

**LCFS Indirect Land Use Change
Expert Workgroup
Carbon Emission Factors Subworkgroup**

June 2010 Update

Membership

- ARB staff representative: Kevin Cleary
- Uwe Fritsche (Oeko-Institut, Germany)
- Holly Gibbs (Stanford University)
- Keith Kline (ORNL)
- Steffen Mueller (University of Illinois at Chicago)
- Richard Nelson (Kansas State University) – Co-chair
- Don O'Connor (representing CDFA, S&T Consulting)
- Michael O'Hare (University of California, Berkeley)
- Sonia Yeh (University of California, Davis) – Co-chair

Task 1. Identify and compare the existing datasets and C emission factors

- Consult experts and conduct internal comparative review of datasets used for direct and indirect LULUC analyses
 - **EPA Renewable Fuel Standard 2010 (EPA)**
 - **CARB-Woods Hole Research Center (WHRC)**
 - FAO – Forestry Resources Assessment 2005 (FRA 2005)
 - **2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006)**
 - New IPCC Tier-1 Global Biomass Carbon Map for the Year 2000 Global Above-and Below-ground Living Biomass Carbon Density (R&G)
 - C stock estimates for tropical landscapes (Gibbs 2008)

Task 1. Identify and compare the existing datasets and C emission factors

- Compare assumptions about C stock (biomass C and soil C), conversion, and fluxes
 - Spatial resolution of land types and associated cover and the corresponding data on C stock (biomass C and soil C), fluxes (sources and sinks) in the reference and disturbed scenario
 - Degradation factors to existing forestland
 - Rate and duration (and the spatial resolution) of biomass and soil C loss after conversion
 - Rate and duration (and spatial resolution) of C uptake (+/-) after land use conversion in the corresponding converted land use type(s).

Task 2. Identify important GHG emission sources and sinks that are ignored in previous analysis

- *Additional* fertilizers that will be required to improve yield
- Other inputs changes (e.g energy inputs +/-) associated with yield and/or management changes
- **Credits for crops that sequester N₂O**
- **GHG emissions from land that stayed in the same use category but changed management practices**
- **Accounting of harvested wood**
- **Other non-GHG aerosols and gases, such as ozone precursors, carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x), and black carbon (BC)**
- Should albedo be considered?
- **Mode of clearing (burning vs. smoldering vs. mechanical) affects the BC and CO emission factors**

Potential Outside Experts

- Suggested by subEWG members:
 - Brent Sohngen/OSU (Global land use /biomass emission factors and databases)
 - Richard Houghton (WHRC) (Global soil and biomass C stock and emission factors)
 - Dr. Charles Rice, Kansas State University
 - Dr. Tristram O. West, ORNL
 - Sassan Saatchi (NASA JPL) - tropical to global biomass maps using satellite data
 - Experts from MIT (Emission factors used in EPPA model global land use/emission model)
 - Experts involved in the European studies (Emission factors most related to EU ILUC studies)
 - Susan Tarka Sanchez, Life Cycle Associates, LLC from CEC FFCA Deliverable (review of EPA/CARB methodology and lit review)
 - Johan Six and Mark Delucchi (UCD) (N₂O emissions)
 - Nancy Harris, Sean Grimland and Sandra Brown/Winrock
 - Experts from Woods Hole (Global soil and biomass C stock and emission factors)
 - Gregg Marland, ORNL (Global soil and biomass C stock and emission factors)
- Suggested by stakeholders:
 - Rob Mitchell (rob.mitchell@ars.usda.gov)
 - Heather Young (hlyoungs@berkeley.edu)
 - Marta Chrusch