowermost soil water content (%) – Required
- **Variable:** TriggerPlantID – Plant ID of crop used to trigger planting. (N/A) – Optional
  - If this planting event depends on another crop, previously planted in the same field. For example this crop is planted 10 days after a previous crop was harvested.

Mgt_Residue_App *XDB | Experiment | Rotation_Components | Component | Mgt_Residue_App*

- **Variable:** DAP – Days after planting for resid. (d) – Optional
  - If needed.
- **Variable:** DepRes – Residue incorporation depth (cm) – Required
- **Variable:** DOY – Day of year of res. app. event (day of the year) – Optional
  - If needed.
- **Variable:** ResC – C content of residues, dry wt. (%) – Required
- **Variable:** ResCode – Residue material, code (N/A) – Required
  - **Choices:**
    * **RE001:** Crop residue
    * **RE002:** Green manure/Compost
    * **RE003:** Barnyard manure
    * **RE004:** Liquid manure
- **Variable:** Residue – Residue amount, dry wt. (kg ha^-1) – Required
- **Variable:** ResK – K content of residues, dry wt. (%) – Not Used
- **Variable:** ResN – N content of residues, dry wt. (%) – Required
- **Variable:** ResP – P content of residues, dry wt. (%) – Optional
- **Variable:** RInP – Residue incorporation percent (%) – Required
- **Variable:** Year – Year of residue event (N/A) – Optional
  - If needed, four-digits.

Mgt_Residue_Auto *XDB | Experiment | Rotation_Components | Component | Mgt_Residue_Auto*

- **Variable:** DResMG – Incorporation depth (cm) – Optional
  - If needed.
- **Variable:** NResDL – Incorp. time after harvest (d) – Not Used
- **Variable:** RIP – Incorp. percent,% of remaining (%) – Required

Mgt_SoilAnalysis *XDB | Experiment | Rotation_Components | Component | Mgt_SoilAnalysis*

- **Variable:** DOY – Day of year of soil analysis (day of the year) – Optional
  - If needed.
- **Variable:** SMHB – pH in buffer method (pH units) – Optional
  - pH in buffer determination method, code.
- **Variable:** SMKE – K method (N/A) – Optional
  - Potassium determination method, code.
  - **Choices:**
    * **SA001:** Olsen
    * **SA002:** Bray No. 1
    * **SA003:** Bray No. 2
    * **SA004:** Mehlich
    * **SA005:** Anion exchange resin
    * **SA006:** Truog
    * **SA007:** Double acid
    * **SA008:** Colwell
    * **SA009:** Water
    * **SA010:** IFDC Pi strip
- **Variable:** SMPX – P method (N/A) – Optional
  - Phosphorus determination method, code.
- **Variable:** Year – Year of soil analysis (N/A) – Optional
  - If needed, four-digits.

Mgt_SoilAnalysis_Lay *XDB | Experiment | Rotation_Components | Component | Mgt_SoilAnalysis | Mgt_SoilAnalysis_Lay*

- **Variable:** SABL – Depth, base of layer (cm) – Optional
- **Variable:** SADM – Bulk density (Mg m^-3) – Optional
- **Variable:** SAKE – K, exchangeable (cmol kg^-1) – Optional
- **Variable:** SANI – Total N content (g kg^-1) – Optional
- **Variable:** SAOC – Organic C content (g kg^-1) – Optional
- **Variable:** SApHB – pH in buffer (pH units) – Optional
- **Variable:** SApHW – pH in water (pH units) – Optional
- **Variable:** SAPX – P, extractable (mg kg^-1) – Optional

Mgt_Tillage_App *XDB | Experiment | Rotation_Components | Component | Mgt_Tillage_App*

- **Variable:** DAP – Days after planting for till. (d) – Optional
  - If needed.
- **Variable:** DOY – Day of year of tillage event (day of the year) – Optional
  - If needed.
- **Variable:** TDep – Tillage depth (cm) – Required
- **Variable:** TImpl – Tillage implement code (N/A) – Required
  - **Choices:**
    * **TI000:** Undefined Implement
    * **TI002:** Tandem disk
    * **TI003:** Offset disk
    * **TI004:** Oneway disk
    * **TI005:** Moldboard plow
    * **TI006:** Chisel plow
    * **TI007:** Disk plow
    * **TI008:** Subsoiler
    * **TI009:** Breeder/lister
    * **TI010:** Field cultivator
    * **TI011:** Row crop cultivator
    * **TI012:** Harrow-springtooth
    * **TI013:** Harrow-spike
    * **TI014:** Rotary hoe
    * **TI015:** Roto-tiller
    * **TI016:** Row crop planter
    * **TI017:** Drill
    * **TI018:** Shredder
    * **TI019:** Hoe
    * **TI020:** Planting stick
    * **TI021:** Animal-drawn implement
    * **TI022:** Hand
    * **TI023:** Manual hoeing
    * **SHF_Juv:** Fake code to tell program to use the standard soil hospitality factor (SHF)
    * **SHF_Mat:** Fake code to tell program to use the mature/perperennial soil hospitality factor (SHF_Mat)
- **Variable:** Year – Year of tillage event (N/A) – Optional
  - If needed, four-digits.