Automatic Harvest Documentation for Forage Crops (AutoMOW)

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There are two new options to simulate or to input post-harvest total biomass and percent leaf using the Cropping System Model for perennial forages (CROPGRO-PFM). One is a dynamic algorithm that calculates post-harvest total biomass and percent leaf (AutoMOW) and the other is entering pre-fix values of post-harvest total biomass and percent leaf directly into the FileX (SmartMOW). Those two new features replace the need to have a MOW file where the user enters post-harvest total biomass, percent leaf, number of leaves, and cutting height for each harvest date.

The AutoMOW uses lookup functions reading parameters from the SPE file to calculate the effect of harvest frequency, cutting height, and pre-harvest total biomass on post-harvest biomass and percent leaf. Those parameters are defined according to the harvesting frequency and cutting height of the user input in FileX. The two parameters MOWREF and RSREF are the reference post-harvest total biomass and percent leaf, respectively. Those two values are modified based on the harvesting frequency, cutting height, and pre-harvest biomass, multiplying the reference values by the corresponding values in the lookup function of SPE file, according to equations 1 and 2.

$$Post\ harvest\ total\ biomass = MOWREF \times YFREQ \times YCUTHT \times YCHMOW \quad \text{Eq. 1}$$

Where MOWREF is the post-harvest biomass reference value; YFREQ is the effect of harvest frequency; YCUTHT is the effect of cutting height; and YCHMOW is the effect of pre-harvest total biomass.

$$Post\ harvest\ percent\ leaf = RSREF \times YRSREF \quad \text{Eq. 2}$$

Where RSREF is the post-harvest percent leaf reference value and YRSREF is the effect of harvest frequency.

The SmartMOW option uses pre-fix values the user enters directly into the FileX for post-harvest total biomass and percent leaf and the model uses those values every time there is a harvest as a fixed condition to keep as a post-harvest condition. The harvest frequency and cutting height are also defined in FileX.

Both AutoMOW and SmartMOW have the option to enter a fixed postharvest vegetative stage (MVS) in the FileX variable called AMVS.

The harvest frequency can be defined in calendar days or growing degree days (GDD), calculated according to equation 3.

$$GDD = \big((TMAX + TMIN) \div 2\big) - TB \; and \; GDD \leq (TO - TB) \; and \; GDD \geq 0 \qquad \text{Eq. 3}$$

Where TMAX is the daily average maximum air temperature; TMIN is the daily minimum air temperature; TB is the base temperature, and TO is the optimal temperature.

Each option of harvest available is defined in the Simulation Controls session where a code letter in the HARVS variable is chosen. The letter **W** uses the AutoMOW option with harvest frequency defined in calendar days and the letter **X** with harvest frequency defined in GDD. The **Y** letter uses the SmartMOW option with harvest frequency defined in calendar days and the letter **Z** with harvest frequency defined in GDD.