## Process Crop Models: Erosion Productivity Impact Calculator (EPIC)

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| ***Description*** | EPIC is an IBM, Macintosh, or Sun based generalized crop model that simulates daily crop growth on a hectare scale. Like most process plant growth models, it predicts plant biomass by simulating carbon fixation by photosynthesis, maintenance respiration, and growth respiration. Several different crops may be grown in rotation within one model execution. It uses the concept of light-use efficiency as a function of photosynthetically available radiation (PAR) to predict biomass. EPIC has been modified to simulate the direct effects of atmospheric carbon dioxide on plant growth and water use. Crop management is explicitly incorporated into the model. |
| ***Appropriate Use*** | This approach is useful for evaluating a limited number of agronomic adaptations to climate change, such as changes in planting dates, modifying rotations (i.e., switching cultivars and crop species), changing irrigation practices, and changing tillage operations. The parameter files are extremely sensitive to local conditions and EPIC can give grossly misleading results when relying on default settings as it is being tailored to different locations and cropping systems. |
| ***Scope*** | All locations; agricultural; site-specific. |
| ***Key Output*** | Response of crop yields, yield components, and irrigation requirements to climate change adaptations. |
| ***Key Input*** | Quantitative data on climate, soils, and crop management. |
| ***Ease of Use*** | Data intensive and difficult to use without sufficient qualifications. A person trained in general crop systems science with moderate programming skills should be able to use EPIC reliably with 3-4 days of intensive training. |
| ***Training Required*** | Requires technical modeling skills and a basic knowledge of agronomic principles. |
| ***Training Available*** | Informal training available; see below. |
| ***Computer Requirements*** | IBM-compatible PC 486 with 4k of RAM and 80MB. |
| ***Documentation*** | Williams, J.R., C.A. Jones, and P.T. Dyke. 1990. The EPIC model documentation. USDA-ARS Technical Bulletin No. 1768. U.S. Department of Agriculture, Washington, DC. pp. 3-92. |
| ***Applications*** | RAC analysis, drought assessment, soil loss tolerance tool, Australian sugarcane model (AUSCANE), pine tree growth simulator, global climate change analysis, farm level planning, drought impacts on residue cover, and nutrient and pesticide movement estimates for alternative farming systems for water quality analysis. |
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| ***Cost*** | No cost for model. |

## Process Crop Models: Erosion Productivity Impact Calculator (EPIC) (cont.)

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| ***References*** | Williams, J.R., C.A. Jones, and P.T. Dyke. 1984. A modeling approach to determining the relationship between erosion and soil productivity. *Transamerican Society of Agricultural Engineering* 27:129-144.<br>Easterling, W.E., N.J. Rosenberg, M.S. McKenney, C.A. Jones, P.T. Dyke, and J.R. Williams. 1992. Preparing the erosion productivity impact calculator (EPIC) model to simulate crop response to climate change and the direct effects of $CO_2$. *Special Issue: Methodology for Assessing Regional Agricultural Consequences of Climate Change, Agricultural and Forest Meteorology* 59(1-2):17-34. |