

**Process Soil and Crop Models: CENTURY**

<b>Description</b>	CENTURY is a general model of plant-soil nutrient cycling that has been used to simulate carbon and nutrient dynamics for different types of ecosystems, including grasslands, agricultural lands, forests, and savannas. CENTURY is composed of a soil organic matter/decomposition submodel, a water budget model, a grassland/crop submodel, a forest production submodel, and management and events scheduling functions. It computes the flow of carbon, nitrogen, phosphorus, and sulfur through the model's compartments. The organic matter structure for C, N, P, and S are identical; the inorganic components are computed for the specific inorganic compound. The grassland/crop production model simulates plant production for different crops and plant communities (e.g., warm or cool season grasslands, wheat, and corn). The forest model simulates the growth of deciduous or evergreen forests in juvenile and mature phases. To simulate a savanna or shrubland, CENTURY uses both of these submodels with some additional code to simulate nutrient competition and shading effects. [Century is also described under terrestrial vegetation.]
<b>Appropriate Use</b>	To study the impact of climate change on net primary production (crops, pastures, forests) as well as carbon and nutrient dynamics (including carbon sequestration), and to explore adaptive agricultural and natural resource management options (tillage, fertilizer, different species and sequences, etc.).
<b>Scope</b>	Site-specific but has been used at watershed, drainage basin, and regional scales using GIS.
<b>Key Output</b>	Changes in soil carbon and nutrient balances, as well as in crop, pasture and forest production, for different climate change scenarios.
<b>Key Input</b>	Monthly average maximum and minimum air temperature; monthly precipitation; soil texture; plant nitrogen; phosphorus and sulfur content; lignin content of plant material; atmospheric and soil nitrogen inputs; initial soil carbon; nitrogen (phosphorus and sulfur optional).
<b>Ease of Use</b>	For trained agronomists and ecologists. Requires advanced knowledge of soil and plant growth processes.
<b>Training Required</b>	CENTURY basic training requires at least 1-2 weeks to acquire minimum skills to conduct simple simulations.
<b>Training Available</b>	Training is offered at NREL, Colorado State University (see Contacts below).
<b>Computer Requirements</b>	Windows-based PC.
<b>Documentation</b>	Available at: <a href="http://www.nrel.colostate.edu/projects/century5/">http://www.nrel.colostate.edu/projects/century5/</a> .
<b>Applications</b>	CENTURY has been used in the Loch Vale Watershed Project, a long-term research program designed to assess the effect of global climate change on the Front Range of the Colorado Rockies. Specifically, CENTURY was used to assess the abiotic and biotic controls on forest distribution and productivity as a basis for assessing potential vegetation change for projected climate scenarios.
<b>Contacts for Framework, Documentation, Technical Assistance</b>	Dr William Parton, NREL at Colorado State University, 1499 Campus Delivery Fort Collins, CO 80523-1499, USA; Tel: 970.491.1987; e-mail: <a href="mailto:billp@nrel.colostate.edu">billp@nrel.colostate.edu</a> .
<b>Cost</b>	Not identified.

**Process Soil and Crop Models: CENTURY (cont.)**

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<b>References</b>	Hall, D.O., J.M.O. Scurlock, D.S. Ojima, and W.J. Parton. 2000. Grasslands and the global carbon cycle: Modelling the effects of climate change. In <i>The Carbon Cycle</i> . T.M.L. Wigley and D.S. Schimel (eds.). Cambridge University Press, Cambridge, UK, pp. 102-114.  Parton, W.J., D.S. Schimel, C.V. Cole, and D.S. Ojima. 1987. Analysis of factors controlling soil organic levels of grasslands in the Great Plains. <i>Soil Science Society of America Journal</i> 51:1173-1179.
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