

[Back to Top](#)

Session 1C: Advances in Simulating Diverse Agricultural Systems

Title: Introducing the CROPGRO Perennial Forage Model for Tropical and Temperate Grasses and Legumes

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Abstract: The annual version of the Cropping Systems Model (CSM) CROPGRO was modified and converted to the CSM CROPGRO Perennial Forage model, for the purpose of predicting herbage harvests, herbage protein, and re-growth of perennial forages over multiple seasons. A storage organ (rhizome, taproot, crown) was added as an additional state variable. The model includes seasonal dormancy, freeze thresholds, and rules for

partitioning to the storage organ. Rules for mobilization of carbohydrate and nitrogen from storage pools to drive re-growth and for re-fill of those storage pools were created and added to the species file. This perennial version is released in the latest DSSAT V4.7 software, with adaptations and species files for Marandu brachiaria, Tifton-85 bermudagrass (*Cynodon*), and alfalfa (*Medicago sativa*). Adaptations are in process for *Paspalum notatum*, *Panicum maximum*, napiergrass, and annual ryegrass (*Lolium multiflorum*). The model requires an additional file called "MOW" that specifies the harvest dates, the residual live stubble and associated percent leaf. The storage pools provide the ability for re-growth despite zero leaf area index caused by harvest or freeze-loss of all leaf tissue, although depletion of reserves from poor management and repeated damage can cause poor recovery and loss of the forage stand. The model will start from seed or vegetative cutting. It uses the DSSAT-CENTURY soil C module for cycling of senesced tissue. Automated harvest routines, prediction of digestibility, and linkages to animal grazing are being developed. Simulated production and re-growth dynamics of brachiaria over 20 harvest cycles over two years will be shown.
