

SALUS Model Data Dictionary

Bruno Basso Lab, Michigan State University

2025-06-23 – GitHub Hash: 9282d2d

Contents

1	Crop File (CDB)	2
1.1	Complex_Species	2
1.1.1	Species	2
1.2	Simple_Crop	7
1.2.1	Species	7
1.3	CO ₂ _XY	13
1.3.1	PhotoSynType	13
1.4	N_Fix	13
1.4.1	Species	13
2	Event Output File (EDB)	14
2.1	Experiment	14
2.1.1	Event	14
3	Global Parameter File (GDB)	18
3.1	Crop_Par	18
3.2	Fert_Par	19
3.3	Irr_Par	19
3.4	Residue_Par	19
3.5	Soil_Bio_Kinetic_Par	20
3.6	Till_Par	21
3.7	CO ₂ _Trend_XY	21
4	Results File (RDB)	21
4.1	Results	21

4.2	Results_Layer	29
5	Soil File (SDB)	31
5.1	Soils	31
5.1.1	Soil	31
6	Weather File (WDB)	34
6.1	Stations	34
6.1.1	HourlyRain	35
6.1.2	Storm_Intensity	35
6.1.3	Weather	35
7	Experiment File (XDB)	36
7.1	Experiment	36
7.1.1	Custom_Labels	37
7.1.2	EnvMod	37
7.1.3	Experiments_Notes	38
7.1.4	Mgt_InitialCond	38
7.1.5	Measured_Data	40
7.1.6	Measured_Data_Notes	41
7.1.7	Rotation_Components	41

I Crop File (CDB)

I.1 Complex_Species

CDB | *Complex_Species*

I.1.1 Species

CDB | *Complex_Species* | *Species*

- **Variable:** CHHeight – 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 senesce 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 P_{1D} 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 ($\text{degree day leaf}^{-1}$) – Optional
 - Phyllochron interval at 14 h daylength. Used to compute phyllochron interval from photoperiod for winter cereals.
- **Variable:** phyll – Phyllochron interval ($\text{degree day leaf}^{-1}$) – 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^{-1}) – 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:**
 - * **EGo.0:** Beginning of ear growth phase
 - * **EGo.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
 - * **GGo.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:** RIPKr – Rel. P concentration in grain (g g^{-1}) – Optional
 - Relative P concentration in grain.
- **Variable:** RIPVg – 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 ($\text{g plant}^{-1} \text{ leaf equiv.}^{-1}$) – 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

1.2 Simple_Crop

CDB | Simple_Crop

1.2.1 Species

CDB | Simple_Crop | Species

- **Variable:** AgeLamEst – Establishment Rate Perennial Crop (unitless) – Optional
 - For perennial, aging curve parameter for increasing the growth for the first AgeBegStableYr years of the crop
- **Variable:** AgeKDecline – Decline Rate Perennial Crop (unitless) – Optional
 - For perennial, aging curve parameter for decreasing the growth after AgeEndStableYr years of the crop
- **Variable:** AgeBegStableYr – First stable/peak year of Perennial Crop (unitless) – Optional

- For perennial, aging curve parameter for the first stable/peak year.
- **Variable:** AgeEndStableYr – Last stable/peak year of Perennial Crop (unitless) – Optional
 - For perennial, aging curve parameter for the last stable/peak year.
- **Variable:** CHeight – Approx. Height of Crop (m) – **Required**
 - Approximate crop height (used for calculating transpiration for CO₂ 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 (m² 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 ($\text{m}^2 \text{m}^{-2}$) – **Required**
 - Relative leaf area index at first point in the growing season.
- **Variable:** relLAI_P2 – Relative LAI at point 2 ($\text{m}^2 \text{m}^{-2}$) – **Required**
 - Relative leaf area index at second point in the growing season.
- **Variable:** relTT_P1 – Relative devel. time at pt. 1 ($(\text{deg. day}) (\text{deg. day})^{-1}$) – **Required**
 - Relative development time at first point in the growing season.
- **Variable:** relTT_P2 – Relative devel. time at pt. 2 ($(\text{deg. day}) (\text{deg. day})^{-1}$) – **Required**
 - Relative development time at second point in the growing season.
- **Variable:** relTT_Sn – Rel dev. time at start of sen. ($(\text{deg. day}) (\text{deg. day})^{-1}$) – **Required**
 - Fraction of growing season when leaf area starts declining.
- **Variable:** RootPartFac – Root Partition Factor (unitless) – Optional
 - A simple multiplier to change the amount of daily biomass that goes to the roots (the higher 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 multiplier to change the amount of daily root biomass that senesce (the higher 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
 - $\text{pcRoot} = (1 - \text{rel_TT}) * \text{RWPC1} + \text{rel_TT} * \text{RWPC2}$
- **Variable:** RWPC2 – Parameter in linear partitioning of biomass (N/A) – Optional
 - $\text{pcRoot} = (1 - \text{rel_TT}) * \text{RWPC1} + \text{rel_TT} * \text{RWPC2}$
- **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:** AgeLamEst – Override establishment Rate Perennial Crop (unitless) – **Optional**
 - For perennial, aging curve parameter for increasing the growth for the first AgeBegStableYr years of the crop
- **Variable:** AgeKDecline – Override decline Rate Perennial Crop (unitless) – **Optional**
 - For perennial, aging curve parameter for decreasing the growth after AgeEndStableYr years of the crop
- **Variable:** AgeBegStableYr – Override first stable/peak year of Perennial Crop (unitless) – **Optional**
 - For perennial, aging curve parameter for the first stable/peak year.
- **Variable:** AgeEndStableYr – Override last stable/peak year of Perennial Crop (unitless) – **Optional**
 - For perennial, aging curve parameter for the last stable/peak year.
- **Variable:** CHHeight – Override approx. height of crop (m) – **Optional**
 - Approximate crop height (used for calculating transpiration for CO₂ 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 ($\text{m}^2 \text{m}^{-2}$) – 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 C₃ Cycle
 - * **C4:** Hatch-Slack or C₄ 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 ($\text{m}^2 \text{m}^{-2}$) – Optional
 - Relative leaf area index at first point in the growing season.
- **Variable:** relLAI_P2 – Override relative LAI at point 2 ($\text{m}^2 \text{m}^{-2}$) – 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 multiplier to change the amount of daily biomass that goes to the roots (the higher 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 multiplier to change the amount of daily root biomass that senesce (the higher 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

I.3 CO₂_XY

CDB|CO₂_XY

I.3.I 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 multiply daily accumulation of Carbon in a plant in response to CO₂ level

I.4 N_Fix

CDB|N_Fix

I.4.I 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 restricted 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 restricted 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:** 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:** 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:**

- * **Tl000:** Undefined Implement
- * **Tl002:** Tandem disk
- * **Tl003:** Offset disk
- * **Tl004:** Oneway disk
- * **Tl005:** Moldboard plow
- * **Tl006:** Chisel plow
- * **Tl007:** Disk plow
- * **Tl008:** Subsoiler
- * **Tl009:** Breeder/lister
- * **Tl010:** Field cultivator
- * **Tl011:** Row crop cultivator
- * **Tl012:** Harrow-springtooth
- * **Tl013:** Harrow-spike
- * **Tl014:** Rotary hoe
- * **Tl015:** Roto-tiller
- * **Tl016:** Row crop planter
- * **Tl017:** Drill
- * **Tl018:** Shredder
- * **Tl019:** Hoe
- * **Tl020:** Planting stick
- * **Tl021:** Animal-drawn implement
- * **Tl022:** Hand
- * **Tl023:** 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 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

3.2 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:** NH4Frac – Fraction of N in ammonium (Fraction) – **Required**
- **Variable:** NO3Frac – 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

3.3 Irr_Par

GDB\ *Irr_Par*

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

3.4 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]

3.5 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

3.6 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**

3.7 CO₂_Trend_XY

GDB | CO₂_Trend_XY

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

4 Results File (RDB)

4.1 Results

RDB | Results

- **Variable:** BMh – Upper limit sink capacity (g/plant) – Not Used
- **Variable:** BMl – Lower limit sink capacity (g/plant) – Not Used
- **Variable:** BWAH – By-Product at Harvest (kg ha⁻¹) – Not Used

- Dry Weight
- **Variable:** BWAHC – Cumulative By-Product at Harvest (kg ha^{-1}) – Not Used
 - Dry Weight
- **Variable:** BundHeight – Height of bund (for rice) (cm) – Not Used
- **Variable:** C_ActInoBl – Below ground active inorg. C (kg ha^{-1}) – Not Used
- **Variable:** C_ActOrgBl – Below ground active organic C (kg ha^{-1}) – Not Used
- **Variable:** C_AtmoCO₂ – Atmospheric CO₂ (ppm) – Not Used
- **Variable:** C_CO₂ – C in cumulative CO₂ evolved (kg ha^{-1}) – Not Used
- **Variable:** CO₂_Effect – Effect that increased CO₂ has on plants (Unitless) – Not Used
 - This is multiplier that increases growth depending on the CO₂ in the atmosphere and if the crop is a C₃ or C₄ plant.
- **Variable:** C_FertApp – C fertilizer applied (kg ha^{-1}) – Not Used
 - Cumulative carbon applied in fertilizer
- **Variable:** C_FertBl – Below ground fertilizer C (kg ha^{-1}) – Not Used
- **Variable:** C_In – Total C additions (kg ha^{-1}) – Not Used
- **Variable:** C_IntFOMAb – Above ground interm. FOM C (kg ha^{-1}) – Not Used
- **Variable:** C_IntFOMBl – Below ground interm. FOM C (kg ha^{-1}) – Not Used
- **Variable:** C_Net – Net C change (kg ha^{-1}) – Not Used
- **Variable:** C_Out – Total C withdrawals (kg ha^{-1}) – Not Used
- **Variable:** C_RapFOMAb – Above ground rapid FOM C (kg ha^{-1}) – Not Used
- **Variable:** C_RapFOMBl – Below ground rapid FOM C (kg ha^{-1}) – Not Used
- **Variable:** C_RDADC – Cumulative C sent to the roots (kg ha^{-1}) – Not Used
- **Variable:** C_ResOrgBl – Below ground resistant org. C (kg ha^{-1}) – Not Used
- **Variable:** C_RSADC – Cumulative C senesced from the roots (kg ha^{-1}) – Not Used
- **Variable:** C_SloFOMAb – Above ground slow FOM C (kg ha^{-1}) – Not Used
- **Variable:** C_SloFOMBl – Below ground slow FOM C (kg ha^{-1}) – Not Used
- **Variable:** C_SloInoBl – Below ground slow inorganic C (kg ha^{-1}) – Not Used
- **Variable:** C_SloOrgBl – Below ground slow organic C (kg ha^{-1}) – Not Used
- **Variable:** C_StDead – Recognizeable standing dead C (kg ha^{-1}) – Not Used
- **Variable:** CapFringe – Depth of capillary fringe (mm) – Not Used
- **Variable:** CD_WaterDepth – Depth H₂O stored in drainage ditch (m) – Not Used
- **Variable:** CD_WaterVolume – Volume H₂O stored in drainage ditch (m^3) – Not Used
- **Variable:** CDay – Cumulative day (d) – Not Used
- **Variable:** CDRad – Clear day radiation ($\text{MJ m}^{-2} \text{d}^{-1}$) – Not Used
 - Estimated solar radiation at the surface on a cloudless day
- **Variable:** ColdFac – Cold stress factor (unitless) – Not Used
- **Variable:** AgeFac – Perennial age factor (unitless) – Not Used

- Perennial crops have low potential growth when planted, increase to a plateau, stays level for a few years, then decreases
- **Variable:** cropmod – Simple or Complex Model? (N/A) – Not Used
 - S for Simple, C for Complex
- **Variable:** cThrTime – Cumulative thermal time (degree day) – Not Used
- **Variable:** CultivarID – Cultivar code (N/A) – Not Used
 - Only used for the complex model
- **Variable:** CWAD – Total above ground biomass (kg ha^{-1}) – Not Used
 - Total mass of stem, leaves, grain, etc.
- **Variable:** DAP – Days after planting (d) – Not Used
- **Variable:** Date – ISO Date (N/A) – Not Used
 - YYYY-MM-DD
- **Variable:** dBiomass – Delta biomass (kg ha^{-1}) – Not Used
- **Variable:** DewP – Average daily dewpoint (degree C) – Not Used
- **Variable:** DOY – Day of the year (day of the year) – Not Used
- **Variable:** DrghtFac – Drought factor (unitless) – Not Used
- **Variable:** DrghtStressDays – Cumulative drought stress (unitless) – Not Used
 - Sum of (1.0 - DrghtFac) during a growing season
- **Variable:** DRNC – Cumulative drainage (mm) – Not Used
- **Variable:** dThrTime – Daily thermal time (degree day) – Not Used
- **Variable:** EOAC – Potential ET, cumul. (mm) – Not Used
- **Variable:** EOAD – Potential ET, daily (mm d^{-1}) – Not Used
- **Variable:** EPAC – Plant transp., cumul. (mm) – Not Used
- **Variable:** EPAD – Plant transp., daily (mm d^{-1}) – Not Used
- **Variable:** EPOAC – Potential plant evap. cumul. (mm) – Not Used
- **Variable:** EPOAD – Potential plant evap. daily (mm d^{-1}) – Not Used
- **Variable:** ESAC – Soil evaporation, cumul. (mm) – Not Used
- **Variable:** ESAD – Soil evaporation, daily (mm d^{-1}) – Not Used
- **Variable:** ESOAC – Potential soil evap. cumul. (mm) – Not Used
- **Variable:** ESOAD – Potential soil evap. daily (mm d^{-1}) – Not Used
- **Variable:** ETAC – Evapotranspiration, cumul. (mm) – Not Used
- **Variable:** ETAD – Evapotranspiration, daily (mm d^{-1}) – Not Used
- **Variable:** ExpElev – Elevation for experiment site (m) – Not Used
 - Echoes the Elev variable in XDB/Experiment
- **Variable:** ExpID – Experiment ID (N/A) – Not Used
- **Variable:** ExpLat – Latitude for experiment site (degree) – Not Used

- Echos the Lat variable in XDB/Experiment
- **Variable:** ExpLong – Longitude for experiment site (degree) – Not Used
 - Echos the Long variable in XDB/Experiment
- **Variable:** FldLvlSet – Desired level of flood water (cm) – Not Used
 - Set by user
- **Variable:** Flood – Flood water height, current (cm) – Not Used
- **Variable:** gPhase – Development phase (N/A) – Not Used
 - 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:** gPhaseoDate – Date Phase 0 is entered (ISO Date) – Not Used
 - Plantng Date
- **Variable:** gPhase1Date – Date Phase 1 is entered (ISO Date) – Not Used
- **Variable:** gPhase2Date – Date Phase 2 is entered (ISO Date) – Not Used
- **Variable:** gPhase3Date – Date Phase 3 is entered (ISO Date) – Not Used
- **Variable:** gPhase4Date – Date Phase 4 is entered (ISO Date) – Not Used
- **Variable:** gPhaseoDOY – Day Phase 0 is entered (N/A) – Not Used
 - Plantng Day of Year
- **Variable:** gPhase1DOY – Day Phase 1 is entered (N/A) – Not Used
- **Variable:** gPhase2DOY – Day Phase 2 is entered (N/A) – Not Used
- **Variable:** gPhase3DOY – Day Phase 3 is entered (N/A) – Not Used
- **Variable:** gPhase4DOY – Day Phase 4 is entered (N/A) – Not Used
- **Variable:** gPhaseoYear – Year Phase 0 is entered (N/A) – Not Used
 - Plantng Year
- **Variable:** gPhase1Year – Year Phase 1 is entered (N/A) – Not Used
- **Variable:** gPhase2Year – Year Phase 2 is entered (N/A) – Not Used
- **Variable:** gPhase3Year – Year Phase 3 is entered (N/A) – Not Used
- **Variable:** gPhase4Year – Year Phase 4 is entered (N/A) – Not Used
- **Variable:** GWAD – Dry weight - grain (kg ha^{-1}) – Not Used
- **Variable:** HeatFac – Heat stress factor (unitless) – Not Used
- **Variable:** HRLT – Day Length (hr) – Not Used
- **Variable:** HWAD – Cumulative harvested plant mass (kg ha^{-1}) – Not Used
- **Variable:** HWAH – Pirmary Harvest (kg ha^{-1}) – Not Used
 - Dry Weight
- **Variable:** HWAHC – Cumulative Pirmary Harvest (kg ha^{-1}) – Not Used
 - Dry Weight

- **Variable:** IPAR – Intercepted photosynthetically active radiation ($\text{MJ m}^{-2} \text{d}^{-1}$) – Not Used
- **Variable:** IRRC – Cumulative irrigation (mm) – Not Used
- **Variable:** KRPP – Number of kernels per shoot (unitless) – Not Used
- **Variable:** LAI – Leaf area index ($\text{m}^2 \text{m}^{-2}$) – Not Used
- **Variable:** LAIMax – Max. leaf area index in the season ($\text{m}^2 \text{m}^{-2}$) – Not Used
- **Variable:** LAIMaxDate – Date of max leaf area index (ISO Date) – Not Used
 - Date of maximum leaf area index during growing season
- **Variable:** LAIMaxDOY – Day of max leaf area index of the year (N/A) – Not Used
 - Day of year of maximum leaf area index of the year during growing season
- **Variable:** LAIMaxYear – Year of max leaf area index (N/A) – Not Used
 - Year of maximum leaf area index during growing season
- **Variable:** LeafEq – Leaf equivalent (leaf equivalent) – Not Used
- **Variable:** LeafEqEar – Leaf Eq for ear growth (leaf equivalent) – Not Used
 - 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) – Not Used
- **Variable:** LeafNum – Number of leaves (count) – Not Used
- **Variable:** LWAD – Dry weight - leaf (kg ha^{-1}) – Not Used
- **Variable:** LWAT – Dry weight - leaf - tillers (kg ha^{-1}) – Not Used
- **Variable:** matDate – Date maturity occurs (Unitless) – Not Used
 - ISO Date
- **Variable:** matDOY – Day of year maturity occurs (Unitless) – Not Used
- **Variable:** matYear – Year maturity occurs (Unitless) – Not Used
- **Variable:** MulchCover – Mulch coverage (fraction) – Not Used
- **Variable:** MulchDW – Mulch dry weight (kg ha^{-1}) – Not Used
- **Variable:** MulchSponge – Mulch water holding capacity (cm) – Not Used
- **Variable:** MulchWat – Water in mulch (cm) – Not Used
- **Variable:** N_ActInoBl – Below ground active inorg. N (kg ha^{-1}) – Not Used
- **Variable:** N_ActOrgBl – Below ground active organic N (kg ha^{-1}) – Not Used
- **Variable:** N_AmmoniaBl – Total ammonia in soil (kg ha^{-1}) – Not Used
- **Variable:** N_BFixBl – Below ground asymbiotic N fixed (kg ha^{-1}) – Not Used
 - N fixed by soil microbes (bacteria, etc) summed across all soil layers.
- **Variable:** N_FertApp – N fertilizer applied (kg ha^{-1}) – Not Used
 - Cumulative nitrogen applied in fertilizer
- **Variable:** N_FertBl – Below ground fertilizer N (kg ha^{-1}) – Not Used
- **Variable:** N_Fix – Cumulative N fixed (kg ha^{-1}) – Not Used

- For symbiosis (legumes, etc.)
- **Variable:** N_Harvst – Cumulative harvested plant N (kg ha^{-1}) – Not Used
- **Variable:** N_In – Total N additions (kg ha^{-1}) – Not Used
- **Variable:** N_LabileBl – Below ground labile N (kg ha^{-1}) – Not Used
- **Variable:** N_Min – N Mineralization/Immobilization (kg ha^{-1}) – Not Used
 - Daily Mineralization/Immobilization values accumulated for all the layers
- **Variable:** N_SOCMin – N Mineralization/Immobilization from SOC (kg ha^{-1}) – Not Used
 - Daily Mineralization/Immobilization from Soil Organic Carbon values accumulated for all the layers
- **Variable:** N_FOMMin – N Mineralization/Immobilization from FOM (kg ha^{-1}) – Not Used
 - Daily Mineralization/Immobilization from Fresh Organic Matter values accumulated for all the layers
- **Variable:** N_N2 – Cumulative N₂ produced (kg ha^{-1}) – Not Used
- **Variable:** N_N2O – Cumulative N₂O to the atmosphere (kg ha^{-1}) – Not Used
 - Cumulative N₂O released into the atmosphere from the surface layer via diffusion
- **Variable:** N_N2OProd – Daily N₂O produced from nit/denitrification ($\text{kg ha}^{-1} \text{ d}^{-1}$) – Not Used
 - Daily N₂O produced as a by-product during nitrification/denitrification in soil
- **Variable:** N_Net – Net N change (kg ha^{-1}) – Not Used
- **Variable:** N_NitrateBl – Total nitrate in soil (kg ha^{-1}) – Not Used
- **Variable:** N_Out – Total N withdrawals (kg ha^{-1}) – Not Used
- **Variable:** N_Plants – Cumulative plant uptake N (kg ha^{-1}) – Not Used
 - This does not count N created by symbionts
- **Variable:** N_RapFOMAb – Above ground rapid FOM N (kg ha^{-1}) – Not Used
- **Variable:** N_RapFOMBl – Below ground rapid FOM N (kg ha^{-1}) – Not Used
- **Variable:** N_ResOrgBl – Below ground resistant org. N (kg ha^{-1}) – Not Used
- **Variable:** N_SloFOMAb – Above ground slow FOM N (kg ha^{-1}) – Not Used
- **Variable:** N_SloFOMBl – Below ground slow FOM N (kg ha^{-1}) – Not Used
- **Variable:** N_SloInoBl – Below ground slow inorganic N (kg ha^{-1}) – Not Used
- **Variable:** N_SloOrgBl – Below ground slow organic N (kg ha^{-1}) – Not Used
- **Variable:** N_Sol – Below ground solution N (kg ha^{-1}) – Not Used
- **Variable:** N_StDead – Recognizeable standing dead N (kg ha^{-1}) – Not Used
- **Variable:** N_UreaBl – Total urea in soil (kg ha^{-1}) – Not Used
- **Variable:** N_Vol – Total N that can volatilize (kg ha^{-1}) – Not Used
- **Variable:** NIAD – Inorganic N in soil (kg ha^{-1}) – Not Used
- **Variable:** NitroFac – N stress factor (unitless) – Not Used
- **Variable:** NitroStressDays – Cumulative N stress (unitless) – Not Used
 - Sum of (1.0 - NitroFac) during a growing season

- **Variable:** NLCC – Cumulative N leached (kg ha^{-1}) – Not Used
 - N leaving the bottom of the soil profile.
- **Variable:** NOAD – Organic N in soil (kg ha^{-1}) – Not Used
- **Variable:** OWAD – Dry weight - one grain (g) – Not Used
- **Variable:** OWAT – Dry weight - one grain-tillers (g) – Not Used
- **Variable:** P_ActInoBl – Below ground active inorg. P (kg ha^{-1}) – Not Used
- **Variable:** P_ActOrgBl – Below ground active organic P (kg ha^{-1}) – Not Used
- **Variable:** P_FertApp – N fertilizer applied (kg ha^{-1}) – Not Used
 - Cumulative phosphorus applied in fertilizer
- **Variable:** P_FertBl – Below ground fertilizer P (kg ha^{-1}) – Not Used
- **Variable:** P_Harvst – Cumulative harvested plant P (kg ha^{-1}) – Not Used
- **Variable:** P_In – Total P additions (kg ha^{-1}) – Not Used
- **Variable:** P_LabileBl – Below ground labile P (kg ha^{-1}) – Not Used
- **Variable:** P_Net – Net P change (kg ha^{-1}) – Not Used
- **Variable:** P_Out – Total P withdrawals (kg ha^{-1}) – Not Used
- **Variable:** P_Plants – Cumulative plant uptake P (kg ha^{-1}) – Not Used
- **Variable:** P_RapFOMAb – Above ground rapid FOM P (kg ha^{-1}) – Not Used
- **Variable:** P_RapFOMBl – Below ground rapid FOM P (kg ha^{-1}) – Not Used
- **Variable:** P_ResOrgBl – Below ground resistant org. P (kg ha^{-1}) – Not Used
- **Variable:** P_SloInoBl – Below ground slow inorganic P (kg ha^{-1}) – Not Used
- **Variable:** P_SloOrgBl – Below ground slow organic P (kg ha^{-1}) – Not Used
- **Variable:** P_Sol – Below ground solution P (kg ha^{-1}) – Not Used
- **Variable:** P_StDead – Recognizeable standing dead P (kg ha^{-1}) – Not Used
- **Variable:** PhaseDes – Development phase name (N/A) – Not Used
 - 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) – Not Used
- **Variable:** PhosStressDays – Cumulative P stress (unitless) – Not Used
 - Sum of (1.0 - PhosFac) during a growing season
- **Variable:** PhotoFac – Photoperiod factor (unitless) – Not Used
- **Variable:** POND – Ponding height, current (mm) – Not Used
- **Variable:** POND MX – Ponding height, maximum (mm) – Not Used
- **Variable:** PREC – Cumulative precipitation (mm) – Not Used
- **Variable:** RadUseEf – Radiation use efficiency (g MJ^{-1}) – Not Used
- **Variable:** Rain – Daily precipitation (mm) – Not Used
- **Variable:** RcID – Unique ID for rotation compon. (N/A) – Not Used

- **Variable:** RelatvTT – Relative thermal time (unitless) – Not Used
- **Variable:** RID – Rotation ID (N/A) – Not Used
 - Counter for occurrence of a given rotation component
- **Variable:** ROFC – Cumulative runoff (mm) – Not Used
- **Variable:** RootDep – Root depth (cm) – Not Used
- **Variable:** RWAD – Dry weight - root (kg ha^{-1}) – Not Used
- **Variable:** RWADMax – Max dry weight - root (kg ha^{-1}) – Not Used
 - Maximum root weight during growing season
- **Variable:** RWADMaxDate – Date of max dry weight - root (ISO Date) – Not Used
 - Date of maximum root weight during growing season
- **Variable:** RWADMaxDOY – Day of max dry weight of the year - root (N/A) – Not Used
 - Day of year of maximum root weight of during growing season
- **Variable:** RWADMaxYear – Year of max dry weight - root (N/A) – Not Used
 - Year of maximum root weight during growing season
- **Variable:** SatDef – Saturation Deficit (mm) – Not Used
- **Variable:** Sink – C Sink (kg ha^{-1}) – Not Used
- **Variable:** SinkMax – C Sink Maximum (kg ha^{-1}) – Not Used
- **Variable:** SoilAlbedo – Soil Albedo (unitless) – Not Used
- **Variable:** SoilElev – Elevation of soil profile (m) – Not Used
- **Variable:** SoilID – Soil Code (N/A) – Not Used
 - Code of soil used in experiment
- **Variable:** SoilLat – Latitude of soil profile (degree) – Not Used
- **Variable:** SoilLong – Longitude of soil profile (degree) – Not Used
- **Variable:** SolRadMult – Sol Rad Mult (MPI Only) (fraction) – Not Used
 - How much to reduce the solar radiation due to intercropping (MPI version) shading.
- **Variable:** Source – C Source (kg ha^{-1}) – Not Used
- **Variable:** SpeciesID – Species code (N/A) – Not Used
 - Formerly limited to two characters
- **Variable:** SRAA – Average solar radiation ($\text{MJ m}^{-2} \text{d}^{-1}$) – Not Used
- **Variable:** StationElev – Elevation of weather station (m) – Not Used
- **Variable:** StationID – Weather Station Code (N/A) – Not Used
 - Code of weather station used in experiment
- **Variable:** StationLat – Latitude of weather station (degree) – Not Used
- **Variable:** StationLong – Longitude of weather station (degree) – Not Used
- **Variable:** SWAD – Dry weight - stem (kg ha^{-1}) – Not Used

- **Variable:** SWAT – Dry weight - stem - tillers (kg ha^{-1}) – Not Used
- **Variable:** SWXD – Potentially extractable water (cm) – Not Used
- **Variable:** TIDRC – Cumulative tile drainage (mm) – Not Used
- **Variable:** TMNA – Average min. temperature (degree C) – Not Used
- **Variable:** TApexDay – Apex daytime temperature (degree C) – Not Used
- **Variable:** TApexNight – Apex nighttime temperature (degree C) – Not Used
- **Variable:** TApexMean – Apex mean temperature (degree C) – Not Used
 - Mean is weighted by number of hour of sunlight.
- **Variable:** TMXA – Average max. temperature (degree C) – Not Used
- **Variable:** VDays – Vernalization Days (Days) – Not Used
- **Variable:** VPD – Vapor Pressure Deficit (kPa) – Not Used
- **Variable:** WTDEPTH – Water Table Depth (mm) – Not Used
- **Variable:** Year – Four digit year (N/A) – Not Used

4.2 Results_Layer

RDB|Results_Layer

- **Variable:** BD – Bulk density (Mg m^{-3}) – Not Used
- **Variable:** C_ActOrg – Total active organic C (kg ha^{-1}) – Not Used
- **Variable:** C_CO2_FOM_lay – C in cumulative CO₂ evolved from FOM (kg ha^{-1}) – Not Used
 - 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}) – Not Used
- **Variable:** C_CO2_SOC_lay – C in cumulative CO₂ evolved from SOC (kg ha^{-1}) – Not Used
 - 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}) – Not Used
- **Variable:** C_RapFOM – Total rapid decomposing FOM C (kg ha^{-1}) – Not Used
- **Variable:** C_ResOrg – Total resistant organic C (kg ha^{-1}) – Not Used
- **Variable:** C_SloFOM – Total slow decomposing FOM C (kg ha^{-1}) – Not Used
- **Variable:** C_SloOrg – Total slow organic C (kg ha^{-1}) – Not Used
- **Variable:** C_Tot – Total C (kg ha^{-1}) – Not Used
 - Sum of C_ActOrg_kg, C_SloOrg, C_ResOrg, C_RapFOM, C_IntFOM_kg, C_SloFOM
- **Variable:** Dflow – Downward Flux (cm/day) – Not Used
- **Variable:** DUL – Drained Upper Limit of Soil Water ($\text{m}^3 \text{m}^{-3}$) – Not Used
- **Variable:** LL – Lower Limit of Soil Water ($\text{m}^3 \text{m}^{-3}$) – Not Used
- **Variable:** Min_Kg – Minimum element in a pool (kg ha^{-1}) – Not Used
 - Hardwired in the Global class.

- **Variable:** N_Ammonia – Ammonia in soil (kg ha^{-1}) – Not Used
- **Variable:** N_BFix – Asymbiotic N fixed (kg ha^{-1}) – Not Used
 - Cumulative N fixed by soil microbes (bacteria, etc)
- **Variable:** N_MinLay – Mineralization/Immobilization (kg ha^{-1}) – Not Used
 - Amount of Mineralization/Immobilization for each layer.
- **Variable:** N_SOCMinLay – SOC Mineralization/Immobilization (kg ha^{-1}) – Not Used
 - Amount of Mineralization/Immobilization Soil Organic Carbon for each layer.
- **Variable:** N_FOMMinLay – FOM Mineralization/Immobilization (kg ha^{-1}) – Not Used
 - Amount of Mineralization/Immobilization Fresh Organic Matter for each layer.
- **Variable:** N_MinLayConc – Mineralization/Immobilization Concentration (ppm) – Not Used
 - Mineralization/Immobilization Concentration for each layer.
- **Variable:** N_N2OConc – N₂O Concentration (ppm) – Not Used
- **Variable:** N_N2OLay – N₂O in Layer (kg ha^{-1}) – Not Used
- **Variable:** NOutLay – Labile N to other layers?? (kg ha^{-1}) – Not Used
- **Variable:** N_Nitrate – Nitrate in soil (kg ha^{-1}) – Not Used
- **Variable:** N_Tot – Total N (kg ha^{-1}) – Not Used
 - 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}) – Not Used
- **Variable:** NetFlow – Net Flux (cm/day) – Not Used
- **Variable:** NIADL – Inorganic N in soil (kg ha^{-1}) – Not Used
- **Variable:** NDownLay – Labile N leaving bottom of layer ($\text{kg ha}^{-1} \text{ d}^{-1}$) – Not Used
 - Non-cumulative. The sum of NDownLay from the bottom layer is the equivalent of N Leaching (NLCC).
- **Variable:** NDownLayC – Cumm. labile N leaving bottom of layer (kg ha^{-1}) – Not Used
 - Cumulative. The value of NDownLayc from the bottom layer is the equivalent of N Leaching (NLCC).
- **Variable:** P_Labile – P in soil (kg ha^{-1}) – Not Used
- **Variable:** RootU – Root Water Uptake (cm/day) – Not Used
- **Variable:** RWADL – Dry weight - root (kg ha^{-1}) – Not Used
- **Variable:** SAT – Saturated Soil Water Content ($\text{m}^3 \text{ m}^{-3}$) – Not Used
- **Variable:** ST – Soil temperature (degree C) – Not Used
- **Variable:** SW – Soil water content ($\text{m}^3 \text{ m}^{-3}$) – Not Used
- **Variable:** SWCN – Sat. hydraulic cond., macr. (cm h^{-1}) – Not Used
 - Macropore.
- **Variable:** Uflow – Upward Flux (cm/day) – Not Used
- **Variable:** ZLYR – Depth to bottom of the layer (cm) – Not Used

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:** PondMax – Maximum ponding height (mm) – **Required**
 - In this case used for surface storage due to roughness.
- **Variable:** FracResOrgInTotOrgC – Fraction SOC in initial resistant pool (fraction) – Optional
 - Fraction of organic soil C to go into initial resistant pool
- **Variable:** FracActInorgInTotInorgC – Fraction SInorgC in initial active pool (fraction) – Optional
 - Fraction of inorganic soil C to go into initial active pool
- **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:** SIDesc – 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:** Silty clay loam
- * **SILO:** Silty loam
- * **VFLOS:** Very fine loamy sand
- * **VFSA:** Very fine 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 (Institute + 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**
 - $< 0.002 \text{ mm}$.
- **Variable:** DUL – Drained upper limit of soil w. ($\text{m}^3 \text{ m}^{-3}$) – **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. ($\text{m}^3 \text{ m}^{-3}$) – **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 ($\text{m}^3 \text{ m}^{-3}$) – 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:**
 - * **I:** I
- **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:** SValue – Storm intensity for the month (N/A) – Optional
- **Variable:** StationID – Station ID (N/A) – Optional
 - **Choices:**
 - * **I:** I

6.1.3 Weather

WDB | Stations | Weather

- **Variable:** CDRad – Clear day solar radiation ($\text{MJ m}^{-2} \text{ d}^{-1}$) – 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. ($\text{moles m}^{-2} \text{ d}^{-1}$) – 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 ($\text{MJ m}^{-2} \text{ d}^{-1}$) – **Required**
- **Variable:** Tmax – Air temperature, maximum (degree C) – **Required**
- **Variable:** Tmin – Air temperature, minimum (degree C) – **Required**
- **Variable:** Wind – Wind run ($\text{km/d}^{\wedge}$) – 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 – Identify 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 Resistant 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:** 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:** 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:** 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:** DOY – Day of year of env. modif. (day of the year) – **Required**
- **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 ($\text{MJ m}^{-2} \text{ d}^{-1}$) – 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:** FIDD – 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:**
 - * **Tl000:** Undefined Implement
 - * **Tl002:** Tandem disk
 - * **Tl003:** Offset disk
 - * **Tl004:** Oneway disk
 - * **Tl005:** Moldboard plow
 - * **Tl006:** Chisel plow
 - * **Tl007:** Disk plow
 - * **Tl008:** Subsoiler
 - * **Tl009:** Breeder/lister
 - * **Tl010:** Field cultivator
 - * **Tl011:** Row crop cultivator
 - * **Tl012:** Harrow-springtooth
 - * **Tl013:** 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:** DLayerI – 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 ($\text{m}^3 \text{m}^{-3}$) – **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:** 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**
- **Variable:** Date – Date of measurement (N/A) – **Required**
 - YYYY-MM-DD

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

Component *XDB | Experiment | Rotation_Components | Component*

- **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
 - * **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
 - * **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
 - * **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:** 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
 - * **M:** At Maturity
 - * **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
 - * **N:** Not irrigated
 - * **R:** Reported Date
 - * **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
 - * **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
 - * **N:** No Residue Applications
 - * **R:** Reported Date
 - * **Y:** Reported Day of Year
- **Variable:** ITill – 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
 - * **N:** No tillage
 - * **R:** Reported Date
 - * **Y:** Reported Day of Year
- **Variable:** OrderNum – Order of the treatment (N/A) – **Required**
 - Order of the treatment (1, 2, 3...).

- **Variable:** Repeat – # times to repeat component (N/A) – Optional
 - Number of times to repeat this treatment before moving on to the next one
- **Variable:** RcID – Unique ID for rotation compon. (N/A) – **Required**
- **Variable:** Title – Rotation component title (N/A) – **Required**
- **Variable:** UseOnce – Only use this componet one time (N/A) – Optional
 - Use a rotation component one time and drop it from reusing later in the rotation (for spin-up)
 - **Choices:**
 - * **Y:** Yes, use only once
 - * **Y:** No, treat as normal component

Mgt_Chemical_App XDB | Experiment | Rotation_Components | Component | Mgt_Chemical_App

- **Variable:** ChAmt – Chemical application amount (kg ha⁻¹) – Optional
- **Variable:** ChCod – Chemical material code (N/A) – Optional
 - Not used in current version.
 - **Choices:**
 - * **CH001:** Alachlor (Lasso), Metolachlor (Dual) [Herbicide]
 - * **CH002:** Propanil (Herbicide)
 - * **CH003:** Trifluralin [Herbicide]
 - * **CH004:** Dalapon (Herbicide)
 - * **CH005:** MCPA [Herbicide]
 - * **CH006:** 2,4-D [Herbicide]
 - * **CH007:** 2,4,5-T [Herbicide]
 - * **CH008:** Pendimethalin [Herbicide]
 - * **CH009:** Atrazine [Herbicide]
 - * **CH010:** Diquat [Herbicide]
 - * **CH011:** Paraquat [Herbicide]
 - * **CH021:** Carbaryl, Sevin, Septene [Insecticide]
 - * **CH022:** Malathion, Mercaptothion [Insecticide]
 - * **CH023:** Naled [Insecticide]
 - * **CH024:** Disiethoate [Insecticide]
 - * **CH025:** Fention [Insecticide]
 - * **CH026:** Diazinon, Basudin [Insecticide]
 - * **CH027:** Ethion, Diethion [Insecticide]
 - * **CH028:** Oxydemeton-Methyl [Insecticide]
 - * **CH029:** Azinphos-Methyl [Insecticide]
 - * **CH030:** Phoaphamidon [Insecticide]
 - * **CH031:** Mevinphosl [Insecticide]
 - * **CH032:** Methyl Parathion [Insecticide]
 - * **CH033:** Parathion [Insecticide]
 - * **CH034:** DDT [Insecticide]
 - * **CH035:** BHC, HCH [Insecticide]
 - * **CH036:** Chlordane [Insecticide]
 - * **CH037:** Heptachlor [Insecticide]
 - * **CH038:** Toxaphene [Insecticide]
 - * **CH039:** Aldrin [Insecticide]
 - * **CH040:** Dieldrin [Insecticide]

- * **CH041:** Endrin, Nendrin [Insecticide]
- * **CH042:** Methomyl, Lannat [Insecticide]
- * **CH043:** Thiotex [Insecticide]
- * **CH044:** Furadan [Insecticide]
- * **CH045:** Endosulfan [Insecticide]
- * **CH051:** Captan [Fungicide]
- * **CH052:** Benomyl [Fungicide]
- * **CH053:** Zineb [Fungicide]
- * **CH054:** Maneb [Fungicide]
- * **CH055:** Mancozeb [Fungicide]
- * **CH056:** Tilt [Fungicide]
- * **CH057:** Rhizobium (for legume crops)

- **Variable:** ChDep – Chemical application depth (cm) – Optional

- Not used in current version.

- **Variable:** ChMet – Chemical application method (N/A) – Optional

- Not used in current version.

- **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:** Broadcast on flooded/saturated soil, none in soil
- * **AP012:** Broadcast on flooded/saturated soil, 15% in soil
- * **AP013:** Broadcast on flooded/saturated soil, 30% in soil
- * **AP014:** Broadcast on flooded/saturated soil, 45% in soil
- * **AP015:** Broadcast on flooded/saturated soil, 60% in soil
- * **AP016:** Broadcast on flooded/saturated soil, 75% in soil
- * **AP017:** Broadcast 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:** ChT – Chemical targets (N/A) – Optional

- Not used in current version.

- **Variable:** DAP – Days after planting for chem. (d) – Optional

- Not used in current version.

- **Variable:** DOY – Day of year of chem. event (day of the year) – Optional

- Not used in current version.

- **Variable:** Year – Year of chemical event (N/A) – Optional

- Not used in current version.

- **Variable:** CO2Adj – CO2 adjustment (ppm) – Optional
- **Variable:** CO2Fac – CO2 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 ($\text{MJ m}^{-2} \text{ d}^{-1}$) – 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:** Broadcast on flooded/saturated soil, none in soil
- * **AP012:** Broadcast on flooded/saturated soil, 15% in soil
- * **AP013:** Broadcast on flooded/saturated soil, 30% in soil
- * **AP014:** Broadcast on flooded/saturated soil, 45% in soil
- * **AP015:** Broadcast on flooded/saturated soil, 60% in soil
- * **AP016:** Broadcast on flooded/saturated soil, 75% in soil
- * **AP017:** Broadcast 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:** 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:** 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_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:** 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:** DAP – Days after planting for irrig. (d) – Optional
 - If needed.
- **Variable:** DFDrn – Drainage type (N/A) – Not Used
 - **Choices:**
 - * **DRoo:** No drainage
 - * **DRox:** Ditches
 - * **DRo2:** Sub-surface tiles
 - * **DRo3:** Surface furrows

- **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 (m²) – 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:** AIAm – 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 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:** PIDs – 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:** PIPH – 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:** 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**

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

- **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:**
 - * **T1000:** Undefined Implement
 - * **T1002:** Tandem disk
 - * **T1003:** Offset disk
 - * **T1004:** Oneway disk
 - * **T1005:** Moldboard plow
 - * **T1006:** Chisel plow
 - * **T1007:** Disk plow
 - * **T1008:** Subsoiler
 - * **T1009:** Breeder/lister
 - * **T1010:** Field cultivator
 - * **T1011:** Row crop cultivator
 - * **T1012:** Harrow-springtooth
 - * **T1013:** Harrow-spike
 - * **T1014:** Rotary hoe
 - * **T1015:** Roto-tiller
 - * **T1016:** Row crop planter
 - * **T1017:** Drill
 - * **T1018:** Shredder
 - * **T1019:** Hoe
 - * **T1020:** Planting stick
 - * **T1021:** Animal-drawn implement
 - * **T1022:** Hand
 - * **T1023:** 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.