

```
<Type name="wheat">
  <MetaData>
    <Uitype>CSUserInterface.GenericUI</Uitype>
    <IsCrop>Yes</IsCrop>
    <ShowInMainTree>Yes</ShowInMainTree>
    <Image>%apsim%\UserInterface\Images\Wheat.jpg</Image>
    <Description>Most APSIM crop or plant modules do not require extra user input. Crop specific
parameters are either provided for your chosen soil, or are captured as part of the standard model
validation process.</Description>
    <Documentation>%apsim%\Documentation\4 Module Reference\Wheat.htm</Documentation>
    <Documentation name="Generic plant documentation">%apsim%\Documentation\4 Module
Reference\Plant.htm</Documentation>
    <Documentation name="Gunnedah and Walgett sensibility
tests">http://www.apsim.info/apsim/publish/apsim/wheat/sensibility/nsw.gif</Documentation>
    <Documentation name="Birchip sensibility
tests">http://www.apsim.info/apsim/publish/apsim/wheat/sensibility/birchip.gif</Documentation>
    <Documentation name="Warra sensibility
tests">http://www.apsim.info/apsim/publish/apsim/wheat/sensibility/warra.gif</Documentation>
    <Documentation name="Darling downs sensibility
tests">http://www.apsim.info/apsim/publish/apsim/wheat/sensibility/darlingdowns.gif</Document
ation>
    <Documentation name="Mingenew sensibility
tests">http://www.apsim.info/apsim/publish/apsim/wheat/sensibility/Mingenew.gif</Documentati
on>
    <Documentation name="Walpeup sensibility
tests">http://www.apsim.info/apsim/publish/apsim/wheat/sensibility/Walpeup.gif</Documentatio
n>
    <Largelcon>%apsim%\UserInterface\Images\wheat32.png</Largelcon>
    <Smalllcon>%apsim%\UserInterface\Images\wheat16.png</Smalllcon>
    <dll>%apsim%/Model/Plant.%dlltext%</dll>
    <drops>
      <drop>toolbox</drop>
```

```

<drop>area</drop>

<drop>simulation</drop>

<drop>folder</drop>

</drops>

<ApsimToSim>

  <component name="[wheat.name]" executable="[dll]" class="Plant.Wheat">

    <executable name="[dll]" version="1.0" />

    <initdata>

      [Model]

      <ModifyKL>[wheat.ModifyKL]</ModifyKL>

      <MaxRootDepth>[wheat.MaxRootDepth]</MaxRootDepth>

      <ll>[soil.[InstanceName] ll]</ll>

      <kl>[soil.[InstanceName] kl]</kl>

      <xf>[soil.[InstanceName] xf]</xf>

      [if [soil.Analysis.CL]]<cl>[soil.Analysis.CL]</cl>[endif]

      [if [soil.Analysis.ESP]]<esp>[soil.Analysis.ESP]</esp>[endif]

      [if [soil.Analysis.EC]]<ec>[soil.Analysis.EC]</ec>[endif]

    </initdata>

  </component>

</ApsimToSim>

</MetaData>

<Model>

  <!--
  *****
  *****

  CONSTANTS - SPECIES-SPECIFIC PARAMETERS

  *****
  *****

```

```
-->
<options>
  <Environment />
  <Population />
  <Phenology />
  <Zadok />
  <Root />
  <GenericArbitratorXY />
  <GenericLeaf name="Leaf" />
  <Stem />
  <CompositePart name="Head">
    <FruitCohort name="Cohort1">
      <FruitPodPart name="Pod" />
      <FruitGrainPartGN name="Grain" />
    </FruitCohort>
  </CompositePart>
  <Parts name="Tops">
    <Leaf />
    <Stem />
    <Head />
  </Parts>
  <Parts name="Grain1">
    <Head.Cohort1.Grain />
  </Parts>
</options>
<RadiationPartitioningOrder>head leaf</RadiationPartitioningOrder>
<crop_type>wheat</crop_type>
```

<default_crop_class>plant</default_crop_class>

<default_cultivar>hartog</default_cultivar>

<!-- Parts than can supply retranslocate to grain

-->

<stress_determinants>leaf stem</stress_determinants>

<yield_parts>meal</yield_parts>

<retrans_parts>stem leaf</retrans_parts>

<!--

%%
%%

SECTION - VALUE LIMITS - MAX AND MINS

%%
%%

OTHER VARIABLES

limits set to check inputs

-->

<sw_ub>1.0</sw_ub>

<sw_lb>0.0</sw_lb>

<year_ub description="year upper limit">2000</year_ub>

<year_lb description="year lower limit">1800</year_lb>

<latitude_ub units="oL" description="latitude upper limit">90</latitude_ub>

<latitude_lb units="oL" description="latitude lower limit">-90</latitude_lb>

<maxt_ub units="oC" description="max. temperature upper limit">55</maxt_ub>

<maxt_lb units="oC" description="max. temperature lower limit">0</maxt_lb>

<mint_ub units="oC" description="min. temperature upper limit">40</mint_ub>

<mint_lb units="oC" description="min. temperature lower limit">-10</mint_lb>

<radn_ub units="MJ/m^2" description="radiation upper limit">50</radn_ub>

<radn_lb units="MJ/m^2" description="radiation lower limit">1</radn_lb>
<dlayer_ub units="mm" description="layer depth upper limit">1000</dlayer_ub>
<dlayer_lb units="mm" description="layer depth lower limit">0</dlayer_lb>
<dul_dep_ub units="mm" description="drained upper limit upper limit">1000</dul_dep_ub>
<dul_dep_lb units="mm" description="drained upper limit lower limit">0</dul_dep_lb>
<sw_dep_ub units="mm" description="soil water upper limit">1000</sw_dep_ub>
<sw_dep_lb units="mm" description="soil water lower limit">0</sw_dep_lb>
<no3_ub units="kg/ha" description="soil nitrate upper limit">10000</no3_ub>
<no3_lb units="kg/ha" description="soil nitrate lower limit">0</no3_lb>
<no3_min_ub units="kg/ha" description="min. soil nitrate upper limit">10000</no3_min_ub>
<no3_min_lb units="kg/ha" description="min. soil nitrate lower limit">0</no3_min_lb>
<nh4_ub units="kg/ha" description="soil ammonium upper limit">10000</nh4_ub>
<nh4_lb units="kg/ha" description="soil ammonium lower limit">0</nh4_lb>
<nh4_min_ub units="kg/ha" description="min. soil ammonium upper limit">10000</nh4_min_ub>
<nh4_min_lb units="kg/ha" description="min. soil ammonium lower limit">0</nh4_min_lb>

<!--
%%%%%%%%%%
%%%%%%%%%%

SECTION - CROP PHENOLOGY

%%%%%%%%%%
%%%%%%%%%%

-->

<stage_code_list>1 2 3 4 5 6 7 8 9 10
12</stage_code_list>

<phase_names>sowing germination emergence end_of_juvenile floral_initiation flowering
start_grain_fill end_grain_fill maturity harvest_ripe end_crop</phase_names>

<phase_type>cwsowing cwemergent cwinductive cwinductive cwinductive cwfixed
cwfixed cwfixed cwfixed cwfixed cwfixed</phase_type>

<composite_phases>under_ground above_ground grainfill reproductive leaf_senescence
vernalisation eme2ej preflowering tiller_formation hi_stress_sensitive stress_reporting
postflowering n_stress</composite_phases>

<under_ground>sowing germination</under_ground>

<above_ground>emergence end_of_juvenile floral_initiation flowering start_grain_fill
end_grain_fill maturity harvest_ripe</above_ground>

<vernalisation>germination emergence end_of_juvenile</vernalisation>

<leaf_senescence>end_of_juvenile(0.4) floral_initiation flowering start_grain_fill end_grain_fill
maturity harvest_ripe</leaf_senescence>

<tiller_formation>emergence end_of_juvenile floral_initiation flowering start_grain_fill
end_grain_fill maturity</tiller_formation>

<preflowering>emergence end_of_juvenile floral_initiation</preflowering>

<postflowering>flowering start_grain_fill</postflowering>

<reproductive>flowering start_grain_fill</reproductive>

<hi_stress_sensitive>flowering</hi_stress_sensitive>

<grainfill>start_grain_fill</grainfill>

<eme2ej>emergence end_of_juvenile</eme2ej>

<stress_reporting>end_of_juvenile floral_initiation flowering start_grain_fill
end_grain_fill</stress_reporting>

<n_stress>end_of_juvenile(0.3) floral_initiation flowering start_grain_fill end_grain_fill maturity
harvest_ripe</n_stress>

<plant class="yes">

<partition_option>2</partition_option>

<partitionparts>root head leaf stem</partitionparts>

<partitionrules>magic demand frac remainder</partitionrules>

<n_retrans_option>2</n_retrans_option>

<n_retrans_fraction description="0.33">1.0 </n_retrans_fraction>

<n_deficit_uptake_fraction>0.0001</n_deficit_uptake_fraction>

<x_temp_grainfill>0 26 35</x_temp_grainfill>

<y_rel_grainfill>0 1 1</y_rel_grainfill>

```
<n_uptake_option>3</n_uptake_option>
<!-- no3_uptake_max = 0.9e-6
      no3_conc_half_max = 80
      -->
<kno3>0.02</kno3>
<no3ppm_min>0.0</no3ppm_min>
<knh4>0.0</knh4>
<nh4ppm_min>0.0</nh4ppm_min>
<total_n_uptake_max units="g/m2">0.6</total_n_uptake_max>
<fruit_no_option>1</fruit_no_option>
<parasite_option>1</parasite_option>
<!-- list of crop class definitions
      !!!plant = wheat
      -->
<class_action>harvest</class_action>
<class_change>unchanged</class_change>
<!--
%%%%%%%%%%
%%%%%%%%%%

SECTION 0 - CO2

%%%%%%%%%%
%%%%%%%%%%

-->
<photosynthetic_pathway units="C3, or C4">C3</photosynthetic_pathway>
<x_co2_te_modifier units="ppm co2">350 700 1000</x_co2_te_modifier>
<y_co2_te_modifier>1.0 1.37 1.69</y_co2_te_modifier>
<x_co2_nconc_modifier units="ppm co2">350 700 1000</x_co2_nconc_modifier>
<y_co2_nconc_modifier>1.0 0.93 0.9</y_co2_nconc_modifier>
```

<!--

%%
%%

SECTION - CROP PHENOLOGY

%%
%%

-->

<phenology_option>2</phenology_option>

<stage_code description="numeric code for phenological stages">1 2 3 4 5
6 7 8 9 10 11</stage_code>

<stage_names description="stage names">sowing germination emergence end_of_juvenile
floral_initiation flowering start_grain_fill end_grain_fill maturity harvest_ripe end_crop
</stage_names>

<!--

STEM REDUCTION EFFECT ON PHENOLOGY

sow ger eme juv fi fl st_gf end_gf mat hv_rpe end

-->

<stage_code_list description="numeric code for phenological stages">1 2 3 4 5 6 7
8 9 10 11</stage_code_list>

<stage_stem_reduction_harvest>1 2 3 4 4 4 4 4 4 4
11</stage_stem_reduction_harvest>

<stage_stem_reduction_kill_stem>1 2 3 3 4 4 4 4 4 4
11</stage_stem_reduction_kill_stem>

<!--

SEED GERMINATION

Water stress factor for germination

-->

<pesw_germ units="mm/mm" description="plant extractable soil water in seedling layer inadequate for germination (mm/mm)">0.00</pesw_germ>

<!--

EMERGENCE

-->

<shoot_lag units="oCd" description="Time lag before linear coleoptile growth starts (deg days)">40.0</shoot_lag>

<shoot_rate units="oCd/mm" description="Growing deg day increase with depth for coleoptile (deg day/mm depth)">1.50</shoot_rate>

<!-- Water stress factor for emergence

-->

<fasw_emerg description="Fraction of available soil water">0.0 1.0 </fasw_emerg>

<rel_emerg_rate description="Stress factor for thermal time calculation between germination and emergence">1.0 1.0 </rel_emerg_rate>

<!--

PHOTOPERIOD AND TWILIGHT

-->

<twilight description="-2.2 (o) ! Twilight is defined as the interval between sunrise or sunset and the time when the true">-6.0 </twilight>

<!-- centre of the sun is 2.2 degrees below the horizon. Sunrise or sunset is defined as when the true centre of the sun is 50' below the horizon.

Vernalisation

-->

<x_vernal_temp>0 2 8 15</x_vernal_temp>

<y_vernal_days>0 1 0.5 0</y_vernal_days>

<!--

THERMAL TIME CALCULATION

Thermal time calculation

-->

<x_temp units="oC" description="cardinal temps.">0 26 34</x_temp>

<y_tt units="oCd" description="effective thermal time">0 26 0</y_tt>

<x_removeBiomPheno description="fraction of above ground biomass removed">0.0 0.1 0.4
0.5 1.0</x_removeBiomPheno>

<y_removeFractPheno description="fraction of above ground thermal time removed">0.0 0.08
0.4 0.5 1.0</y_removeFractPheno>

<!--

LEAF NUMBER DEVELOPMENT

currently leaf number at emergence will affect LAI at early stage, leaf_no_seed has no effect on the model, but will have in future

-->

<leaf_no_at_emerg description="0.5 ! (expanded) leaf number at emergence ()">2.0
</leaf_no_at_emerg>

<leaf_app_rate1 units="oCd" description="Growing deg day required to develop the most leaf
ligules. (deg day).">75.0</leaf_app_rate1>

<leaf_app_rate2 units="oCd" description="Growing deg day required to develop last leaf ligules.
(deg day).">2.0</leaf_app_rate2>

<leaf_no_rate_change description="Leaf no below flag above which leaf appearance rate
changes from rate1 to rate2.">7</leaf_no_rate_change>

<!-- RELATIVE to FLAG

-->

<leaf_no_pot_option>2</leaf_no_pot_option>

<x_node_no_app>0 20</x_node_no_app>

<y_node_app_rate>95 95</y_node_app_rate>

<!-- x_node_no_leaf = 0 5 8

-->

<x_node_no_leaf>0 2.5 6</x_node_no_leaf>

<y_leaves_per_node>1 1 6.0</y_leaves_per_node>

<x_lai_ratio description="ratio table for critical leaf size below which leaf number is reduced
()">0.0 0.1 0.8 1.0</x_lai_ratio>

<y_leaf_no_frac description="reduction in leaf appearance ()">0.0 1.0 1.0 1.0</y_leaf_no_frac>

<!--

%%
%%

SECTION 2 - PHOTOSYNTHESIS, BIOMASS GROWTH AND PARTITION

%%
%%

%%

PHOTOSYNTHESIS AND RADIATION USE EFFICIENCY (RUE)

%%

STAGE DEPENDENT RUE

-->

<x_stage_rue description="numeric code for phenological stages">1 2 3 4 5 6 7 8
9 10 11</x_stage_rue>

<y_rue units="g/MJ">0 0 1.24 1.24 1.24 1.24 1.24 1.24 0.00 0.00 0</y_rue>

<!--

EXTINCTION COEFFICIENT

ROW SPACING DETERMINED

-->

<skiprow_default>0</skiprow_default>

<row_spacing_default units="mm">250</row_spacing_default>

<x_row_spacing>200 350 1000</x_row_spacing>

<y_extinct_coef>0.50 0.50 0.50</y_extinct_coef>

<!-- y_extinct_coef = 0.45 0.45 0.45

-->

<y_extinct_coef_dead>0.30 0.30 0.30</y_extinct_coef_dead>

<!-- POD EXTINCTION COEFFICIENT and RUE

-->

<extinct_coef_pod>0.0</extinct_coef_pod>

<spec_pod_area units="mm^2/g">0.0</spec_pod_area>

<rue_pod units="g/MJ">0.0</rue_pod>

<!--

TEMPERATURE RESPONSE OF PHOTOSYNTHESIS - RUE

-->

<x_ave_temp units="oC" description="mean daily temperature">0 10 25 35</x_ave_temp>

<y_stress_photo description="multiplier on RUE">0 1 1 0</y_stress_photo>

<!-- %%%%%%%%%%%

BIOMASS INITIATION, PARTITION AND TRANSLOCATION

%%%%%%%%%%

INITIATION

root

-->

<dm_init units="g/plant" description="part weight at emergence xxx">0.010</dm_init>

<root_dm_init units="g/plant" description="part weight at emergence">0.010</root_dm_init>

<leaf_dm_init>0.003</leaf_dm_init>

<stem_dm_init>0.0016</stem_dm_init>

<pod_dm_init>0.0</pod_dm_init>

<meal_dm_init>0.0</meal_dm_init>

<oil_dm_init>0.0</oil_dm_init>

<!--

TRANSLOCATION PARTS

-->

<stemGrowthStructuralFractionStage> 5.6 6.01</stemGrowthStructuralFractionStage>

<stemGrowthStructuralFraction> .70 0.0</stemGrowthStructuralFraction>

<!--

BIOMASS PARTITIONING

sow ger eme juv endjuv fi flag flow endhead st_gf end_gf mat hv_rpe end

-->

<x_stage_no_partition>1 2 3 4 4.9 5 5.4 6 6.9 7 8 9 10
11</x_stage_no_partition>

<!-- y_ratio_root_shoot = 0 0 1.0 0.6 0.3 0.25 0.10 0.08 0 0 0 0 0
(0-1)

-->

<y_ratio_root_shoot units="0-1">0 0 1.0 1.0 0.3 0.30 0.30 0.08 0.01 0 0 0 0
0</y_ratio_root_shoot>

<y_frac_leaf units="0-1" description="fraction of remaining dm allocated to leaves">0 0 0.6
0.6 0.6 0.42 0.0 0.0 0.0 0 0 0 0 0</y_frac_leaf>

<y_frac_pod units="0-1" description="fraction of dm allocated to pod or multiplier of grain dm to
account for pod dm">0 0 0 0 0 0 0.33 0.33 0.33 0 0 0 0 0</y_frac_pod>

<!--

GRAIN NUMBER DETERMINATION

GRAIN FILLING

-->

<grain_no_determinant>stem</grain_no_determinant>

<sw_fac_max description="soil water stress factor maximum">1.125</sw_fac_max>

<temp_fac_min description="temperature stress factor minimum">0.69</temp_fac_min>

<sfac_slope description="soil water stress factor slope">-0.125</sfac_slope>

<tfac_slope description="temperature stress factor slope">0.0125</tfac_slope>

<potential_grain_n_filling_rate units="g/grain/d">0.000055</potential_grain_n_filling_rate>

<minimum_grain_n_filling_rate units="g/grain/d">0.000015</minimum_grain_n_filling_rate>

<x_temp_grain_n_fill>0 25</x_temp_grain_n_fill>

<y_rel_grain_n_fill>0 1</y_rel_grain_n_fill>

<crit_grainfill_rate description="0.0005">0. </crit_grainfill_rate>

<GrainMaxDailyNConc>0.03 </GrainMaxDailyNConc>

<x_temp_grain units="oC" description="temperature table for grain growth rate">0.0 15.0</x_temp_grain>

<y_grain_rate units="0-1" description="temperature factor on grain growth rate">0.0 1.0</y_grain_rate>

<carbo_oil_conv_ratio description="Carbohydrate:oil conversion ratio (>= 1.0)">1.0 </carbo_oil_conv_ratio>

<grain_oil_conc description="fractional oil content of grain (0-1)">0.0 </grain_oil_conc>

<!--

GRAIN WATER CONTENT

-->

<grn_water_cont units="g/g" description="water content of grain g/g">0.125</grn_water_cont>

<!--

%%
%%

SECTION 3 - LEAF/STEM/POD AREA GROWTH

%%
%%

LEAF SIZE AS A FUNCTION OF LEAF NUMBER

-->

<node_no_correction>2.0</node_no_correction>

<x_node_no>1 5 8 10</x_node_no>

<y_leaf_size>1400 3700 4800 5600</y_leaf_size>

<!--

SPECIFIC LEAF AREA - SLA

-->

<x_lai>0 5</x_lai>

<!-- y_sla_max = 27000 27000 ! maximum specific leaf area for delta LAI

-->

<y_sla_max description="maximum specific leaf area for delta LAI">27000 22000 </y_sla_max>

<!-- sla_min = 10000 ! minimum specific leaf area for delta LAI

-->

<sla_min description="minimum specific leaf area for delta LAI">18000 </sla_min>

<!--

TPLA - USED TO INITIALISE THE INITIAL LAI

-->

<initial_tpla units="mm^2/plant" description="initial total plant leaf area">200</initial_tpla>

<!--

HARVESTING EFFECTS ON LEAF AREA

-->

<fr_height_cut>0.0 0.1 1</fr_height_cut>

<fr_stem_remain>0.0 0.2 1</fr_stem_remain>

<!--

%%
%%

SECTION 4 - ROOT DEPTH AND ROOT LENGTH GROWTH

%%
%%

ROOTING DEPTH

sow ger eme juv fi fl st_gf end_gf mat hv_rpe end

stage_code = 1 2 3 4 5 6 7 8 9 10 11 ()

root_depth_rate = 0 5.0 40 40 40 40 0 0.0 0.0 0.0 0 (mm/d)

-->

<root_depth_rate units="mm/d">0 5.0 30 30 30 30 0.0 0.0 0.0 0.0
</root_depth_rate>

<!-- Effect of sw_supply_demand_ratio on root depth increase

-->

<x_ws_root description="sw_supply_demand_ratio">0 1 </x_ws_root>

<y_ws_root_fac description="effect of supply_demand_ratio on root depth increase">1 1
</y_ws_root_fac>

<!-- x_sw_ratio = [sw_dep(layer)-ll_dep(layer)]/[dul_dep(layer)-ll_dep(layer)] in the deepest root layer

-->

SECTION 5 - WATER RELATIONS AND WATER STRESS FACTORS

%%%

STAGE DEPENDENT TRANSPIRATION EFFICIENCY COEFFICIENTS

Transpiration efficiency coefficient to convert vpd to transpiration efficiency (kpa)

The following transp_eff_cf values are

in the form kpa/g carbo per m² / g water per m² (kpa/g carbo per m² / mm water) because
1g water = 1 cm³ water

sow ger eme juv fi fl st_gf end_gf mat hv_rpe end

stage_code = 1 2 3 4 5 6 7 8 9 10 11 ()

-->

<transp_eff_cf units="Pa">0 0 .006 .006 .006 .006 .006 .006 .0025 .00
</transp_eff_cf>

<!--

VPD FRACTION

Fraction of distance between svp at min temp and svp at max temp where average svp during transpiration lies.

-->

<svp_fract description="(0-1)">0.75 </svp_fract>

<eo_crop_factor_default description="default crop factor for limiting soil">1.5
</eo_crop_factor_default>

<!-- water demand to some fraction/multiple

of atmospheric potential.

WATER STRESS FACTORS FOR PHOTOSYNTHESIS, EXPANSION AND DEVELOPMENT

swdef_photo for photosynthesis is calculated in the code as = sw_supply_sum/sw_demand -
function crop_swdef_photo

For expansion growth, more sensitive than other growth processes

$x_sw_demand_ratio = sw_supply_sum/sw_demand$

-->

<x_sw_demand_ratio description="water availability">0.1 1.1</x_sw_demand_ratio>

<y_swdef_leaf description="stress indices">0 1</y_swdef_leaf>

<!-- For phenology stress factor based on available soil water portion

$sw_avail_pot_sum = sum_real_array (sw_avail_pot, deepest_layer),$

$sw_avail_sum = sum_real_array (sw_avail, deepest_layer)$

$sw_avail_ratio = divide (sw_avail_sum, sw_avail_pot_sum, 1.0) !???$

-->

<x_sw_avail_ratio description="water availability">0.0 0.16</x_sw_avail_ratio>

<y_swdef_pheno description="stress index for phenology">1.0 1.0</y_swdef_pheno>

<x_sw_avail_ratio_flowering description="water availability">0.2 0.50

1.0</x_sw_avail_ratio_flowering>

<y_swdef_pheno_flowering description="stress index for flowering phenology">1.0 1.0

1.0</y_swdef_pheno_flowering>

<x_sw_avail_ratio_start_grain_fill description="water availability">0.2 0.50

1.0</x_sw_avail_ratio_start_grain_fill>

<y_swdef_pheno_start_grain_fill description="stress index for grainfilling phenology">1.0 1.0

1.0</y_swdef_pheno_start_grain_fill>

<!--

WATERLOGGING STRESS (OXYGEN DEFICIT) FACTOR FOR PHOTOSYNTHESIS

-->

<oxdef_photo_rtfr description="fraction of roots waterlogged for effect on photosynthesis">0.0
0.8 1.0</oxdef_photo_rtfr>

<oxdef_photo units="0-1" description="stress index on photosynthesis">1.0 1.0
1.0</oxdef_photo>

<!--

%%%%%%%%%%
%%%%%%%%%%

SECTION 6 -NITROGEN RELATIONS, UPTAKE AND STRESS FACTORS

%%%%%%%%%%
%%%%%%%%%%

UPTAKE PREFERENCE AND CONSTANTS

preference for n supply - it is assumed that mass flow is always predominant, but further crop preference can

be specified as follows:

'active' = diffusive flow before fixation

'fixation' = fixed N before active uptake.

-->

<n_supply_preference>active</n_supply_preference>

<!-- Time constant for N uptake by diffusion. H van Keulen & NG Seligman. Purdoe 1987.

This is the time it would take to remove, by diffusion, current amount of N if it wasn't depleted between time steps

-->

<no3_diffn_const description="2.0 (days)">4.0 </no3_diffn_const>

<!--

LEGUME N FIXATION RATE - potential rate of N fixation (g N fixed per g above ground biomass)

sow ger eme juv fi fl st_gf end_gf mat hv_rpe end

stage_code = 1 2 3 4 5 6 7 8 9 10 11 ()

-->

<N_fix_rate units="gN/gDM">0 0 0 .00 0.00 0.00 0.00 0.00 0.00 0.00 0</N_fix_rate>

<x_sw_avail_fix description="soil water ratio for effect on N fixation">0.0 0.50 0.95
1.0</x_sw_avail_fix>

<y_swdef_fix units="0-1" description="stress index on N fixation">1.0 1.0 1.0
1.0</y_swdef_fix>

<!--

NITROGEN STRESS FACTORS FOR PHOTOSYNTHESIS, LEAF GROWTH AND DEVELOPMENT

n_conc_ratio = divide ((N_conc_stover - N_conc_stover_min), (N_conc_stover_crit -
N_conc_stover_min), 0.0)

n_conc_ratio_leaf = divide ((N_conc_leaf - N_conc_leaf_min), (N_conc_leaf_crit -
N_conc_leaf_min), 0.0)

g_nfact_photo = N_fact_photo * N_conc_ratio

g_n_fact_pheno = N_fact_pheno * N_conc_ratio

g_nfact_expansion = N_fact_expansion * n_conc_ratio_leaf

-->

<n_stress_option>1</n_stress_option>

<N_fact_photo description="multiplier for N deficit effect on photosynthesis">1.5
</N_fact_photo>

<N_fact_expansion description="multiplier for N deficit effect on leaf expansion">1.0
</N_fact_expansion>

<N_fact_pheno description="multiplier for N deficit effect on phenology">100 </N_fact_pheno>

<N_fact_grain description="multiplier for N deficit effect on grain filling">1.5 </N_fact_grain>

<!--

NITROGEN CONCENTRATION LIMITS: MAX. CRITICAL AND MINIMUM N CONCENTRATIONS

emerg endjuv fi flow end gf maturity

-->

<x_stage_code>3 4 5 6 8 10</x_stage_code>

<y_n_conc_min_leaf>0.025 0.025 0.021 0.010 0.005 0.0025</y_n_conc_min_leaf>

<y_n_conc_crit_leaf>0.063 0.063 0.042 0.015 0.008 0.0035</y_n_conc_crit_leaf>

<y_n_conc_max_leaf>0.070 0.070 0.050 0.020 0.010 0.005</y_n_conc_max_leaf>

<y_n_conc_min_stem>0.025 0.025 0.004 0.003 0.003 0.0025</y_n_conc_min_stem>

<y_n_conc_crit_stem>0.050 0.050 0.020 0.010 0.005 0.0035</y_n_conc_crit_stem>
<y_n_conc_max_stem>0.070 0.070 0.040 0.015 0.015 0.015</y_n_conc_max_stem>
<y_n_conc_min_pod>0.025 0.025 0.004 0.003 0.003 0.0025</y_n_conc_min_pod>
<y_n_conc_crit_pod>0.050 0.050 0.020 0.010 0.005 0.0035</y_n_conc_crit_pod>
<y_n_conc_max_pod>0.070 0.070 0.040 0.015 0.015 0.015</y_n_conc_max_pod>
<!-- n_conc_min_root = 0.010 0.010 0.006 0.006 0.006 0.006 ()
n_conc_crit_root = 0.020 0.016 0.016 0.016 0.015 0.015 ()
-->
<n_conc_min_root>0.010</n_conc_min_root>
<n_conc_crit_root>0.020</n_conc_crit_root>
<n_conc_max_root>0.020</n_conc_max_root>
<n_conc_min_grain>0.014</n_conc_min_grain>
<n_conc_crit_grain>0.030</n_conc_crit_grain>
<n_conc_max_grain>0.030</n_conc_max_grain>
<y_n_conc_min_meal>0.0 0.0 0.0 0.0 0.014 0.014</y_n_conc_min_meal>
<y_n_conc_crit_meal>0.0 0.0 0.0 0.0 0.030 0.030</y_n_conc_crit_meal>
<y_n_conc_max_meal>0.0 0.0 0.0 0.0 0.030 0.030</y_n_conc_max_meal>
<y_n_conc_min_oil>0.0 0.0 0.0 0.0 0.0 0.0</y_n_conc_min_oil>
<y_n_conc_crit_oil>0.0 0.0 0.0 0.0 0.0 0.0</y_n_conc_crit_oil>
<y_n_conc_max_oil>0.0 0.0 0.0 0.0 0.0 0.0</y_n_conc_max_oil>
<!--

INITIAL NITROGEN CONCENTRATION OF ORGANS

root

-->

<n_init_conc description="xxx">0.020 </n_init_conc>

<root_n_init_conc>0.020</root_n_init_conc>

<leaf_n_init_conc>0.063</leaf_n_init_conc>

```
<stem_n_init_conc>0.050</stem_n_init_conc>
<pod_n_init_conc>0.063</pod_n_init_conc>
<meal_n_init_conc>0.0</meal_n_init_conc>
<oil_n_init_conc>0.0</oil_n_init_conc>
<!--
```

NITROGEN CONCENTRATION IN SENESCENCED ORGANS

This means that as soon as leaves fall off, all N except for the amount below is instantly transferred from leaves to stem (need to stop this occurring if you 'kill' crop)

-->

```
<n_senescence_option>2</n_senescence_option>
```

```
<!--      root
```

-->

```
<n_sen_conc description="xxxx">0.005 </n_sen_conc>
```

```
<root_n_sen_conc description="shouldn't they more or less match the min_conc of plant parts?">0.005 </root_n_sen_conc>
```

```
<leaf_n_sen_conc>0.005</leaf_n_sen_conc>
```

```
<stem_n_sen_conc>0.0025</stem_n_sen_conc>
```

```
<pod_n_sen_conc>0.007</pod_n_sen_conc>
```

```
<meal_n_sen_conc>0.014</meal_n_sen_conc>
```

```
<oil_n_sen_conc>0.0</oil_n_sen_conc>
```

```
<!--
```

```
%%%%%%%%%%
%%%%%%%%%%
```

SECTION 7 -SENESCENCE AND DETACHMENT

```
%%%%%%%%%%
%%%%%%%%%%
```

DM SENESCENCE

```
-->

<root_die_back_fr units="0-1" description="fraction of roots lost at
harvest">0.0</root_die_back_fr>

<dm_senescence_option>1</dm_senescence_option>

<!-- dm fraction senesced for each fraction of canopy senesced.

-->

<x_dm_sen_frac_root description="root">0 1 </x_dm_sen_frac_root>
<y_dm_sen_frac_root>0.005 0.005</y_dm_sen_frac_root>
<x_dm_sen_frac_leaf description="leaf">0 1 </x_dm_sen_frac_leaf>
<y_dm_sen_frac_leaf>0 1</y_dm_sen_frac_leaf>
<x_dm_sen_frac_stem description="stem">0 1 </x_dm_sen_frac_stem>
<y_dm_sen_frac_stem>0 0</y_dm_sen_frac_stem>
<x_dm_sen_frac_pod description="flower">0 1 </x_dm_sen_frac_pod>
<y_dm_sen_frac_pod>0 0</y_dm_sen_frac_pod>
<x_dm_sen_frac_meal description="meal">0 1 </x_dm_sen_frac_meal>
<y_dm_sen_frac_meal>0 0</y_dm_sen_frac_meal>
<x_dm_sen_frac_oil description="oil">0 1 </x_dm_sen_frac_oil>
<y_dm_sen_frac_oil>0 0</y_dm_sen_frac_oil>

<!--
```

LEAF NUMBER AND AREA SENESENCE

```
-->

<min_tpla description="lower limit of total plant leaf area">5.0</min_tpla>

<node_sen_rate units="oCd/node" description="rate of node senescence on main
stem">60.0</node_sen_rate>

<fr_lf_sen_rate description="fraction of total leaf number senescing per main stem
node">0.035</fr_lf_sen_rate>

<n_fact_lf_sen_rate>0.0</n_fact_lf_sen_rate>
```



```
<lai_sen_light units="m^2/m^2" description="induced senescence occurs
(m^2/m^2)">7.0</lai_sen_light>

<!-- sen_light_slope = 0.005()    ! sensitivity of leaf area senescence to shading
-->

<sen_light_slope description="sensitivity of leaf area senescence to
shading">0.002</sen_light_slope>

<x_temp_senescence description="minimum temperature for frost senescence table (oC)">-15.0
-5.0 </x_temp_senescence>

<y_senescence_fac description="daily fraction of leaf area senesced due to frost (0-1)">0 0
</y_senescence_fac>

<x_maxt_senescence description="minimum temperature for heat senescence table (oC)">34.0
34.1 45.0 </x_maxt_senescence>

<y_heatsenescence_fac description="daily fraction of leaf area senesced due to heat (0-1)">0
0.05 0.40 </y_heatsenescence_fac>

<sen_rate_water description="slope in linear eqn relating soil water stress during photosynthesis
to leaf senescence rate">0.10</sen_rate_water>
```

```
<!--
```

DETACHMENT

```
root
```

```
-->
```

```
<dead_detach_frac description="xxx">0</dead_detach_frac>
```

```
<sen_detach_frac description="xxx">1</sen_detach_frac>
```

```
<root_dead_detach_frac description="fraction detached from each part of a dead plant per
day.">0</root_dead_detach_frac>
```

```
<root_sen_detach_frac description="fraction of senesced plant part detached each day from live
plants">1</root_sen_detach_frac>
```

```
<leaf_dead_detach_frac>0.0</leaf_dead_detach_frac>
```

```
<leaf_sen_detach_frac>0.0</leaf_sen_detach_frac>
```

```
<stem_dead_detach_frac>0.0</stem_dead_detach_frac>
```

<stem_sen_detach_frac>0.0</stem_sen_detach_frac>

<pod_dead_detach_frac>0.0</pod_dead_detach_frac>

<pod_sen_detach_frac>0.0</pod_sen_detach_frac>

<meal_dead_detach_frac>0.0</meal_dead_detach_frac>

<meal_sen_detach_frac>0.0</meal_sen_detach_frac>

<oil_dead_detach_frac>0.0</oil_dead_detach_frac>

<oil_sen_detach_frac>0.0</oil_sen_detach_frac>

<!--

%%%%%%%%%%
%%%%%%%%%%

SECTION 8 - WE MIGHT PUT RETRANSLOCATION OF DM AND N IN THIS SECTION

%%%%%%%%%%
%%%%%%%%%%

%%%%%%%%%%
%%%%%%%%%%

SECTION 9 - CROP FAILURE AND DEATH

%%%%%%%%%%
%%%%%%%%%%

crop failure

-->

<leaf_no_crit description="critical number of leaves, below which portion of the crop may die due to water stress">10.0</leaf_no_crit>

<tt_emerg_limit units="oCd" description="maximum degree days allowed for emergence to take place">300.0</tt_emerg_limit>

<days_germ_limit units="days" description="maximum days allowed after sowing for germination to take place (days)">40.0</days_germ_limit>

<swdf_photo_limit description="critical cumulative photosynthesis water stress, above which the crop partly fails (unitless)">99.0</swdf_photo_limit>

<swdf_photo_rate description="rate of plant reduction with photosynthesis water stress">0.0</swdf_photo_rate>

<swdf_pheno_limit description="critical cumulative phenology water stress, above which the crop fails (unitless)">25</swdf_pheno_limit>

<!--

PLANT DEATH

-->

<x_weighted_temp units="oC">55.0 60.0</x_weighted_temp>

<y_plant_death>0.0 1.0</y_plant_death>

<!--

%%
%%

SECTION 10 - PHOSPHORUS RELATIONS, UPTAKE AND STRESS FACTORS

%%
%%

%%
%%

SECTION 11 - DIGESTIBILITY

%%
%%

green

-->

<XLeafGreenDigestibilityMaxStageCode>3 5 6 6.5 8 9 10
11</XLeafGreenDigestibilityMaxStageCode>

<YLeafGreenDigestibilityMax>0.85 0.85 0.85 0.8 0.78 0.78
0.78</YLeafGreenDigestibilityMax>

<XLeafGreenDigestibilityAvgStageCode>3 5 6 6.5 8 9 10
11</XLeafGreenDigestibilityAvgStageCode>

<YLeafGreenDigestibilityAvg>0.82 0.82 0.82 0.82 0.7 0.68 0.68
0.68</YLeafGreenDigestibilityAvg>

<XLeafGreenDigestibilityMinStageCode>3 5 6 6.5 8 9 10
11</XLeafGreenDigestibilityMinStageCode>

<YLeafGreenDigestibilityMin>0.72 0.72 0.72 0.72 0.6 0.58 0.58
0.58</YLeafGreenDigestibilityMin>

<XStemGreenDigestibilityMaxStageCode>3 5 6 6.5 8 9 10
11</XStemGreenDigestibilityMaxStageCode>

<YStemGreenDigestibilityMax>0.82 0.82 0.65 0.64 0.59 0.51 0.42
0.3</YStemGreenDigestibilityMax>

<XStemGreenDigestibilityAvgStageCode>3 5 6 6.5 8 9 10
11</XStemGreenDigestibilityAvgStageCode>

<YStemGreenDigestibilityAvg>0.82 0.82 0.65 0.64 0.59 0.51 0.42
0.3</YStemGreenDigestibilityAvg>

<XStemGreenDigestibilityMinStageCode>3 5 6 6.5 8 9 10
11</XStemGreenDigestibilityMinStageCode>

<YStemGreenDigestibilityMin>0.82 0.82 0.65 0.64 0.59 0.51 0.42
0.3</YStemGreenDigestibilityMin>

<XPodGreenDigestibilityMaxStageCode>3 5 6 6.5 8 9 10
11</XPodGreenDigestibilityMaxStageCode>

<YPodGreenDigestibilityMax>0.82 0.82 0.82 0.78 0.68 0.67 0.66
0.66</YPodGreenDigestibilityMax>

<XPodGreenDigestibilityAvgStageCode>3 5 6 6.5 8 9 10
11</XPodGreenDigestibilityAvgStageCode>

<YPodGreenDigestibilityAvg>0.82 0.82 0.82 0.78 0.68 0.67 0.66
0.66</YPodGreenDigestibilityAvg>

<XPodGreenDigestibilityMinStageCode>3 5 6 6.5 8 9 10
11</XPodGreenDigestibilityMinStageCode>

<YPodGreenDigestibilityMin>0.82 0.82 0.82 0.78 0.68 0.67 0.66
0.66</YPodGreenDigestibilityMin>

<XMealGreenDigestibilityMaxStageCode>3 5 6 6.5 8 9 10
11</XMealGreenDigestibilityMaxStageCode>

<YMealGreenDigestibilityMax>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YMealGreenDigestibilityMax>

<XMealGreenDigestibilityAvgStageCode>3 5 6 6.5 8 9 10
11</XMealGreenDigestibilityAvgStageCode>

<YMealGreenDigestibilityAvg>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YMealGreenDigestibilityAvg>

<XMealGreenDigestibilityMinStageCode>3 5 6 6.5 8 9 10
11</XMealGreenDigestibilityMinStageCode>

<YMealGreenDigestibilityMin>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YMealGreenDigestibilityMin>

<XOilGreenDigestibilityMaxStageCode>3 5 6 6.5 8 9 10
11</XOilGreenDigestibilityMaxStageCode>

<YOilGreenDigestibilityMax>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YOilGreenDigestibilityMax>

<XOilGreenDigestibilityAvgStageCode>3 5 6 6.5 8 9 10
11</XOilGreenDigestibilityAvgStageCode>

<YOilGreenDigestibilityAvg>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YOilGreenDigestibilityAvg>

<XOilGreenDigestibilityMinStageCode>3 5 6 6.5 8 9 10
11</XOilGreenDigestibilityMinStageCode>

<YOilGreenDigestibilityMin>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YOilGreenDigestibilityMin>

<!-- senesced

-->

<XLeafSenescedDigestibilityMaxStageCode>3 5 6 6.5 8 9 10
11</XLeafSenescedDigestibilityMaxStageCode>

<YLeafSenescedDigestibilityMax>0.60 0.75 0.7 0.68 0.6 0.58 0.5
0.43</YLeafSenescedDigestibilityMax>

<XLeafSenescedDigestibilityAvgStageCode>3 5 6 6.5 8 9 10
11</XLeafSenescedDigestibilityAvgStageCode>

<YLeafSenescedDigestibilityAvg>0.60 0.75 0.7 0.68 0.6 0.58 0.5
0.43</YLeafSenescedDigestibilityAvg>

<XLeafSenescedDigestibilityMinStageCode>3 5 6 6.5 8 9 10
11</XLeafSenescedDigestibilityMinStageCode>

<YLeafSenescedDigestibilityMin>0.60 0.75 0.7 0.68 0.6 0.58 0.5
0.43</YLeafSenescedDigestibilityMin>

<XStemSenescedDigestibilityMaxStageCode>3 5 6 6.5 8 9 10
11</XStemSenescedDigestibilityMaxStageCode>

<YStemSenescedDigestibilityMax>0.55 0.55 0.55 0.55 0.45 0.38 0.3
0.3</YStemSenescedDigestibilityMax>

<XStemSenescedDigestibilityAvgStageCode>3 5 6 6.5 8 9 10
11</XStemSenescedDigestibilityAvgStageCode>

<YStemSenescedDigestibilityAvg>0.55 0.55 0.55 0.55 0.45 0.38 0.3
0.3</YStemSenescedDigestibilityAvg>

<XStemSenescedDigestibilityMinStageCode>3 5 6 6.5 8 9 10
11</XStemSenescedDigestibilityMinStageCode>

<YStemSenescedDigestibilityMin>0.55 0.55 0.55 0.55 0.45 0.38 0.3
0.3</YStemSenescedDigestibilityMin>

<XPodSenescedDigestibilityMaxStageCode>3 5 6 6.5 8 9 10
11</XPodSenescedDigestibilityMaxStageCode>

<YPodSenescedDigestibilityMax>0.82 0.82 0.82 0.78 0.68 0.67 0.66
0.66</YPodSenescedDigestibilityMax>

<XPodSenescedDigestibilityAvgStageCode>3 5 6 6.5 8 9 10
11</XPodSenescedDigestibilityAvgStageCode>

<YPodSenescedDigestibilityAvg>0.82 0.82 0.82 0.78 0.68 0.67 0.66
0.66</YPodSenescedDigestibilityAvg>

<XPodSenescedDigestibilityMinStageCode>3 5 6 6.5 8 9 10
11</XPodSenescedDigestibilityMinStageCode>

<YPodSenescedDigestibilityMin>0.82 0.82 0.82 0.78 0.68 0.67 0.66
0.66</YPodSenescedDigestibilityMin>

<XMealSenescedDigestibilityMaxStageCode>3 5 6 6.5 8 9 10
11</XMealSenescedDigestibilityMaxStageCode>

<YMealSenescedDigestibilityMax>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YMealSenescedDigestibilityMax>

<XMealSenescedDigestibilityAvgStageCode>3 5 6 6.5 8 9 10
11</XMealSenescedDigestibilityAvgStageCode>

<YMealSenescedDigestibilityAvg>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YMealSenescedDigestibilityAvg>

<XMealSenescedDigestibilityMinStageCode>3 5 6 6.5 8 9 10
11</XMealSenescedDigestibilityMinStageCode>

<YMealSenescedDigestibilityMin>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YMealSenescedDigestibilityMin>

<XOilSenescedDigestibilityMaxStageCode>3 5 6 6.5 8 9 10
11</XOilSenescedDigestibilityMaxStageCode>

<YOilSenescedDigestibilityMax>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YOilSenescedDigestibilityMax>

<XOilSenescedDigestibilityAvgStageCode>3 5 6 6.5 8 9 10
11</XOilSenescedDigestibilityAvgStageCode>

<YOilSenescedDigestibilityAvg>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YOilSenescedDigestibilityAvg>

<XOilSenescedDigestibilityMinStageCode>3 5 6 6.5 8 9 10
11</XOilSenescedDigestibilityMinStageCode>

<YOilSenescedDigestibilityMin>0.85 0.85 0.85 0.85 0.85 0.85 0.85
0.85</YOilSenescedDigestibilityMin>

<!--

%%
%%

SECTION - VALUE LIMITS - MAX AND MINS

%%
%%

ROOT PARAMETERS

-->

<ll_ub description="upper limit of lower limit">1000.0</ll_ub>

<kl_ub description="upper limit of water uptake factor">1.0</kl_ub>

<!--

SOIL WATER

-->

<minsw description="lowest acceptable value for ll">0.00001</minsw>

<!-- cultivar parameter upper bounds

-->

<tt_emergence_ub units="oCd" description="upper limit">1000.0</tt_emergence_ub>

<tt_flower_to_maturity_ub units="oCd" description="upper limit">1500.0</tt_flower_to_maturity_ub>

<tt_maturity_to_ripe_ub units="oCd" description="upper limit">1000.0</tt_maturity_to_ripe_ub>

<tt_flower_to_start_grain_ub units="oCd" description="upper limit">1000.0</tt_flower_to_start_grain_ub>

<tt_init_to_flower_ub units="oCd" description="upper limit">1000.0</tt_init_to_flower_ub>

<!--

%%
%%

SECTION - Root KL modifiers:

Hochman et. al. (2007) Simulating the effects of saline and sodic subsoils on wheat

crops growing on Vertosols. Australian Journal of Agricultural Research, 58, 802:810

%%
%%

-->

<CIA>4.0</CIA>

<CIB>-0.005</CIB>

<ESPA>10.0</ESPA>

<ESPB>-0.15</ESPB>

<ECA>3.0</ECA>

<ECB>-1.3</ECB>

<leaf_ashalk units="mol/kg">0.60</leaf_ashalk>

<stem_ashalk units="mol/kg">0.60</stem_ashalk>

<pod_ashalk units="mol/kg">1.10</pod_ashalk>

<meal_ashalk units="mol/kg">1.10</meal_ashalk>

<oil_ashalk units="mol/kg">1.10</oil_ashalk>

<seed_ripe_stage>9.0</seed_ripe_stage>

</plant>

<!--

PARAMETERS - CULTIVAR-SPECIFIC VALUES

-->

<base_cultivar>

<!-- Basic Cultivar information from which other cultivars can inherit information. Do not use this cultivar in

Simulations but choose from the following list of cultivars.

-->

<grains_per_gram_stem>25.0</grains_per_gram_stem>

<potential_grain_filling_rate description="grain growth rate during grainfill">0.0020
</potential_grain_filling_rate>

<potential_grain_growth_rate description="grain growth from flowering to grain fill">0.0010
</potential_grain_growth_rate>

<max_grain_size>0.041</max_grain_size>

<tt_emergence units="oCd">1.0</tt_emergence>

<tt_end_of_juvenile units="oCd">400.0</tt_end_of_juvenile>

<tt_floral_initiation units="oCd">555.0</tt_floral_initiation>

<tt_flowering units="oCd">120.0</tt_flowering>

<!--

startgf_to_mat = 580

tt_end_grain_fill = (0.05 * (tt_flowering + startgf_to_mat))

= 35

tt_start_grain_fill = startgf_to_mat - tt_end_grain_fill

= 545

-->

<tt_start_grain_fill units="oCd">545</tt_start_grain_fill>

<tt_end_grain_fill units="oCd">35</tt_end_grain_fill>

<tt_maturity units="oCd">1</tt_maturity>

<tt_end_crop units="oCd">1000</tt_end_crop>

<tt_harvest_ripe units="oCd">1000</tt_harvest_ripe>

<startgf_to_mat>580</startgf_to_mat>

<vern_sens>1.5</vern_sens>

<photop_sens>3.0</photop_sens>

<cum_vernal_days>0 25</cum_vernal_days>

<tt_emergence units="oCd">800 600</tt_emergence>

<est_days_emerg_to_init units="d">83</est_days_emerg_to_init>

<x_pp_endjuv_to_init>10.8 16.3</x_pp_endjuv_to_init>

<y_tt_endjuv_to_init>50 50</y_tt_endjuv_to_init>

<!--<x_pp_init_to_flower units="h">10.8 16.3</x_pp_init_to_flower>

<y_tt_init_to_flower units="oCd">450 200</y_tt_init_to_flower>

<x_pp_init_to_flower units="h"> 10-0 10.9 11.0 15.5 18.0</x_pp_init_to_flower>

<y_tt_init_to_flower units="oCd">130 130 300 150 150</y_tt_init_to_flower>-->

<x_pp_flower_to_start_grain units="h">1 24</x_pp_flower_to_start_grain>

<y_tt_flower_to_start_grain units="oCd">120 120</y_tt_flower_to_start_grain>

<x_pp_start_to_end_grain units="h">1 24</x_pp_start_to_end_grain>

<y_tt_start_to_end_grain units="oCd">580 580</y_tt_start_to_end_grain>

<tt_end_grain_to_maturity units="oCd">50.0</tt_end_grain_to_maturity>

<tt_maturity_to_ripe units="oCd">1.0</tt_maturity_to_ripe>

```
<x_stem_wt units="g/plant" description="stem weight per plant">0.6</x_stem_wt>
<y_height units="mm" description="plant canopy height">0.1500</y_height>
</base_cultivar>
<!-- ===== Eastern Australian Cultivars =====
In order from fastest to slowest maturing varieties.
-->
<hartog cultivar="yes">
<derived_from>base_cultivar</derived_from>
<vern_sens>1.5</vern_sens>
<photop_sens>3.0</photop_sens>
</hartog>
<janz cultivar="yes">
<derived_from>base_cultivar</derived_from>
<vern_sens>2.2</vern_sens>
<photop_sens>2.9</photop_sens>
<tt_floral_initiation units="oCd">458</tt_floral_initiation>
<tt_flowering units="oCd">109</tt_flowering>
<tt_start_grain_fill units="oCd">612</tt_start_grain_fill>
</janz>
<cunningham cultivar="yes">
<derived_from>base_cultivar</derived_from>
<vern_sens>1.5</vern_sens>
<photop_sens>3.5</photop_sens>
</cunningham>
<hybrid_meteor cultivar="yes">
<derived_from>base_cultivar</derived_from>
<vern_sens>1.5</vern_sens>
```

<photop_sens>3.5</photop_sens>
</hybrid_meteor>
<buckly cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>1.5</vern_sens>
 <photop_sens>3.5</photop_sens>
</buckly>
<anlace cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>1.5</vern_sens>
 <photop_sens>3.5</photop_sens>
</anlace>
<bowie cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>1.5</vern_sens>
 <photop_sens>3.5</photop_sens>
</bowie>
<sunco cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>2.0</vern_sens>
 <photop_sens>3.5</photop_sens>
</sunco>
<batavia cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>2.0</vern_sens>
 <photop_sens>4.0</photop_sens>
</batavia>

```
<suneca cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.8</vern_sens>
  <photop_sens>3.0</photop_sens>
</suneca>

<sunbri cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.5</vern_sens>
  <photop_sens>4.0</photop_sens>
</sunbri>

<sunbrook cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>3.0</vern_sens>
  <photop_sens>4.0</photop_sens>
</sunbrook>

<ellison cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.0</vern_sens>
  <photop_sens>3.5</photop_sens>
</ellison>

<espada cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.5</photop_sens>
</espada>

<!-- Barley Varieties

===== Western Australian Cultivars =====
```

dsg 240504 The following "pasture" cultivar is for testing purposes only

-->

<pasture cultivar="yes">

<derived_from>base_cultivar</derived_from>

<grains_per_gram_stem>0.0</grains_per_gram_stem>

</pasture>

<kulin cultivar="yes">

<derived_from>base_cultivar</derived_from>

<tt_floral_initiation units="oCd">580.0</tt_floral_initiation>

<tt_start_grain_fill units="oCd">646</tt_start_grain_fill>

<tt_end_grain_fill units="oCd">34</tt_end_grain_fill>

<startgf_to_mat>680</startgf_to_mat>

<vern_sens>1.6</vern_sens>

<photop_sens>1.8</photop_sens>

</kulin>

<gamenya cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.6</vern_sens>

<photop_sens>2.0</photop_sens>

<tt_floral_initiation units="oCd">630.0</tt_floral_initiation>

<tt_start_grain_fill units="oCd">665</tt_start_grain_fill>

<tt_end_grain_fill units="oCd">35</tt_end_grain_fill>

<startgf_to_mat>700</startgf_to_mat>

</gamenya>

<gutha cultivar="yes">

<derived_from>base_cultivar</derived_from>

<grains_per_gram_stem description="Not sure why this is different??? NIH">20.0

</grains_per_gram_stem>

<vern_sens>1.5</vern_sens>
<photop_sens>3.0</photop_sens>
</gutha>
<spear cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <tt_floral_initiation units="oCd">555.0</tt_floral_initiation>
 <startgf_to_mat description="was 740">580 </startgf_to_mat>
 <vern_sens>1.5</vern_sens>
 <photop_sens>3.5</photop_sens>
 <grains_per_gram_stem description="was 27.0">20 </grains_per_gram_stem>
 <max_grain_size>0.045</max_grain_size>
</spear>
<dagger cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <tt_floral_initiation units="oCd">555.0</tt_floral_initiation>
 <startgf_to_mat description="was 740">580 </startgf_to_mat>
 <vern_sens>1.5</vern_sens>
 <photop_sens>3.5</photop_sens>
 <grains_per_gram_stem description="was 27.0">20 </grains_per_gram_stem>
 <max_grain_size>0.045</max_grain_size>
</dagger>
<wilgoyne cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <tt_floral_initiation units="oCd">555.0</tt_floral_initiation>
 <startgf_to_mat description="was 680">580 </startgf_to_mat>
 <vern_sens>1.4</vern_sens>
 <photop_sens>1.6</photop_sens>

```

<grains_per_gram_stem>20.0</grains_per_gram_stem>

<max_grain_size>0.045</max_grain_size>

</wilgoyne>

<!-- ===== American Cultivars =====

-->

<yecora cultivar="yes">

  <derived_from>base_cultivar</derived_from>

  <grains_per_gram_stem description="Not sure why this is different??? NIH">20.0
</grains_per_gram_stem>

  <vern_sens>2.5</vern_sens>

  <photop_sens>3.5</photop_sens>

</yecora>

<!-- ===== New Zealand Cultivars =====

-->

<NewZealand_base_cultivar cultivar="yes">

  <derived_from>base_cultivar</derived_from>

  <grains_per_gram_stem description="grain numbers set">35.0 </grains_per_gram_stem>

  <!-- I have set this as 35 because the lower value of 22 was giving lower yields that expected-->

  <max_grain_size>0.047</max_grain_size>

  <vern_sens>2.0</vern_sens>

  <photop_sens>3.5</photop_sens>

  <y_height units="mm" description="plant canopy height">50 1500</y_height>

  <!-- 4 micromet rfz -->

  <node_sen_rate units="oCd/node" description="rate of node senescence on main
stem">120.0</node_sen_rate>

  <!-- I have reduced to reduce the rate of senescence following flag leaf to get the canopy
duration that is observed in NZ HEB Jun 2011 -->

  <root_depth_rate units="mm/d">0 5.0 20 20 20 20 0 0.0 0.0 0.0 0
</root_depth_rate>

```


<x_stage_no_partition>1 2 3 4 4.9 5 5.4 6 6.9 7 8 9 10
11</x_stage_no_partition>

<y_frac_leaf units="0-1" description="fraction of remaining dm allocated to leaves">0 0 0.6
0.6 0.3 0.3 0.0 0.0 0.0 0 0 0 0 0</y_frac_leaf>

<!-- roots were going down to fast so reduced rate HEB I don't really believe they grow slower
that australian varieties, probably an error in temperature response of root extension this is a short
term solution -->

<!-- Some NZ cultivars are using base cultivar instead of NewZealand_base_cultivar to avoid
causing problems with the validation set. These will need to be reconciled in the future-->

<x_node_no_leaf>0 2.5 6</x_node_no_leaf>

<y_leaves_per_node>1 1 1</y_leaves_per_node>

<!-- I have reduced the branching rate for NZ varieties to account for the higher typical sowing
rates (150 300 plants / m2) HEB June 2011-->

<sen_rate_water description="slope in linear eqn relating soil water stress during photosynthesis
to leaf senescence rate">0.05</sen_rate_water>

<!-- I have reduced the rate of senescence during water stress to improve predictions of LAI
under water stress-->

<x_pp_init_to_flower units="h"> 10-0 10.9 11.0 15.5 18.0</x_pp_init_to_flower>

<y_tt_init_to_flower units="oCd">130 130 300 150 150</y_tt_init_to_flower>

<!--Based on measurements from CPT-->

</NewZealand_base_cultivar>

<Advantage cultivar="yes">

<derived_from>base_cultivar</derived_from>

<grains_per_gram_stem description="Not sure why this is different ? NIH">22.0
</grains_per_gram_stem>

<max_grain_size>0.047</max_grain_size>

<vern_sens>2.0</vern_sens>

<photop_sens>3.5</photop_sens>

</Advantage>

<Albric cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>3.0</vern_sens>
<photop_sens>4.5</photop_sens>
</Albric>
<Amarok cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>5.0</vern_sens>
<photop_sens>3.0</photop_sens>
</Amarok>
<Aspiring cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>5.0</vern_sens>
<photop_sens>3.0</photop_sens>
</Aspiring>
<Avalon cultivar="yes">
<derived_from>base_cultivar</derived_from>
<grains_per_gram_stem description="Not sure why this is different ? NIH">22.0
</grains_per_gram_stem>
<max_grain_size>0.047</max_grain_size>
<vern_sens>5.0</vern_sens>
<photop_sens>4.0</photop_sens>
</Avalon>
<BAKKER_GOLD cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>1.0</vern_sens>
<photop_sens>4.0</photop_sens>
</BAKKER_GOLD>
<Batten cultivar="yes">
<derived_from>base_cultivar</derived_from>

<grains_per_gram_stem description="Not sure why this is different ? NIH">22.0
</grains_per_gram_stem>

<max_grain_size>0.047</max_grain_size>

<vern_sens>1.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Batten>

<Batten_winter cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>3.0</vern_sens>

<photop_sens>5.0</photop_sens>

</Batten_winter>

<Batten_spring cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>0</vern_sens>

<photop_sens>5</photop_sens>

</Batten_spring>

<Bounty cultivar="yes">

<derived_from>base_cultivar</derived_from>

<grains_per_gram_stem description="Not sure why this is different ? NIH">22.0
</grains_per_gram_stem>

<max_grain_size>0.047</max_grain_size>

<vern_sens>5.0</vern_sens>

<photop_sens>4.5</photop_sens>

</Bounty>

<Buster cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Buster>

<Cassius cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>5.0</photop_sens>

<grains_per_gram_stem>50.0 </grains_per_gram_stem>

<max_grain_size>0.06</max_grain_size>

</Cassius>

<Cellar cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>4.0</vern_sens>

<photop_sens>2.0</photop_sens>

</Cellar>

<CENTAUR cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</CENTAUR>

<Claire cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>3.0</vern_sens>

<photop_sens>5.0</photop_sens>

</Claire>

<Conquest cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>0.0</vern_sens>

<photop_sens>5.0</photop_sens>

</Conquest>

<Commando cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>1.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Commando>

<Consort cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>4.5</photop_sens>

</Consort>

<CR137 cultivar="yes">

<derived_from>base_cultivar</derived_from>

<grains_per_gram_stem description="Not sure why this is different ? NIH">22.0
</grains_per_gram_stem>

<max_grain_size>0.047</max_grain_size>

<vern_sens>1.0</vern_sens>

<photop_sens>4.0</photop_sens>

</CR137>

<Dominio cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>1.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Dominio>

<Einstein cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Einstein>

<Exceed cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Exceed>

<Hilton cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Hilton>

<Kohika cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>1.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Kohika>

<Kopara cultivar="yes">

<derived_from>base_cultivar</derived_from>

<grains_per_gram_stem description="Not sure why this is different ? NIH">22.0
</grains_per_gram_stem>

<max_grain_size>0.047</max_grain_size>

<vern_sens>1.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Kopara>

<Kotuku cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>1.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Kotuku>

<Macro cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Macro>

<Marshall cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Marshall>

<Monad cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>1.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Monad>

<Morph cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>1.0</vern_sens>

<photop_sens>4.5</photop_sens>

</Morph>

<Moulin cultivar="yes">

<derived_from>base_cultivar</derived_from>

<grains_per_gram_stem description="Not sure why this is different ? NIH">22.0
</grains_per_gram_stem>

<max_grain_size>0.047</max_grain_size>

<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Moulin>

<Option cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>4.0</vern_sens>

<photop_sens>4.5</photop_sens>

</Option>

<Otane cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>1.0</vern_sens>

<photop_sens>3.0</photop_sens>

</Otane>

<Pennant cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Pennant>

<Phonix cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Phonix>

<Raffels cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>3.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Raffels>

<Regency cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>5.0</vern_sens>
<photop_sens>4.0</photop_sens>
</Regency>
<Richmond cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>4.0</vern_sens>
<photop_sens>5.0</photop_sens>
</Richmond>
<rongotea cultivar="yes">
<derived_from>base_cultivar</derived_from>
<grains_per_gram_stem description="Not sure why this is different ? NIH">22.0
</grains_per_gram_stem>
<max_grain_size>0.047</max_grain_size>
<vern_sens>2.0</vern_sens>
<photop_sens>4.0</photop_sens>
</rongotea>
<Sapphire cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>1.0</vern_sens>
<photop_sens>4.0</photop_sens>
</Sapphire>
<Saracen cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>0.0</vern_sens>
<photop_sens>5.0</photop_sens>
</Saracen>
<Savannah cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>5.0</vern_sens>
<photop_sens>4.0</photop_sens>
</Savannah>
<Solstice cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>5.0</vern_sens>
<photop_sens>4.0</photop_sens>
</Solstice>
<Tanker cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>5.0</vern_sens>
<photop_sens>4.0</photop_sens>
</Tanker>
<Torlesse cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>1.0</vern_sens>
<photop_sens>4.0</photop_sens>
</Torlesse>
<Wakaniu cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>5.0</vern_sens>
<photop_sens>4.0</photop_sens>
</Wakaniu>
<Weston cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>5.0</vern_sens>

<photop_sens>4.0</photop_sens>

</Weston>

<!-- Generic flowering types -->

<V0_P0 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>0</vern_sens>

<photop_sens>0</photop_sens>

</V0_P0>

<V1_P0 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>1</vern_sens>

<photop_sens>0</photop_sens>

</V1_P0>

<V2_P0 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>2</vern_sens>

<photop_sens>0</photop_sens>

</V2_P0>

<V3_P0 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>3</vern_sens>

<photop_sens>0</photop_sens>

</V3_P0>

<V4_P0 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>4</vern_sens>
<photop_sens>0</photop_sens>
</V4_P0>

<V5_P0 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>5</vern_sens>
<photop_sens>0</photop_sens>
</V5_P0>

<V0_P1 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>0</vern_sens>
<photop_sens>1</photop_sens>
</V0_P1>

<V1_P1 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>1</vern_sens>
<photop_sens>1</photop_sens>
</V1_P1>

<V2_P1 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>2</vern_sens>

<photop_sens>1</photop_sens>

</V2_P1>

<V3_P1 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>3</vern_sens>

<photop_sens>1</photop_sens>

</V3_P1>

<V4_P1 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>4</vern_sens>

<photop_sens>1</photop_sens>

</V4_P1>

<V5_P1 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5</vern_sens>

<photop_sens>1</photop_sens>

</V5_P1>

<V0_P2 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>0</vern_sens>

<photop_sens>2</photop_sens>

</V0_P2>

<V1_P2 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>1</vern_sens>
<photop_sens>2</photop_sens>
</V1_P2>

<V2_P2 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>2</vern_sens>
<photop_sens>2</photop_sens>
</V2_P2>

<V3_P2 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>3</vern_sens>
<photop_sens>2</photop_sens>
</V3_P2>

<V4_P2 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>4</vern_sens>
<photop_sens>2</photop_sens>
</V4_P2>

<V5_P2 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5</vern_sens>

<photop_sens>2</photop_sens>

</V5_P2>

<V0_P3 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>0</vern_sens>

<photop_sens>3</photop_sens>

</V0_P3>

<V1_P3 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>1</vern_sens>

<photop_sens>3</photop_sens>

</V1_P3>

<V2_P3 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>2</vern_sens>

<photop_sens>3</photop_sens>

</V2_P3>

<V3_P3 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>3</vern_sens>

<photop_sens>3</photop_sens>

</V3_P3>

<V4_P3 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>4</vern_sens>
<photop_sens>3</photop_sens>
</V4_P3>

<V5_P3 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>5</vern_sens>
<photop_sens>3</photop_sens>
</V5_P3>

<V0_P4 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>0</vern_sens>
<photop_sens>4</photop_sens>
</V0_P4>

<V1_P4 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>1</vern_sens>
<photop_sens>4</photop_sens>
</V1_P4>

<V2_P4 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>2</vern_sens>

<photop_sens>4</photop_sens>

</V2_P4>

<V3_P4 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>3</vern_sens>

<photop_sens>4</photop_sens>

</V3_P4>

<V4_P4 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>4</vern_sens>

<photop_sens>4</photop_sens>

</V4_P4>

<V5_P4 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5</vern_sens>

<photop_sens>4</photop_sens>

</V5_P4>

<V0_P5 cultivar="yes">

<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>0</vern_sens>

<photop_sens>5</photop_sens>

</V0_P5>

<V1_P5 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>1</vern_sens>
<photop_sens>5</photop_sens>
</V1_P5>

<V2_P5 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>2</vern_sens>
<photop_sens>5</photop_sens>
</V2_P5>

<V3_P5 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>3</vern_sens>
<photop_sens>5</photop_sens>
</V3_P5>

<V4_P5 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>
<vern_sens>4</vern_sens>
<photop_sens>5</photop_sens>
</V4_P5>

<V5_P5 cultivar="yes">
<derived_from>NewZealand_base_cultivar</derived_from>

<vern_sens>5</vern_sens>

<photop_sens>5</photop_sens>

</V5_P5>

<!-- x_pp_endjuv_to_init = 10.8 16.3

y_tt_endjuv_to_init = 700 600

x_pp_init_to_flower = 1 24 (h)

y_tt_init_to_flower = 50 50 (oCd)

===== Chinese Cultivars =====

-->

<xifeng24 description="tested and revised by mike and wen on 26 Nov.02" cultivar="yes">

<derived_from>base_cultivar</derived_from>

<tt_start_grain_fill units="oCd">617.5</tt_start_grain_fill>

<tt_end_grain_fill units="oCd">32.5</tt_end_grain_fill>

<startgf_to_mat>650</startgf_to_mat>

<vern_sens>2.0</vern_sens>

<photop_sens>2.0</photop_sens>

<potential_grain_filling_rate>0.0025</potential_grain_filling_rate>

</xifeng24>

<dingxi24 description="based on cv. hartog" cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>0.5</vern_sens>

<photop_sens>1.0</photop_sens>

</dingxi24>

<!-- ===== Special Cultivars for Validation simulations ONLY

=====

-->

<hartog_wet cultivar="yes">

<!-- Cultivar to "fix" phenology for APS26 to observed dates to allow comparison of the rest of the model w.r.t water and N use.

-->

<derived_from>base_cultivar</derived_from>

</hartog_wet>

<hartog_dry cultivar="yes">

<!-- Cultivar to "fix" phenology for APS26 to observed dates to allow comparison of the rest of the model w.r.t water and N use.

-->

<derived_from>base_cultivar</derived_from>

</hartog_dry>

<gatton_hartog cultivar="yes">

<derived_from>base_cultivar</derived_from>

<!-- special parameterisation for simulations at Gatton where there appears to be consistent problems with

use of temperature data from the remote met square.

-->

<vern_sens>2.5</vern_sens>

<photop_sens>3.5</photop_sens>

</gatton_hartog>

<!-- ===== yield Prophet Cultivars =====

Very Early maturing

-->

<axe cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>2.2</vern_sens>
 <photop_sens>2.2</photop_sens>
 <tt_floral_initiation units="oCd">407</tt_floral_initiation>
 <tt_flowering units="oCd">123</tt_flowering>
 <tt_start_grain_fill units="oCd">650</tt_start_grain_fill>
</axe>

<h45 cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>1.5</vern_sens>
 <photop_sens>1.5</photop_sens>
</h45>

<h46 cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>1.5</vern_sens>
 <photop_sens>1.5</photop_sens>
</h46>

<silverstar cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>1.5</vern_sens>
 <photop_sens>1.5</photop_sens>
</silverstar>

<westonia cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>1.9</vern_sens>
 <photop_sens>0.5</photop_sens>

<tt_floral_initiation units="oCd">433</tt_floral_initiation>

<tt_flowering units="oCd">94</tt_flowering>

<tt_start_grain_fill units="oCd">650</tt_start_grain_fill>

</westonia>

<zippy cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.5</vern_sens>

<photop_sens>1.5</photop_sens>

</zippy>

<tamarinrock cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.5</vern_sens>

<photop_sens>1.5</photop_sens>

</tamarinrock>

<wollaroi cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.5</vern_sens>

<photop_sens>1.5</photop_sens>

</wollaroi>

<waagan cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.5</vern_sens>

<photop_sens>1.5</photop_sens>

</waagan>

<saintly cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.5</vern_sens>

```
<photop_sens>1.5</photop_sens>
</saintly>
```

```
<!-- Early maturing
```

```
-->
```

```
<early>
```

```
<derived_from>base_cultivar</derived_from>
```

```
<vern_sens>2.3</vern_sens>
```

```
<photop_sens>3.2</photop_sens>
```

```
</early>
```

```
<arrino cultivar="yes">
```

```
<derived_from>early</derived_from>
```

```
</arrino>
```

```
<ruby cultivar="yes">
```

```
<derived_from>early</derived_from>
```

```
</ruby>
```

```
<kirchauff cultivar="yes">
```

```
<derived_from>early</derived_from>
```

```
</kirchauff>
```

```
<kalka cultivar="yes">
```

```
<derived_from>early</derived_from>
```

```
</kalka>
```

```
<kukri cultivar="yes">
```

```
<derived_from>early</derived_from>
```

```
</kukri>
```

```
<hybrid_mercury cultivar="yes">
  <derived_from>early</derived_from>
</hybrid_mercury>
<ouyen cultivar="yes">
  <derived_from>early</derived_from>
</ouyen>
<tamaroi cultivar="yes">
  <derived_from>early</derived_from>
</tamaroi>
<wyalkatchem cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.0</vern_sens>
  <photop_sens>2.7</photop_sens>
  <tt_floral_initiation units="oCd">436</tt_floral_initiation>
  <tt_flowering units="oCd">111</tt_flowering>
  <tt_start_grain_fill units="oCd">650</tt_start_grain_fill>
</wyalkatchem>
<hunter cultivar="yes">
  <derived_from>early</derived_from>
</hunter>
<mace cultivar="yes">
  <derived_from>early</derived_from>
</mace>
<young cultivar="yes">
  <derived_from>early</derived_from>
</young>
<bowerbird cultivar="yes">
```


<derived_from>early</derived_from>
</bowerbird>
<drysdale cultivar="yes">
 <derived_from>early</derived_from>
</drysdale>
<bonnie_rock cultivar="yes">
 <derived_from>early</derived_from>
</bonnie_rock>
<perengori cultivar="yes">
 <derived_from>early</derived_from>
</perengori>
<agtscythe cultivar="yes">
 <derived_from>early</derived_from>
</agtscythe>
<livingston cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>2.4</vern_sens>
 <photop_sens>2.6</photop_sens>
 <tt_floral_initiation units="oCd">419</tt_floral_initiation>
 <tt_flowering units="oCd">118</tt_flowering>
 <tt_start_grain_fill units="oCd">611</tt_start_grain_fill>
</livingston>
<crusader cultivar="yes">
 <derived_from>base_cultivar</derived_from>
 <vern_sens>2.3</vern_sens>
 <photop_sens>2.8</photop_sens>
 <tt_floral_initiation units="oCd">421</tt_floral_initiation>

```
<tt_flowering units="oCd">84</tt_flowering>
<tt_start_grain_fill units="oCd">638</tt_start_grain_fill>
</crusader>
<hyperno cultivar="yes">
  <derived_from>early</derived_from>
</hyperno>
<dart cultivar="yes">
  <derived_from>early</derived_from>
</dart>
<emurock cultivar="yes">
  <derived_from>early</derived_from>
</emurock>
<imposeclplus cultivar="yes">
  <derived_from>early</derived_from>
</imposeclplus>
<condo cultivar="yes">
  <derived_from>early</derived_from>
</condo>
<katana cultivar="yes">
  <derived_from>early</derived_from>
</katana>
<!-- Early-Mid maturing
_____
-->
<annuello cultivar="yes">
  <derived_from>base_cultivar</derived_from>
<vern_sens>1.5</vern_sens>
```

```
<photop_sens>3.0</photop_sens>
</annuello>
<diamondbird cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</diamondbird>
<frame cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</frame>
<goroke cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</goroke>
<ventura cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</ventura>
<mitre cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</mitre>
```

```
<yallaroi cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</yallaroi>
<yitpi cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</yitpi>
<carnamah cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</carnamah>
<estoc cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</estoc>
<scout cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.8</vern_sens>
  <photop_sens>3.5</photop_sens>
  <tt_start_grain_fill units="oCd">550</tt_start_grain_fill>
</scout>
<sunstate cultivar="yes">
```

```
<derived_from>base_cultivar</derived_from>
<vern_sens>1.5</vern_sens>
<photop_sens>3.0</photop_sens>
</sunstate>
<guardian cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</guardian>
<barunga cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</barunga>
<catalina cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</catalina>
<gladius cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</gladius>
<halbred cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
```

```
<photop_sens>3.0</photop_sens>
</halbred>
<stiletto cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</stiletto>
<clf_stiletto cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</clf_stiletto>
<pugsley cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</pugsley>
<lincoln cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.8</vern_sens>
  <photop_sens>2.9</photop_sens>
  <tt_floral_initiation units="oCd">426</tt_floral_initiation>
  <tt_flowering units="oCd">91</tt_flowering>
  <tt_start_grain_fill units="oCd">612</tt_start_grain_fill>
</lincoln>
<impala cultivar="yes">
  <derived_from>base_cultivar</derived_from>
```

```
<vern_sens>1.5</vern_sens>
<photop_sens>3.0</photop_sens>
</impala>
<spitfire cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</spitfire>
<correll cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</correll>
<peake cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</peake>
<Sunmate cultivar="yes">
  <derived_from>spitfire</derived_from>
</Sunmate>
<WID802 cultivar="yes">
  <derived_from>spitfire</derived_from>
</WID802>
<justica cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
```

```
<photop_sens>3.0</photop_sens>
</justica>
<kord cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</kord>
<cobra cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</cobra>
<corack cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</corack>
<grenadecplus cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</grenadecplus>
<merlin cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</merlin>
```



```
<shield cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</shield>
```

```
<sunguard cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</sunguard>
```

```
<yawa cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.0</photop_sens>
</yawa>
```

```
<!-- Mid maturing
```

```
-->
```

```
<baxter cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.5</photop_sens>
</baxter>
```

```
<babbler cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.5</photop_sens>
```

</babblers>

<camn cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.5</vern_sens>

<photop_sens>3.5</photop_sens>

</camn>

<clf-jnz cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.5</vern_sens>

<photop_sens>3.5</photop_sens>

</clf-jnz>

<dollarbird cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.5</vern_sens>

<photop_sens>3.5</photop_sens>

</dollarbird>

<sapphire cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.5</vern_sens>

<photop_sens>3.5</photop_sens>

</sapphire>

<arrivato cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>1.5</vern_sens>

<photop_sens>3.5</photop_sens>

</arrivato>

<derrimut cultivar="yes">

<derived_from>base_cultivar</derived_from>
<vern_sens>2.0</vern_sens>
<photop_sens>2.7</photop_sens>
<tt_floral_initiation units="oCd">479</tt_floral_initiation>
<tt_flowering units="oCd">105</tt_flowering>
<tt_start_grain_fill units="oCd">576</tt_start_grain_fill>
</derrimut>

<barham cultivar="yes">
<derived_from>base_cultivar</derived_from>
<vern_sens>1.5</vern_sens>
<photop_sens>3.5</photop_sens>
</barham>

<buckley cultivar="yes">
<derived_from>base_cultivar</derived_from>
<vern_sens>1.5</vern_sens>
<photop_sens>3.5</photop_sens>
</buckley>

<carinya cultivar="yes">
<derived_from>base_cultivar</derived_from>
<vern_sens>1.5</vern_sens>
<photop_sens>3.5</photop_sens>
</carinya>

<wallup cultivar="yes">
<derived_from>base_cultivar</derived_from>
<vern_sens>1.5</vern_sens>
<photop_sens>3.5</photop_sens>
</wallup>

```
<elmoreclplus cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.5</photop_sens>
</elmoreclplus>
```

```
<justicacplus cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.5</photop_sens>
</justicacplus>
```

```
<DBAAurora cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>1.5</vern_sens>
  <photop_sens>3.5</photop_sens>
</DBAAurora>
```

```
<!-- Mid+ maturing
```

```
_____ -
```

```
-->
```

```
<bellaroi cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.0</vern_sens>
  <photop_sens>3.5</photop_sens>
</bellaroi>
```

```
<lang cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.3</vern_sens>
```

```
<photop_sens>3.3</photop_sens>
<tt_floral_initiation units="oCd">449</tt_floral_initiation>
<tt_flowering units="oCd">62</tt_flowering>
<tt_start_grain_fill units="oCd">567</tt_start_grain_fill>
</lang>
<caparoi cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.0</vern_sens>
  <photop_sens>3.5</photop_sens>
</caparoi>
<suntop cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.0</vern_sens>
  <photop_sens>3.5</photop_sens>
</suntop>
<!-- Mid-late maturing
_____
-->
<braewood cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.8</vern_sens>
  <photop_sens>3.0</photop_sens>
</braewood>
<calingiri cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.8</vern_sens>
  <photop_sens>3.0</photop_sens>
```

</calingiri>

<chara cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>2.8</vern_sens>

<photop_sens>3.0</photop_sens>

</chara>

<giles cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>2.8</vern_sens>

<photop_sens>3.0</photop_sens>

</giles>

<wylie cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>2.5</vern_sens>

<photop_sens>3.0</photop_sens>

<tt_floral_initiation units="oCd">459</tt_floral_initiation>

<tt_flowering units="oCd">84</tt_flowering>

<tt_start_grain_fill units="oCd">577</tt_start_grain_fill>

</wylie>

<endure cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>2.8</vern_sens>

<photop_sens>3.0</photop_sens>

</endure>

<sunlin cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>2.8</vern_sens>

```
<photop_sens>3.0</photop_sens>
</sunlin>
<sunvale cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.8</vern_sens>
  <photop_sens>3.0</photop_sens>
</sunvale>
<gregory cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.7</vern_sens>
  <photop_sens>3.2</photop_sens>
  <!-- <tt_start_grain_fill units="oCd">650</tt_start_grain_fill> -->
</gregory>
<Lancer cultivar="yes">
  <derived_from>gregory</derived_from>
</Lancer>
<magenta cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.8</vern_sens>
  <photop_sens>3.0</photop_sens>
</magenta>
<sentinel cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.8</vern_sens>
  <photop_sens>3.0</photop_sens>
</sentinel>
<envoy cultivar="yes">
```

```
<derived_from>base_cultivar</derived_from>
<vern_sens>2.8</vern_sens>
<photop_sens>3.0</photop_sens>
</envoy>
<gauntlet cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.8</vern_sens>
  <photop_sens>3.0</photop_sens>
</gauntlet>
<gazelle cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.8</vern_sens>
  <photop_sens>3.0</photop_sens>
</gazelle>
<phantom cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <vern_sens>2.8</vern_sens>
  <photop_sens>3.0</photop_sens>
</phantom>
<Harper cultivar="yes">
  <derived_from>sunvale</derived_from>
</Harper>
<Mitch cultivar="yes">
  <derived_from>sunvale</derived_from>
</Mitch>
<Trojan cultivar="yes">
  <derived_from>sunvale</derived_from>
```


</Trojan>

<!-- Late Maturing

_____ -

-->

<kelallac cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>2.5</vern_sens>

<photop_sens>4.0</photop_sens>

</kelallac>

<preston>

<derived_from>kelallac</derived_from>

</preston>

<strzelecki cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>2.5</vern_sens>

<photop_sens>4.0</photop_sens>

</strzelecki>

<bolac cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>3.1</vern_sens>

<photop_sens>3.1</photop_sens>

<tt_floral_initiation units="oCd">457</tt_floral_initiation>

<tt_flowering units="oCd">60</tt_flowering>

<tt_start_grain_fill units="oCd">604</tt_start_grain_fill>

</bolac>

<beaufort cultivar="yes">

<derived_from>kelallac</derived_from>

</beaufort>

<eaglehawk cultivar="yes">

<derived_from>base_cultivar</derived_from>

<vern_sens>2.5</vern_sens>

<photop_sens>2.5</photop_sens>

<tt_end_of_juvenile units="oCd">500.0</tt_end_of_juvenile>

<tt_floral_initiation units="oCd">655.0</tt_floral_initiation>

<tt_flowering units="oCd">250.0</tt_flowering>

<tt_start_grain_fill units="oCd">500</tt_start_grain_fill>

</eaglehawk>

<forrest cultivar="yes">

<derived_from>kelallac</derived_from>

</forrest>

<Scenario cultivar="yes">

<derived_from>kelallac</derived_from>

</Scenario>

<!-- Winter Wheat

Based on data in Penrose et al 2003 (AJAR)

wagga maturity types

-->

<lorikeet cultivar="yes">

<derived_from>base_cultivar</derived_from>

<tt_floral_initiation units="oCd">380.0</tt_floral_initiation>

<vern_sens>3.9</vern_sens>

```
<photop_sens>3.9</photop_sens>
</lorikeet>
<wylah cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">380.0</tt_floral_initiation>
  <vern_sens>3.9</vern_sens>
  <photop_sens>3.9</photop_sens>
</wylah>
<rosella cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">380.0</tt_floral_initiation>
  <vern_sens>3.9</vern_sens>
  <photop_sens>3.9</photop_sens>
</rosella>
<whistler cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">380.0</tt_floral_initiation>
  <vern_sens>3.9</vern_sens>
  <photop_sens>3.9</photop_sens>
</whistler>
<wedgetail cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">380.0</tt_floral_initiation>
  <vern_sens>3.9</vern_sens>
  <photop_sens>3.9</photop_sens>
</wedgetail>
<!--
```

mid maturity types

-->

<marombi cultivar="yes">

<derived_from>base_cultivar</derived_from>

<tt_floral_initiation units="oCd">455.0</tt_floral_initiation>

<vern_sens>3.9</vern_sens>

<photop_sens>4.0</photop_sens>

</marombi>

<!--

CSIRO maturity types

-->

<declic cultivar="yes">

<derived_from>base_cultivar</derived_from>

<tt_floral_initiation units="oCd">530.0</tt_floral_initiation>

<vern_sens>3.9</vern_sens>

<photop_sens>4.3</photop_sens>

</declic>

<mackellar cultivar="yes">

<derived_from>base_cultivar</derived_from>

<tt_floral_initiation units="oCd">530.0</tt_floral_initiation>

<vern_sens>3.9</vern_sens>

<photop_sens>4.3</photop_sens>

</mackellar>

<mackellar_TAS cultivar="yes">

<derived_from>base_cultivar</derived_from>

```
<tt_floral_initiation units="oCd">530.0</tt_floral_initiation>
<vern_sens>3.2</vern_sens>
<photop_sens>3.5</photop_sens>
<!--
tt_flowering = 120.0
startgf_to_mat = 750
tt_end_grain_fill = (0.05 * (tt_flowering + startgf_to_mat))
                    = 43.5
tt_start_grain_fill = startgf_to_mat - tt_end_grain_fill
                    = 706.5
-->
<tt_start_grain_fill units="oCd">706.5</tt_start_grain_fill>
<tt_end_grain_fill units="oCd">43.5</tt_end_grain_fill>
</mackellar_TAS>
<revenue cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">530.0</tt_floral_initiation>
  <vern_sens>3.9</vern_sens>
  <photop_sens>4.3</photop_sens>
</revenue>
<manning>
  <derived_from>revenue</derived_from>
</manning>
<adagio cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">530.0</tt_floral_initiation>
  <vern_sens>3.9</vern_sens>
```

```
<photop_sens>4.3</photop_sens>
</adagio>
<brennan cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">530.0</tt_floral_initiation>
  <vern_sens>3.9</vern_sens>
  <photop_sens>4.3</photop_sens>
</brennan>
<!--
  Late maturity types

-->
<dennis cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">580.0</tt_floral_initiation>
  <vern_sens>3.9</vern_sens>
  <photop_sens>4.5</photop_sens>
</dennis>
<tenant cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">580.0</tt_floral_initiation>
  <vern_sens>3.9</vern_sens>
  <photop_sens>4.5</photop_sens>
</tenant>
<teesdale cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">580.0</tt_floral_initiation>
```

```
<vern_sens>3.9</vern_sens>
<photop_sens>4.5</photop_sens>
</teesdale>
<wills cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <tt_floral_initiation units="oCd">580.0</tt_floral_initiation>
  <vern_sens>3.9</vern_sens>
  <photop_sens>4.5</photop_sens>
</wills>
  <!-- bangladesh version PLP...
-->
<bangladesh cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <potential_grain_filling_rate>0.0025</potential_grain_filling_rate>
  <grains_per_gram_stem>34.0</grains_per_gram_stem>
  <phyllochron>80.0</phyllochron>
  <startgf_to_mat>690</startgf_to_mat>
  <max_grain_size>0.042</max_grain_size>
  <vern_sens>1.5</vern_sens>
  <photop_sens>1.8</photop_sens>
</bangladesh>
<shatabdi cultivar="yes">
  <derived_from>base_cultivar</derived_from>
  <potential_grain_filling_rate>0.0025</potential_grain_filling_rate>
  <grains_per_gram_stem>28.0</grains_per_gram_stem>
  <tt_end_of_juvenile units="oCd400 340">400</tt_end_of_juvenile>
  <tt_floral_initiation units="oCd555">450.0</tt_floral_initiation>
```

<tt_flowering units="oCd120">120.0</tt_flowering>
<tt_start_grain_fill units="oCd 690">540</tt_start_grain_fill>
<max_grain_size>0.039</max_grain_size>
<vern_sens>1.8</vern_sens>
<photop_sens>2.8</photop_sens>
</shatabdi>
<prodip cultivar="yes">
<derived_from>base_cultivar</derived_from>
<potential_grain_filling_rate>0.0025</potential_grain_filling_rate>
<grains_per_gram_stem>27.0</grains_per_gram_stem>
<tt_end_of_juvenile units="oCd400 340">365</tt_end_of_juvenile>
<tt_floral_initiation units="oCd555">450.0</tt_floral_initiation>
<tt_flowering units="oCd120">120.0</tt_flowering>
<tt_start_grain_fill units="oCd 640">580</tt_start_grain_fill>
<max_grain_size>0.046</max_grain_size>
<vern_sens>1.6</vern_sens>
<photop_sens>3.2</photop_sens>
</prodip>
<sufi cultivar="yes">
<derived_from>base_cultivar</derived_from>
<potential_grain_filling_rate>0.0025</potential_grain_filling_rate>
<grains_per_gram_stem>28.0</grains_per_gram_stem>
<tt_end_of_juvenile units="oCd400 365">305</tt_end_of_juvenile>
<tt_floral_initiation units="oCd450">400.0</tt_floral_initiation>
<tt_flowering units="oCd120">120.0</tt_flowering>
<tt_start_grain_fill units="oCd">400</tt_start_grain_fill>
<max_grain_size>0.036</max_grain_size>

<vern_sens>2.0</vern_sens>
<photop_sens>3.0</photop_sens>
</sufi>
<shatabdi_x cultivar="yes">
<derived_from>base_cultivar</derived_from>
<potential_grain_filling_rate>0.0025</potential_grain_filling_rate>
<grains_per_gram_stem>28.0</grains_per_gram_stem>
<tt_end_of_juvenile units="oCd400 340">400</tt_end_of_juvenile>
<tt_floral_initiation units="oCd555">555.0</tt_floral_initiation>
<tt_flowering units="oCd120">120.0</tt_flowering>
<tt_start_grain_fill units="oCd 690">690</tt_start_grain_fill>
<max_grain_size>0.042</max_grain_size>
<vern_sens>1.3</vern_sens>
<photop_sens>2.6</photop_sens>
</shatabdi_x>
<shatabdi_early cultivar="yes">
<derived_from>base_cultivar</derived_from>
<potential_grain_filling_rate>0.0035</potential_grain_filling_rate>
<grains_per_gram_stem>25.0</grains_per_gram_stem>
<tt_end_of_juvenile units="oCd400">430.0</tt_end_of_juvenile>
<tt_floral_initiation units="oCd555">475.0</tt_floral_initiation>
<tt_flowering units="oCd120">180.0</tt_flowering>
<tt_start_grain_fill units="oCd 690">570</tt_start_grain_fill>
<max_grain_size>0.046</max_grain_size>
<vern_sens>3.0</vern_sens>
<photop_sens>3.50</photop_sens>
</shatabdi_early>

<lsni-2008 cultivar="yes">
<derived_from>base_cultivar</derived_from>
<grains_per_gram_stem>21.0</grains_per_gram_stem>
<potential_grain_filling_rate>0.0055</potential_grain_filling_rate>
<max_grain_size>0.0525</max_grain_size>
<tt_start_grain_fill units="oCd450">440.0</tt_start_grain_fill>
<tt_floral_initiation units="oCd450">385.2</tt_floral_initiation>
<tt_flowering units="oCd300">110.5</tt_flowering>
<tt_end_of_juvenile units="oCd400 365">480.9</tt_end_of_juvenile>
<vern_sens>2.0</vern_sens>
<photop_sens>3.1</photop_sens>
<y_height units="mm" description="plant canopy height">0 1700</y_height>
<x_stem_wt units="g/plant" description="stem weight per plant">0 2</x_stem_wt>
</lsni-2008>

<shatabdi_old cultivar="yes">
<derived_from>base_cultivar</derived_from>
<potential_grain_filling_rate>0.0035</potential_grain_filling_rate>
<grains_per_gram_stem>26.0</grains_per_gram_stem>
<phyllochron>70.0</phyllochron>
<startgf_to_mat>520</startgf_to_mat>
<max_grain_size>0.042</max_grain_size>
<vern_sens>1.90</vern_sens>
<photop_sens>3.00</photop_sens>
</shatabdi_old>
</Model>

</Type>