

Asner, GP, and SR Archer. 2010. Livestock and the global carbon cycle. In: *Livestock in a Changing Landscape: Drivers, Consequences and Responses* (H Steinfeld, H Mooney, F Schneider, LE Neville, eds.). Island Press, Washington, D.C. In Press.

Main Messages

- **The element carbon (C) is the basis for all life on Earth.** Global terrestrial net primary production—the net amount of C taken up by plants and photosynthetic microorganisms—is about 57 billion metric tons (petagrams or Pg) per year.
- **Global livestock production directly appropriates about 2 Pg C, or 3%, of global net primary production each year**, with this carbon mostly allocated from the 24 Pg C fixed in grazing lands and agricultural systems.
- **The most profound biospheric impact of livestock production on the carbon cycle is a growing set of worldwide ecological degradation syndromes**, including increasing rates of deforestation, woody vegetation encroachment on grazing lands, and desertification.
- **Livestock production results in a wide range of collateral carbon flows**, including carbon losses to the atmosphere via tropical deforestation for pasture and croplands ($\sim 1.2 \text{ Pg C yr}^{-1}$), C losses via desertification ($\sim 0.2 \text{ Pg C yr}^{-1}$), C sequestration via woody vegetation encroachment ($\sim 0.3 \text{ Pg C yr}^{-1}$), and C losses via methane emissions from livestock ($\sim 2.1 \text{ Pg yr}^{-1}$ in carbon dioxide (CO₂)-equivalents). These carbon-cycle impacts far exceed those of intensive livestock production.
- **Livestock production causes total emissions of $\sim 3.2 \text{ Pg CO}_2$ -equivalents yr⁻¹**, not including nitrogen-oxide compounds.
- **Carbon losses associated with grazing systems could be decreased, and sequestration could be enhanced, through proactive management** that maintains vegetation cover and soil carbon stores and through more explicitly integrating climatic fluctuations into planning of livestock production systems, such as where, when, and in what density to place grazing animals on the land with respect to drought events.